behavioral sciences

Special Issue Reprint

The Developmental Trajectory of Children's Social Behaviors and Their Cognitive Neural Mechanisms

Edited by
Xuechen Ding and Wan Ding

mdpi.com/journal/behavsci

MDPI

The Developmental Trajectory of Children's Social Behaviors and Their Cognitive Neural Mechanisms

The Developmental Trajectory of Children's Social Behaviors and Their Cognitive Neural Mechanisms

Editors

Xuechen Ding
Wan Ding

MDPI

Basel • Beijing • Wuhan • Barcelona • Belgrade • Novi Sad • Cluj • Manchester

Editors

Xuechen Ding
School of Psychology
Shanghai Normal University
Shanghai
China

Wan Ding
College of Psychology
Zhejiang Normal University
Jinhua
China

Editorial Office
MDPI
St. Alban-Anlage 66
4052 Basel, Switzerland

This is a reprint of articles from the Special Issue published online in the open access journal *Behavioral Sciences* (ISSN 2076-328X) (available at: www.mdpi.com/journal/behavsci/special_issues/0CHM40W1VA).

For citation purposes, cite each article independently as indicated on the article page online and as indicated below:

Lastname, A.A.; Lastname, B.B. Article Title. *Journal Name* **Year**, *Volume Number*, Page Range.

ISBN 978-3-7258-0156-5 (Hbk)
ISBN 978-3-7258-0155-8 (PDF)
doi.org/10.3390/books978-3-7258-0155-8

Contents

About the Editors

Xuechen Ding

Xuechen Ding is an Associate Professor at the School of Psychology, Shanghai Normal University. His research interests include peer relationships, social behavior, and socio-emotional adjustment during middle childhood and early adolescence.

Wan Ding

Wan Ding is an Associate Professor at the College of Psychology, Zhejiang Normal University. Her research interests include children's emotion socialization, children's develoment in family relationships, and the mental health of disadvantaged children from early childhood to adolescence.

Preface

The normative development of children's social, emotional, and academic adjustment stems from sources including both family and peer groups. Parent–child and peer interactions have unique and significant implications for children, and these social relationships serve as foundations for feelings of security and belonging. During the socialization process in at-home and in-school contexts, children display a wide variety of social behaviors. However, several issues require further exploration. For example, what are the different causal relations that might underlie children's social behaviors? What is the trajectory of these social behaviors at different developmental stages? Can we establish the neural basis for these social behaviors using advanced techniques? In light of these premises, this reprint aims to advance the literature on the development trajectory of children's social behaviors and their cognitive neural mechanisms. The research in this reprint elucidates a broad range of social behaviors and illustrate relevant empirical evidence, new methodological concerns, and future directions in this field.

Xuechen Ding and Wan Ding
Editors

behavioral sciences

MDPI

Article

Relations between Prosociality and Psychological Maladjustment in Chinese Elementary and Secondary School Students: Mediating Roles of Peer Preference and Self-Perceived Social Competence

Mingxin Li [1,†], Guomin Jin [2,†], Tongyan Ren [1], Aersheng Haidabieke [1], Lingjun Chen [3,*] and Xuechen Ding [1,4,5,*]

[1] Department of Psychology, Shanghai Normal University, Shanghai 200234, China; 1000527473@smail.shnu.edu.cn (M.L.); 1000527479@smail.shnu.edu.cn (T.R.); 1000498022@smail.shnu.edu.cn (A.H.)
[2] School of Psychology and Cognitive Science, East China Normal University, Shanghai 200062, China; 52213200007@stu.ecnu.edu.cn
[3] School of Education, Shanghai Jiao Tong University, Shanghai 200240, China
[4] Laboratory for Educational Big Data and Policymaking, Shanghai Academy of Educational Sciences, Shanghai 200032, China
[5] The Research Base of Online Education for Shanghai Middle and Primary Schools, Shanghai 200234, China
* Correspondence: lingjunchen@sjtu.edu.cn (L.C.); dingxuechen@shnu.edu.cn (X.D.)
† These authors contributed equally to this work.

Abstract: Despite empirical findings that prosociality can prevent elementary and secondary school students from developing psychological maladjustment, little is known about the underlying mechanisms. The goal of the present study was to examine the mediating effects of peer preference and self-perceived social competence on the associations between prosociality and psychological maladjustment (i.e., depressive symptoms and loneliness). Participants were 951 students (Mage = 11 years, 442 girls) in Grades 3~7 from Shanghai, China. They completed peer nominations of prosociality and peer preference and self-report measures of self-perceived social competence, depressive symptoms, and loneliness. Multiple mediation analyses revealed that: (a) both peer preference and self-perceived social competence mediated the relations between prosociality and psychological maladjustment, and (b) a serial indirect pathway (i.e., prosociality → peer preference → self-perceived social competence → psychological maladjustment) emerged when controlling for age group and gender. These findings point to potential targets in the prevention and intervention of Chinese students' internalization of problems.

Keywords: prosocial behavior; psychological maladjustment; peer preference; self-perceived social competence

Citation: Li, M.; Jin, G.; Ren, T.; Haidabieke, A.; Chen, L.; Ding, X. Relations between Prosociality and Psychological Maladjustment in Chinese Elementary and Secondary School Students: Mediating Roles of Peer Preference and Self-Perceived Social Competence. *Behav. Sci.* **2023**, *13*, 547. https://doi.org/10.3390/bs13070547

Academic Editors: John A. Hunter and Scott D. Lane

Received: 9 May 2023
Revised: 11 June 2023
Accepted: 28 June 2023
Published: 30 June 2023

1. Introduction

Prosociality refers to one's tendency to act in a manner that benefits others, and it manifests in many ways, such as caring, sharing, and helping [1]. As a major aspect of social competence, prosociality is critical to child and adolescent normative development [2]. Research has shown that elementary and secondary school students who exhibit more prosociality often report fewer internalizing symptoms, such as depressive symptoms and loneliness [3–5]. These studies suggest that prosociality may serve as a protective factor against becoming psychologically maladjusted. Despite consistent evidence linking prosociality to better psychological functioning, the underlying mechanisms that help to account for these links remain under-investigated [6]. Drawing from contextual-developmental perspectives [7] and informed by prior research findings [8,9], this study explores the mediating effects of peer preference and self-perceived social competence in the relations

between prosociality and psychological maladjustment among a large sample of Chinese elementary and secondary school students.

1.1. Prosociality and Psychological Maladjustment

Engagement in prosocial behavior necessitates good emotion regulation and social–cognitive skills [2]. For example, being prosocial requires the ability to regulate one's negative feelings when observing another's distress [10,11]. Thus, the self-regulation abilities that prosocial students display may help them be less prone to emotional problems. A growing body of literature has examined the association between prosociality and adolescent psychological maladjustment [12–14], such as depression and loneliness. For example, longitudinal studies show that prosociality caused a decrease in depressive symptoms in elementary and secondary school students [3,15,16]. A recent meta-analysis also supports that prosocial behavior is negatively related to internalizing problems including depression, although the effect is small [6]. Similar to depression, students with higher prosociality tend to experience lower levels of loneliness [5,17]. Taken together, this body of research has stressed that prosocial behavior can work as a protective factor for psychological well-being. However, how prosociality relates to adolescent psychological maladjustment remains relatively unclear. Understanding the underlying mechanisms of these relations will help to understand the key variables related to prosociality that may closely affect students' psychological well-being.

1.2. Peer Preference and Self-Perceived Social Competence as Potential Mediators

In addition to direct relations, prosociality is likely to be related to decreased depressive symptoms and loneliness indirectly through peer preference and self-perceived social competence. According to the contextual-developmental perspective [7], cultural values provide a basis for social evaluations of children's behaviors, which may in turn shape children's developmental outcomes. In Chinese society where interpersonal harmony is emphasized, prosocial behavior is highly encouraged and regarded as a behavioral virtue that contributes to effective group functioning [18]. Accordingly, students with high prosociality are likely to receive positive feedback from their peers, as shown in higher peer preference (i.e., likeability) [3,7,19]. Being well-liked and preferred by peers may provide students with more opportunities to receive instrumental help and emotional support from peers, which ultimately contribute to their fewer internalizing problems, such as depressive symptoms and loneliness [5,20]. The mediating effect of peer preference on the relation between prosociality and psychological maladjustment has been investigated once. In this study, researchers found that students with high levels of prosociality were more preferred and well-liked by their peers, which in turn reduced their depressive symptoms [3].

Aside from peer preference, self-perceived social competence may be the other potential mediator that can explain the relations between prosociality and psychological maladjustment. Self-perceived social competence refers to one's subjective perceptions of competence or adequacy in the social domain of functioning [21]. Children's social behaviors have long been linked to their self-perceived competence [22,23]. Prosocial students may regard their sense of self, especially their social selves, in a more favorable light. This is because taking prosocial actions may enable individuals to feel valued and needed by others, which bolsters feelings about the social self [24]. Research has shown that prosociality is linked to higher levels of general self-worth and social worth [24,25]. Cognitive theories of internalizing disorders posit that individuals with adaptive self-schemas are less vulnerable to developing internalizing problems [26,27]. The positive self-perception is thus thought to protect elementary and secondary school students from developing psychological problems [28,29].

Peer preference and self-perceived social competence may mediate the relations between prosociality and psychological maladjustment in a serial manner. The competency-based model suggests that peer experiences, such as peer preference, may impact self-perceptions of one's ability to function in the social domain (i.e., self-perceived social

competence) [26,28,30,31]. As discussed above, prosocial adolescents are usually accepted and well-liked by peers [3,7], and they may integrate positive feedback from peers into their sense of social self, which leads them to perceive that they are socially accepted and competent. This high level of self-perceived social competence, in turn, could mitigate the risk of experiencing depression and loneliness. Consistent with this theorizing, self-perceived social competence has been found to mediate the link between peer rejection and children's internalizing problems [32]. In this study, the authors found that socially rejected children had poorer self-perceived social competence, which in turn heightened the risk for internalizing problems. Therefore, incorporating the contextual-developmental perspective, cognitive theories of internalizing disorders, the competency-based model, and the empirical evidence reviewed above, we proposed that students with high prosociality would be more preferred and accepted by their peers; subsequently, high levels of peer preference would relate to increased self-perceived social competence, which in turn reduced their experiences of depression and loneliness.

1.3. The Present Study

Although previous studies found that prosociality is related to decreased depressive symptoms and loneliness among elementary and secondary school students [3–5], few examined the mechanisms that account for the relations. Therefore, the present study aimed to examine whether peer preference and self-perceived social competence act as mediators of the relations (see Figure 1). Grounded on the relevant theories and empirical studies reviewed above, in the present study, we propose the following hypotheses: (a) prosociality will be directly and negatively related to loneliness and depressive symptoms but positively related to peer preference and self-perceived social competence, while peer preference and self-perceived social competence related to loneliness and depressive symptoms negatively. (b) Prosociality will be linked with psychological maladjustment through its negative associations with peer preference and self-perceived social competence in a serial way. That is, prosociality would be related to greater peer preference, which in turn would be related to higher levels of self-perceived social competence. Higher self-perceived social competence would then be related to decreased depressive symptoms and loneliness (see Figure 1).

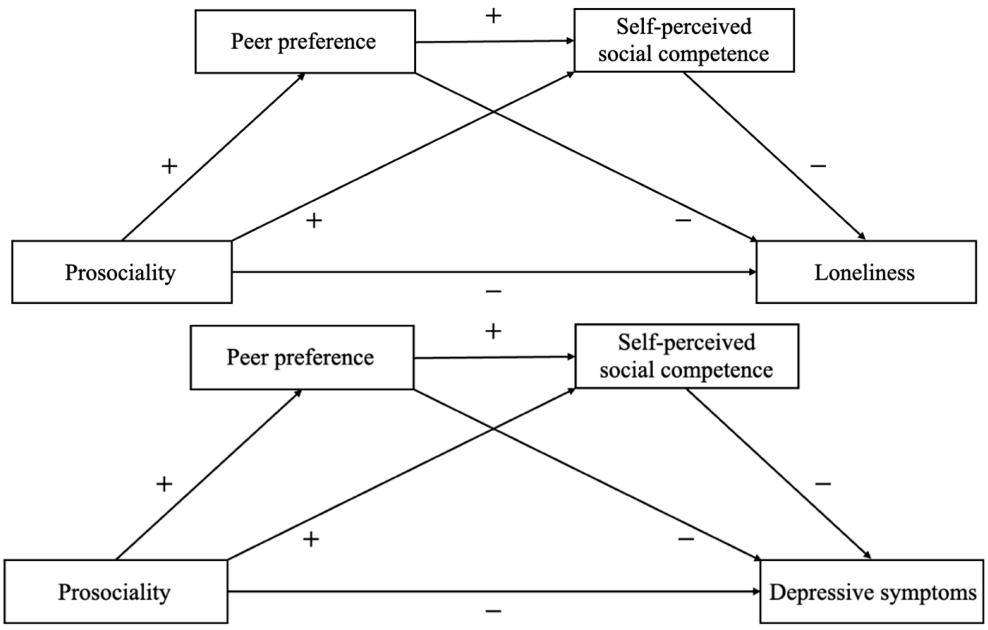

Figure 1. Hypothesized conceptual model.

2. Method

2.1. Participants

Participants in this study were 951 students (M_{age} = 11 years, 442 girls, range = 8.75 years~13.34 years) in Grades 3~7 from a public elementary school and a public secondary school in the urban area of Shanghai. Both schools are typical elementary and secondary schools in urban areas of China, and almost all the students from these two schools have successfully graduated. The sample included 181 third graders (18.7%), 240 fourth graders (24.8%), 169 fifth graders (17.5%), 180 sixth graders (18.6%), and 181 seventh graders (18.7%). All participants in this sample were of the majority Han nationality.

2.2. Procedure

Students completed peer nominations and self-report measures that were group-administered during class time on a school day. The administration of the measures was carried out by trained researchers (i.e., graduate students). All students in the schools were invited to participate with no criteria for exclusion. Extensive explanations of the procedure and measures were provided during data collection. All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of Shanghai Normal University (No. 2023026). Recruitment and data collection were all completed in September 2021.

2.3. Measures

2.3.1. Prosociality

Prosociality was measured using a peer-nomination measure adapted from the Revised Class Play [33]. Consistent with the procedure outlined by Masten [34], participants were asked to nominate up to three classmates who best fit each of the three descriptors assessing aspects of prosocial behavior (e.g., "Helps others when they need it", "Is polite to others"). Both same-gender and cross-gender nominations were allowed, and self-nominations were not allowed. Nominations each child received from all classmates for each item were totaled and standardized within the class to form an index of prosociality. The measure was used and shown to be reliable and valid in other studies with Chinese children [35]. The internal reliability (Cronbach's alphas) of the measure is 0.89 in this study.

2.3.2. Depressive Symptoms

Participants' depressive symptoms were assessed using a 14-item measure of the Children's Depression Inventory (CDI) [36]. Each item consists of three alternative responses (e.g., "I feel like crying every day", "I feel like crying most days", and "I feel like crying once in a while"). Children were asked to choose one that best describes them in the past two weeks. Following the procedure outlined by Kovacs [36], the average score of depressive symptoms was computed, with higher scores indicative of more depressive symptoms. The measure has been demonstrated to be reliable and valid in Chinese children [3,37,38]. In this study, the internal consistency coefficient of the scale was 0.87.

2.3.3. Loneliness

Loneliness was assessed by a self-report measure, adapted from Asher [39]. The 16 items assess the individual's experiences with loneliness, such as feeling isolated, having few close relations, or feeling left out. The average score of loneliness was computed, with higher scores indicative of greater feelings of loneliness. The measure has been demonstrated to be reliable and valid in Chinese children [40–42]. The internal consistency coefficient of the scale was 0.92 in this study.

2.3.4. Peer Preference

Participants were asked to nominate up to three classmates with whom they most liked to be around (i.e., positive nominations) and three classmates with whom they least liked to be around (i.e., negative nominations). Nominations received from all classmates were totaled and standardized within classrooms to account for different sizes of classes. Peer preference was calculated by subtracting negative nomination scores from positive nomination scores [43]. The procedure has been used in Chinese children [40,44,45].

2.3.5. Self-Perceived Social Competence

Students' self-perceived social competence was assessed using the social competence subscale of the Self-Perception Profile for Children (SPPC) [46]. The subscale consists of six items. Each item consists of two opposite descriptions (e.g., "Some kids know how to become popular" BUT "Other kids do not know how to become popular"). Children were asked to choose the description that best fits and then indicate whether the description is somewhat true or very true for them. Thus, each item is scored on a four-point scale with a higher score reflecting a higher self-perceived social competence. The measure has been demonstrated to be reliable and valid in Chinese children [47,48]. The internal consistency coefficient of the scale in this study was 0.83.

2.4. Analytic Plan

Data were analyzed using SPSS 25.0 and SPSS PROCESS macro 4.0 software [49]. Firstly, descriptive statistics and Pearson correlations were conducted for the main study variables. We then used the PROCESS macro to test the hypothesized multiple mediation models. In PROCESS, model six was applied to examine the mediating effect of peer preference and social self-perception on the associations between prosociality and psychological maladjustment. Mediation analyses were conducted using the 5000 bootstraps sampling method to generate 95% bias-corrected confidence intervals (CI) for all the indexes. When zero was not included in the 95% CI, the effects were considered statistically significant. Age group and gender were included in the models as covariates.

3. Results

3.1. Descriptive Statistics

Means and standard deviations for and intercorrelations among study variables are presented in Table 1. The results showed that prosociality was positively correlated with self-perceived social competence and peer preference but negatively correlated with loneliness and depressive symptoms, whereas self-perceived social competence and peer preference were negatively correlated with loneliness and depressive symptoms.

Table 1. Means, standard deviations, and correlations among all variables (N = 951).

Variables	*M*	*SD*	Correlations				
			1	**2**	**3**	**4**	**5**
1. prosociality	0.00	1.00	1				
2. loneliness	1.92	0.73	−0.23 **	1			
3. depression	1.41	0.35	−0.17 **	0.64 **	1		
4. SPSC	2.96	0.69	0.25 **	−0.77 **	−0.59 **	1	
5. PP	0.00	1.59	0.46 **	−0.032 **	−0.22 **	0.28 **	1

Notes: SPSC = Self-Perceived Social Competence; PP = Peer Preference; M = mean value; SD = standard deviation. ** $p < 0.01$.

A multivariate analysis of variance (MANOVA) was conducted to examine the overall effects of gender (boys, girls), age group (elementary school, secondary school), and their interactions on study variables. Results indicated that there were significant main effects of gender, Wilks' $\lambda = 0.94$, F (5, 893) = 10.01, $p < 0.001$, and age group, Wilks' $\lambda = 0.94$,

F (5, 893) = 10.01, $p < 0.001$. Follow-up univariate analysis revealed that compared to boys, girls had higher scores on peer preference, F (1, 891) = 15.13, $p < 0.001$, $\eta^2 = 0.01$, and prosociality, F (1, 891) = 58.32, $p < 0.001$, $\eta^2 = 0.05$. Secondary school students had higher levels of depression than students in elementary school, F (1, 891) = 25.21, $p < 0.001$, $\eta^2 = 0.05$. There was also a significant interaction between gender and age, Wilks' $\lambda = 0.97$, F (5, 893) = 4.29, $p < 0.001$. Specifically, boys had higher level of depression and loneliness than girls in elementary school, whereas girls had higher score of both depression and loneliness in secondary school (depressive symptoms: (F (1, 897) = 5.79, $p < 0.05$, $\eta^2 = 0.01$); loneliness: (F (1, 897) = 15.12, $p < 0.001$, $\eta^2 = 0.02$). For self-perceived social competence, girls had higher self-perceived social competence than boys in elementary school, (F (1, 897) = 6.82, $p < 0.05$, $\eta^2 = 0.01$), but boys had higher self-perceived social competence than girls in secondary school. On the other hand, girls had higher scores on prosocial behavior and peer preference in elementary school (prosociality: F (1, 897) = 9.12, $p < 0.05$, $\eta^2 = 0.01$; peer preference: (F (1, 897) = 7.81, $p < 0.05$, $\eta^2 = 0.01$), but there was no significant difference in secondary school.

3.2. Testing Multiple Mediation Models

Model six of PROCESS was used to test our hypothesized multiple mediation models, with separate models evaluated for each dependent variable. The results of our models are shown in Figures 2 and 3 and Table 2. In the model with depressive symptoms as the dependent variable (Figure 2), prosociality was positively related to peer preference ($a_1 = 0.45$, $p < 0.001$), which, in turn, was negatively related to depressive symptoms ($b_1 = -0.07$, $p = 0.025$). The indirect effect of prosociality on depressive symptoms through peer preference was significant ($a_1b_1 = -0.03$, 95% CI [−0.06, −0.01]), thus demonstrating that peer preference served as a mediator. In addition, prosociality was positively related to self-perceived social competence ($a_2 = 0.16$, $p < 0.001$), which, in turn, was negatively related to depressive symptoms ($b_2 = -0.56$, $p < 0.001$). The indirect effect of prosociality on depressive symptoms through self-perceived social competence was significant ($a_2b_2 = -0.09$, 95% CI [−0.13, −0.05]), thus demonstrating that self-perceived social competence served as a mediator. Moreover, peer preference was positively related to self-perceived social competence ($d_1 = 0.21$, $p < 0.001$). The serial mediating effect of prosociality on depressive symptoms through peer preference and self-perceived social competence was also significant ($a_1d_1b_2 = -0.05$, 95% CI [−0.07, −0.04]).

Table 2. Total, direct, and indirect effects of prosociality (X) on depressive symptoms and loneliness (Y) through peer preference (M1) and self-perceived social competence (M2).

Dependent Variable	Effect	Estimate	SE	95% CI	
				Lower	Upper
Depressive symptoms					
	Total effect	−0.19	0.03	−0.2593	−0.1284
	Direct effect	−0.02	0.03	−0.0757	0.0445
	Total indirect effect	−0.18	0.02	−0.2221	−0.1323
	Indirect effect (X→M1→Y)	−0.03	0.02	−0.0608	−0.0009
	Indirect effect (X→M2→Y)	−0.09	0.02	−0.1292	−0.0531
	Indirect effect (X→M1→M2→Y)	−0.05	0.01	−0.0742	−0.0357
Loneliness					
	Total effect	−0.24	0.03	−0.3047	−0.1720
	Direct effect	0.01	0.02	−0.0332	0.0629
	Total indirect effect	−0.25	0.03	−0.3005	−0.2001
	Indirect effect (X→M1→Y)	−0.06	0.01	−0.0827	−0.0322
	Indirect effect (X→M2→Y)	−0.12	0.03	−0.1714	−0.0733
	Indirect effect (X→M1→M2→Y)	−0.07	0.01	−0.0957	−0.0464

In the model with loneliness as the dependent variable (Figure 3), prosociality was positively related to peer preference ($a_1 = 0.45$, $p < 0.001$), which, in turn, was negatively related to loneliness ($b_1 = -0.13$, $p < 0.001$). The indirect effect of prosociality on loneliness through peer preference was significant ($a_1b_1 = -0.06$, 95% CI [−0.09, −0.04]), thus demonstrating that peer preference served as a mediator. In addition, prosociality was positively related to self-perceived social competence ($a_2 = 0.16$, $p < 0.001$), which, in turn, was negatively related to loneliness ($b_2 = -0.74$, $p < 0.001$). The indirect effect of prosociality on loneliness through self-perceived social competence was significant ($a_2b_2 = -0.12$, 95% CI [−0.17, −0.07]), thus demonstrating that self-perceived social competence served as a mediator. Moreover, the serial mediating effect of prosociality on loneliness through peer preference and self-perceived social competence was also significant ($a_1d_1b_2 = -0.07$, 95% CI [−0.09, −0.05]).

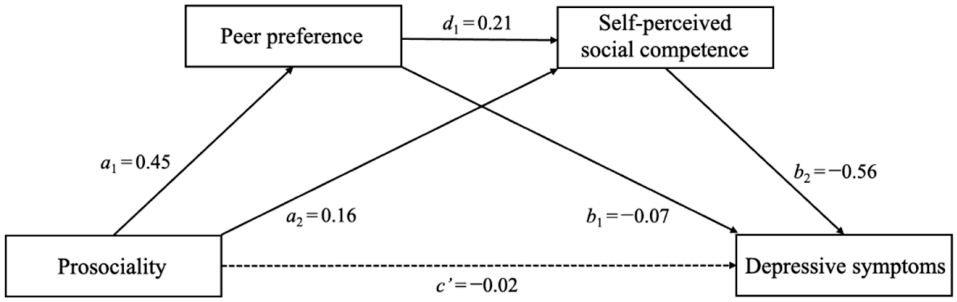

Figure 2. The multiple mediation role of peer preference and self-perceived social competence in the relation between prosociality and depressive symptoms. Note: Values reflect standardized coefficients. Age and gender were controlled for as covariates.

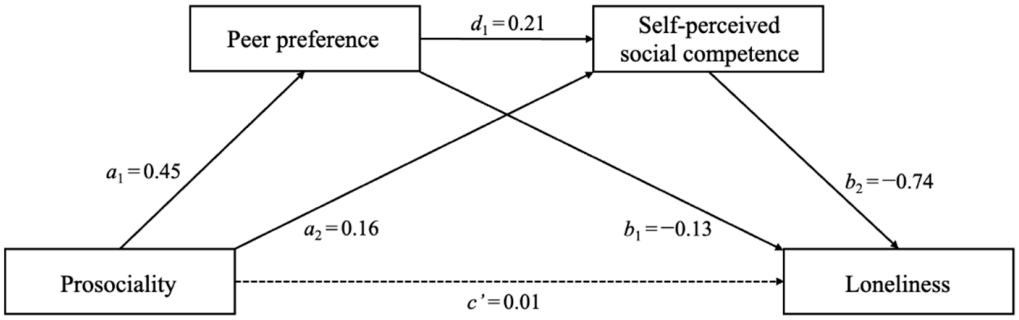

Figure 3. The multiple mediation role of peer preference and self-perceived social competence in the relation between prosociality and loneliness. Note: Values reflect standardized coefficients. Age and gender were controlled for as covariates.

4. Discussion

Previous research has shown that prosociality is critical to child and adolescent social functioning [2]. Elementary and secondary school students with high levels of prosociality often report lower levels of internalizing symptoms, such as depressive symptoms and loneliness, which suggest that prosociality may serve as a protective factor for developing psychological maladjustment [3–5]. However, the mechanisms that might help to explain the association between prosociality and psychological maladjustment are not well understood. Especially considering the function of peer preference and self-perceived social competence during preadolescence and early adolescence. Accordingly, in the present study, we evaluated a complex conceptual model to examine the mediating effects of peer preference and self-perceived social competence on the associations between prosociality and psychological maladjustment. Multiple mediation analyses indicate that the association between prosociality and psychological maladjustment is mediated by both peer

preference and self-perceived social competence. Additionally, a serial indirect pathway was observed when controlling for age group and gender.

4.1. The Mediation Role of Peer Preference and Self-Perceived Social Competence

In this study, it was found that prosocial behavior may prevent elementary and secondary school students from psychological symptoms. According to the results of this study, peer preference mediates the relations between prosociality and psychological maladjustment. It is consistent with previous findings that showed the reciprocal association between prosocial behaviors and peer relations, namely, positive social behaviors promote good peer relations and vice versa [50,51]. Moving beyond that, peer difficulties, such as low social preference, have been shown to affect children's symptoms of depression from kindergarten [52]. This effect may even last through adolescence [53]. The link from prosocial behavior to peer interaction and then to psychological adjustment can be explained by the contextual-developmental perspective [7]. Cultural values offer a framework for social assessments of children's behaviors, which can subsequently shape their developmental trajectories. In Chinese culture, where promoting interpersonal harmony is emphasized, prosocial behavior is encouraged and esteemed as a moral virtue that facilitates the smooth functioning of the peer network [18]. Consistently, studies had reported that students with prosocial behaviors (such as politeness, helping others, leadership, etc.) generally had supportive peers and were favored by teachers. [54,55]. These positive interaction experiences enable them to meet their own social, psychological, and instrumental needs and their emotional experience of decrease in depression and loneliness accordingly. This finding provided new evidence for the relations between prosocial behavior and psychological symptoms through peer preference, which is in line with the perspective of contextual-developmental. In Chinese culture, helping others is a sign of personality sublimation, and students who interact with each other under this value will be preferred by their peers and thus reducing their depressive symptoms and loneliness.

In the present study, self-perceived social competence is another potential mediator that can explain the relations between prosociality and psychological maladjustment. Self-perceived social competence can be defined as the degree to which people's judgments of how they are seen by others are correct [56]. Children's social behaviors have long been linked to their self-concept, and studies have found a significant correlation between self-concept and cooperative behavior [17,18,57]. Prosocial behavior enables individuals to retain their sense of self, especially their social selves, in a more favorable light because they may feel valued and needed by others, bolstering feelings about the social self eventually [24]. On the other hand, according to sociometer theory, perceptions of peer approval are regarded as essential for assessments of one's worth as a person. Further, adolescents start to evaluate themselves on a variety of life domains, including their social roles and integration in peer groups [29,58,59]. Consistent with prior findings, this study provided evidence that prosocial behavior can be used as a protective factor to allow individuals to experience less psychological maladjustment. The high level of prosociality is positively connected with self-perceived social competence, which mirrored the results that prosociality is linked to higher levels of general self-worth and social worth [24,25], and the positive self-perceived social competence, in turn, may protect elementary and secondary school students from developing psychological problems [28].

4.2. The Serial Multiple Mediation Model

This study further found that peer preference and self-perceived social competence play a serial mediation role between prosociality and psychological maladjustment. It provides evidence of a positive connection between peer preference and self-perceived social competence, which is partly consistent with previous research; adolescents who report being rejected by their peers have higher levels of depression and loneliness and lower levels of self-esteem and perceived self-competence [14,30]. Humanism emphasizes the individual and social potential and agency of human beings. Humanists believe that

loneliness is an individual's subjective feeling about the number of friends and quality of friendship as well as the evaluations of their basic social skills. Students feel lonely when the quantity and quality of their social networks are lower than expected [60]. Hymel and colleagues have explained the relations between loneliness and social status from the perspective of social cognition. They believe that children's loneliness and their actual social status among peers is the individual's perceived level of interpersonal relations mediated by social cognition [61]. Dodge devised a model of social information processing, which stresses the cognitive steps in evaluating social situations. Those students who have defects or deviations in social information processing will encounter difficulties in interacting with their peers and be negatively evaluated by their peers and vice versa [62]. Different social statuses will cause elementary and secondary school students to know the world and themselves in different ways. Rejected students may adopt self-defensive attributions, and they will also adopt withdrawal methods when solving problems and interacting with peers, resulting in the deviated cognition of social networks and themselves [61]. Similar to the previous studies, this analysis found that students with high social self-perception have significantly lower loneliness than students with low self-perceived social competence [54]. Group feedback that students with different social statuses received can also affect children's cognitive and behavioral responses, thereby causing changes in children's self-perception, including social self-perception [61]. As mentioned above, under the cultural orientation of harmony in China, prosocial students are well-liked. These students are more likely to develop positive self-perception, including social self-perception, which can reduce adjustment difficulties consequently.

5. Conclusions

The limitations and suggestions of this study are as follows. First, although the proposed mediation models are grounded in strong theoretical frameworks and empirical studies, the possibility of reciprocal relations between some study variables cannot be ruled out due to the cross-sectional nature of our data. For example, the relations between prosociality and depressive symptoms may be bidirectional [3], and effect of prosociality, peer preference, and self-perceived social competence on psychological maladjustment may be reciprocal. Relatedly, there may be biases when mediation effects are examined using cross-sectional data [62]. To address these limitations, it is recommended that future research adopt a multiple-wave longitudinal design, which will allow for the testing of mediation effects as well as the examination of directional and transactional processes over time [63]. Second, data were derived from self-reports, and the social desirability effect may affect the accuracy of the results. In the future, prosocial behavior and psychological maladjustment together with their associations can be studied through interviews and other methods. Third, children in their preadolescence and early adolescence phase are in an important stage of individual development, and their prosocial behavior is easily affected by other factors in their daily life, such as their development of the theory of mind and popularity goals [64,65]. Therefore, in the future, these variables could be included as an endorsement of boundary conditions in this model to further explore the impact of other factors on prosocial behavior and the psychological mechanism. Fourth, this study had a limited age range from middle childhood to early adolescence, and the long-term developmental differences could not be explained. In the future, studies can use an extended age group from early childhood to adulthood.

In conclusion, our study tested a serial mediation model of peer preference and self-perceived social competence as mediators between prosocial behavior and psychological maladjustment among Chinese elementary and secondary students. The results suggested that prosociality may be related to greater levels of peer preference, which in turn may be associated with higher levels of self-perceived social competence. Higher self-perceived social competence would then be related to decreased psychological maladjustment (i.e., depressive symptoms and loneliness) among students of elementary and secondary school in Chinese culture. The mechanisms of these relations may inform prevention and early in-

tervention programs for internalizing problems through the strength of prosociality among elementary and secondary school students. Role play and social cognition training about prosocial behaviors can shape students' perceptions, especially self-perceived social competence, correctly. Additionally, subjective evaluation (self-perceived social competence) of peer interaction and objective assessment from peers (nominations from their social group) are important characteristics of peer relations to include in research investigating peer relations in adolescence [62]. Therefore, the current study assessed peer relations from both subjective and objective perspectives when examining their links between prosocial behavior and psychological symptoms, which extends the field of the effect of peer interaction on psychological maladjustment.

Author Contributions: Conceptualization, X.D. and L.C.; methodology, G.J.; software, G.J.; validation, A.H., L.C. and X.D.; formal analysis, G.J.; investigation, M.L. and T.R.; resources, X.D.; data curation, T.R.; writing—original draft preparation, G.J. and M.L.; writing—review and editing, X.D. and L.C.; visualization, A.H.; supervision, X.D.; project administration, X.D. and L.C.; funding acquisition, X.D. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by the National Natural Science Foundation of China (32000756).

Institutional Review Board Statement: All procedures performed in studies involving human participants were in accordance with the APA ethical institutional standards. This article does not contain any studies with animals performed by authors. This study was approved by the institutional review board of the Shanghai Normal University (No. 2023026).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Caprara, G.V.; Alessandri, G.; Eisenberg, N. Prosociality: The contribution of traits, values, and self-efficacy beliefs. *J. Pers. Soc. Psychol.* **2012**, *102*, 1289–1303. [CrossRef] [PubMed]
2. Eisenberg, N.; Eggum-Wilkens, N.D.; Spinrad, T.L. The development of prosocial behavior. In *The Oxford H of Prosocial Behavior*; Schroeder, D.A., Graziano, W.G., Eds.; Oxford University Press: New York, NY, USA, 2015; pp. 114–136.
3. Jin, G.; Fu, R.; Li, D.; Chen, X.; Liu, J. Longitudinal associations between prosociality and depressive symptoms in Chinese children: The mediating role of peer preference. *J. Youth Adolesc.* **2022**, *51*, 956–966. [CrossRef] [PubMed]
4. Padilla-Walker, L.M.; Millett, M.A.; Memmott-Elison, M.K. Can helping others strengthen teens? Character strengths as mediators between prosocial behavior and adolescents' internalizing symptoms. *J. Adolesc.* **2020**, *79*, 70–80. [CrossRef] [PubMed]
5. Woodhouse, S.S.; Dykas, M.J.; Cassidy, J. Loneliness and peer relations in adolescence. *Soc. Dev.* **2012**, *21*, 273–293. [CrossRef]
6. Memmott-Elison, M.K.; Holmgren, H.G.; Padilla-Walker, L.M.; Hawkins, A.J. Associations between prosocial behavior, externalizing behaviors, and internalizing symptoms during adolescence: A meta-analysis. *J. Adolesc.* **2020**, *80*, 98–114. [CrossRef]
7. Chen, X. Culture, peer interaction, and socioemotional development. *Child Dev. Perspect.* **2012**, *6*, 27–34. [CrossRef]
8. Spilt, J.L.; van Lier, P.A.C.; Leflot, G.; Onghena, P.; Colpin, H. Children's social self-concept and internalizing problems: The influence of peers and teachers. *Child Dev.* **2014**, *85*, 1248–1256. [CrossRef] [PubMed]
9. Zhang, X.; Pomerantz, E.M.; Qin, L.; Logis, H.; Ryan, A.M.; Wang, M. Characteristics of likability, perceived popularity, and admiration in the early adolescent peer system in the United States and China. *Dev. Psychol.* **2018**, *54*, 1568–1581. [CrossRef]
10. Eisenberg, N.; Eggum, N.D. Empathic responding: Sympathy and personal distress. In *The Social Neuroscience of Empathy*; Decety, J., Ickes, W., Eds.; Boston Review: Boston, UK, 2009; pp. 71–83.
11. Criss, M.M.; Cui, L.; Wood, E.E.; Morris, A.S. Associations between emotion regulation and adolescent adjustment difficulties: Moderating effects of parents and peers. *J. Child Fam. Stud.* **2021**, *30*, 1979–1989. [CrossRef]
12. Main, A.; Zhou, Q.; Liew, J.; Lee, C. Prosocial tendencies among Chinese American children in immigrant families: Links to cultural and socio-demographic factors and psychological adjustment. *Soc. Dev.* **2017**, *26*, 165–184. [CrossRef]
13. Urben, S.; Habersaat, S.; Palix, J.; Fegert, J.M.; Schmeck, K.; Bürgin, D.; Seker, S.; Boonmann, C.; Schmid, M. Examination of the importance of anger/irritability and limited prosocial emotion/callous-unemotional traits to understand externalizing symptoms and adjustment problems in adolescence: A 10-year longitudinal study. *Front. Psychiatry* **2022**, *13*, 939603. [CrossRef] [PubMed]
14. Di Giunta, L.; Pastorelli, C.; Thartori, E.; Bombi, A.S.; Baumgartner, E.; Fabes, R.A.; Enders, C.K. Trajectories of Italian children's peer rejection: Associations with aggression, prosocial behavior, physical attractiveness, and adolescent adjustment. *J. Abnorm. Child Psychol.* **2018**, *46*, 1021–1035. [CrossRef]

15. Memmott-Elison, M.K.; Toseeb, U. Prosocial behavior and psychopathology: An 11-year longitudinal study of inter-and intraindividual reciprocal relations across childhood and adolescence. *Dev. Psychopathol.* **2022**, 1–15. [CrossRef] [PubMed]
16. Davis, A.N.; Carlo, G.; Schwartz, S.J.; Unger, J.B.; Zamboanga, B.L.; Lorenzo-Blanco, E.I.; Cano, M.Á.; Baezconde-Garbanati, L.; Oshri, A.; Streit, C.; et al. The longitudinal associations between discrimination, depressive symptoms, and prosocial behaviors in U.S. Latino/a recent immigrant adolescents. *J. Youth Adolesc.* **2016**, *45*, 457–470. [CrossRef] [PubMed]
17. Chen, W.; Li, X.; Huebner, E.S.; Tian, L. Parent–child cohesion, loneliness, and prosocial behavior: Longitudinal relations in children. *J. Soc. Pers. Relat.* **2022**, *39*, 2939–2963. [CrossRef]
18. Chen, X.; French, D.C. Children's social competence in cultural context. *Annu. Rev. Psychol.* **2008**, *59*, 591–616. [CrossRef]
19. Ettekal, I.; Mohammadi, M. Co-occurring trajectories of direct aggression and prosocial behaviors in childhood: Longitudinal associations with peer acceptance. *Front. Psychol.* **2020**, *11*, 581192. [CrossRef]
20. Yang, Y.; Chen, L.; Zhang, L.; Ji, L.; Zhang, W. Developmental changes in associations between depressive symptoms and peer relationships: A four-year follow-up of Chinese adolescents. *J. Youth Adolesc.* **2020**, *49*, 1913–1927. [CrossRef]
21. Harter, S.; Pike, R. The pictorial scale of perceived competence and social acceptance for young children. *Child Dev.* **1984**, *55*, 1969–1982. [CrossRef]
22. Boivin, M.; Hymel, S. Peer experiences and social self-perceptions: A sequential model. *Dev. Psychol.* **1997**, *33*, 135–145. [CrossRef]
23. Hymel, S.; Bowker, A.; Woody, E. Aggressive versus withdrawn unpopular children: Variations in peer and self-perceptions in multiple domains. *Child Dev.* **1993**, *64*, 879–896. [CrossRef] [PubMed]
24. Grant, A.M.; Gino, F. A little thanks goes a long way: Explaining why gratitude expressions motivate prosocial behavior. *J. Pers. Soc. Psychol.* **2010**, *98*, 946–955. [CrossRef] [PubMed]
25. Fu, X.; Padilla-Walker, L.M.; Brown, M.N. Longitudinal relations between adolescents' self-esteem and prosocial behavior toward strangers, friends and family. *J. Youth Adolesc.* **2017**, *57*, 90–98. [CrossRef] [PubMed]
26. Jacobs, R.H.; Reinecke, M.A.; Gollan, J.K.; Kane, P. Empirical evidence of cognitive vulnerability for depression among children and adolescents: A cognitive science and developmental perspective. *Clin. Psychol. Rev.* **2008**, *28*, 759–782. [CrossRef]
27. Beck, A.T. Cognitive models of depression. *J. Cong. Psychother.* **1987**, *1*, 5–37.
28. Cole, D.A. Relation of social and academic competence to depressive symptoms in childhood. *J. Abnorm. Psychol.* **1990**, *99*, 422–429. [CrossRef]
29. Troop-Gordon, W.; Ladd, G.W. Trajectories of peer victimization and perceptions of the self and schoolmates: Precursors to internalizing and externalizing problems. *Child Dev.* **2005**, *76*, 1072–1091. [CrossRef]
30. Platt, B.; Kadosh, K.C.; Lau, J.Y. The role of peer rejection adolescent depression. *Depress. Anxiety* **2013**, *30*, 809–821. [CrossRef]
31. Luna, P.; Guerrero, J.; Rodrigo-Ruiz, D.; Losada, L.; Cejudo, J. Social competence and peer social acceptance: Evaluating effects of an educational intervention in adolescents. *Front. Psychol.* **2020**, *11*, 1305. [CrossRef]
32. Sakız, H.; Mert, A.; Sarıçam, H. Self-esteem and perceived social competence protect adolescent students against ostracism and loneliness. *J. Psychol. Couns. Sch.* **2021**, *31*, 94–109. [CrossRef]
33. Chen, X.; Rubin, K.H.; Sun, Y. Social reputation and peer relationships in Chinese and Canadian children: A cross-cultural study. *Child Dev.* **1992**, *63*, 1336–1343. [CrossRef]
34. Masten, A.S.; Morison, P.; Pellegrini, D.S. A revised class play method of peer assessment. *Dev. Psychol.* **1985**, *21*, 523–533. [CrossRef]
35. Chen, X.; Li, D.; Li, Z.; Li, B.; Liu, M. Sociable and prosocial dimensions of social competence in Chinese children: Common and unique contributions to social, academic, and psychological adjustment. *Dev. Psychol.* **2000**, *36*, 302–314. [CrossRef] [PubMed]
36. Kovacs, M. *The Children's Depression Inventory (CDI) Manual*, 1st ed.; Multi-Health Systems: Oppenheim, Germany, 1992.
37. Ding, X.; Ooi, L.L.; Coplan, R.J.; Zhang, W.; Yao, W. Longitudinal relations between rejection sensitivity and adjustment in Chinese children: Moderating effect of emotion regulation. *J. Genet. Psychol.* **2021**, *182*, 422–434. [CrossRef] [PubMed]
38. Yang, P.; Coplan, R.J.; Zhang, Y.; Ding, X.; Zhu, Z. Assessment and implications of aloneliness in Chinese children and early adolescents. *J. Appl. Dev. Psychol.* **2023**, *85*, 101514. [CrossRef]
39. Asher, S.R.; Hymel, S.; Renshaw, P.D. Loneliness in children. *Child Dev.* **1984**, *55*, 1456–1464. [CrossRef]
40. Ding, X.; Chen, X.; Fu, R.; Li, D.; Liu, J. Relations of shyness and unsociability with adjustment in migrant and non-migrant children in urban China. *J. Abnorm. Child Psychol.* **2020**, *48*, 289–300. [CrossRef]
41. Ding, X.; Zhang, W.; Ooi, L.L.; Coplan, R.J.; Zhang, S.; Dong, Q. Longitudinal relations between social avoidance, academic achievement, and adjustment in Chinese children. *J. Appl. Dev. Psychol.* **2022**, *79*, 101385. [CrossRef]
42. Ding, X.; Coplan, R.J.; Deng, X.; Ooi, L.L.; Li, D.; Sang, B. Sad, scared, or rejected? A short-term longitudinal study of the predictors of social avoidance in Chinese children. *J. Abnorm. Child Psychol.* **2019**, *47*, 1265–1276. [CrossRef]
43. Coie, J.; Terry, R.; Lenox, K.; Lochman, J.; Hyman, C. Childhood peer rejection and aggression as predictors of stable patterns of adolescent disorder. *Dev. Psychopathol.* **1995**, *7*, 697–713. [CrossRef]
44. Ding, X.; Fu, R.; Ooi, L.L.; Coplan, R.J.; Zheng, Q.; Deng, X. Relations between different components of rejection sensitivity and adjustment in Chinese children. *J. Appl. Dev. Psychol.* **2020**, *67*, 101–119. [CrossRef]
45. Ding, X.; Zhang, W.; Ooi, L.; Coplan, R.J.; Zhu, X.; Sang, B. Relations between social withdrawal subtypes and socio-emotional adjustment among Chinese children and early adolescents. *J. Res. Adolesc* **2023**. *advance online publication*. [CrossRef] [PubMed]
46. Harter, S. *Manual for the Self-Perception Profile for Children*; University of Denver: Colorado, UK, 1985.

47. Ding, X.; Liu, J.; Li, D.; Sang, B. Psychometric properties of Chinese version of Harter's Self-Perception Profile for Children. *Chin. J. Clin. Psychol.* **2014**, *22*, 251–255.
48. Liu, J.; Coplan, R.J.; Chen, X.; Li, D.; Ding, X.; Zhou, Y. Unsociability and shyness in Chinese children: Concurrent and predictive relations with indices of adjustment: Unsociability in China. *Soc. Dev.* **2014**, *23*, 119–136. [CrossRef]
49. Hayes, A.F. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*; Guilford Publications: New York, NY, USA, 2017.
50. Layous, K.; Nelson, S.K.; Oberle, E.; Schonert-Reichl, K.A.; Lyubomirsky, S. Kindness counts: Prompting prosocial behavior in preadolescents boosts peer acceptance and well-being. *PLoS ONE* **2012**, *7*, e51380. [CrossRef] [PubMed]
51. Aikins, J.W.; Litwack, S.D. Popularity in the peer system. In *Prosocial Skills, Social Competence, and Popularity*; Cillessen, A.H.N., Schwartz, D., Mayeux, L., Eds.; The Guilford Press: New York, NY, USA, 2011; pp. 140–162.
52. Gooren, E.M.J.C.; van Lier, P.A.C.; Stegge, H.; Terwogt, M.M.; Koot, H.M. The development of conduct problems and depressive symptoms in early elementary school children: The role of peer rejection. *J. Clin. Child. Adolesc. Psychol.* **2011**, *40*, 245–253. [CrossRef]
53. Will, G.J.; van Lier, P.A.; Crone, E.A.; Güroğlu, B. Chronic childhood peer rejection is associated with heightened neural responses to social exclusion during adolescence. *J. Abnorm. Child Psychol.* **2016**, *44*, 43–55. [CrossRef]
54. Li, Y.; Sun, H. The Relationship of Children's Loneliness with Peer Relationship, Social Behavior and Self-perceived Social Competence. *Psychol. Sci.* **2007**, *30*, 84–88.
55. Zhou, Z.; Zhao, D.; Chen, J.; Jiang, J.; Rachel, H. Loneliness as a Function of Sociometric Status and Self-Perceived Social Competence in Middle Childhood. *Dev. Psychopathol.* **2003**, *4*, 70–74.
56. Kenny, D.A. *Interpersonal Perception: A Social Relations Analysis*; Guilford Press: New York, NY, USA, 1994.
57. Cauley, K.; Tyler, B. The relationship of self-concept to prosocial behavior in children. *Early Child Res. Q.* **1989**, *4*, 51–60. [CrossRef]
58. Harter, S. *The Construction of the Self*; Guilford Press: New York, NY, USA, 1999.
59. Fend, H. *Eltern und Freunde. Soziale Entwicklung im Jugendalter [Parents and Friends. Social Development in Adolescence]*; Hogrefe AG: Bern, Switzerland, 1998.
60. Bo, L.; Chen, H. *Personality Psychology*; China Light Industry Press: Beijing, China, 2004.
61. Zou, H. The Developmental Function of Peer Relationship and Its Influencing Factors. *Dev. Psychol.* **1998**, *14*, 40–46.
62. Andrea, E.; Michelle, A.; Helmut, A. Subjective and Objective Peer Approval Evaluations and Self-Esteem Development: A Test of Reciprocal, Prospective, and Long-Term Effects. *Dev. Psychol.* **2016**, *52*, 1563–1577.
63. MacKinnon, D.P.; Luecken, L.J. How and for whom? Mediation and moderation in health psychology. *Health Psychol.* **2008**, *27*, S99–S100. [CrossRef]
64. Wang, X.; Auyeung, B.; Pan, N.; Lin, L.; Chen, Q.; Chen, J.; Liu, S.; Dai, M.; Gong, J.; Li, X.; et al. Empathy, Theory of Mind, and Prosocial Behaviors in Autistic Children. *Front. Psychiatry* **2022**, *13*, 844578. [CrossRef] [PubMed]
65. Lansu, T.A.M. How popularity goal and popularity status are related to observed and peer-nominated aggressive and prosocial behaviors in elementary school students. *J. Exp. Child Psychol.* **2023**, *227*, 105590. [CrossRef] [PubMed]

behavioral sciences

MDPI

Article

Harsh Childhood Discipline and Developmental Changes in Adolescent Aggressive Behavior: The Mediating Role of Self-Compassion

Qing-Feng Yang, Rui-Bo Xie, Rui Zhang and Wan Ding *

Parent Education Research Center, Intelligent Laboratory of Child and Adolescent Mental Health and Crisis Intervention of Zhejiang Province, School of Psychology, Zhejiang Normal University, Jinhua 321004, China
* Correspondence: dingwan@zjnu.edu.cn

Abstract: Harsh discipline during childhood (psychological aggression and corporal punishment) has been found to be an early risk factor for adolescent aggressive behavior. However, previous studies have mainly examined the relationship between harsh discipline as a whole and the level of adolescent aggressive behavior. This study investigates the effects of childhood psychological aggression and corporal punishment on the initial levels and rate of change in adolescent aggressive behavior, as well as the mediating role of self-compassion in this relationship. Using cluster sampling, a three-wave follow-up assessment was conducted on 1214 high-school students (60.7% boys; mean age at Wave 1 = 15.46 ± 0.71). The results showed that childhood psychological aggression and corporal punishment had a positive predictive effect on the development level of adolescent aggressive behavior. However, only childhood psychological aggression significantly directly attenuated the decline rate of adolescent aggressive behavior. In addition, both childhood psychological aggression and corporal punishment indirectly affected the initial levels and growth rate of adolescent aggressive behavior through self-compassion. These findings could provide potential targets for prevention and intervention programs aimed at improving aggressive behavior in Chinese adolescents.

Keywords: psychological aggression; corporal punishment; self-compassion; aggressive behavior; developmental trajectories

Citation: Yang, Q.-F.; Xie, R.-B.; Zhang, R.; Ding, W. Harsh Childhood Discipline and Developmental Changes in Adolescent Aggressive Behavior: The Mediating Role of Self-Compassion. *Behav. Sci.* **2023**, *13*, 725. https://doi.org/10.3390/bs13090725

Academic Editor: Scott D. Lane

Received: 28 July 2023
Revised: 25 August 2023
Accepted: 29 August 2023
Published: 30 August 2023

1. Introduction

Adolescent aggressive behavior is an important social issue that requires attention globally. It can be defined as any behavior directed towards oneself or others with the intention of causing harm [1]. A recent report by the World Health Organization (WHO) estimated that four out of ten young people aged 10 to 29 had engaged in physical conflicts with others in the year prior to the study, and approximately one-fourth of adolescents experienced bullying in the past month [2]. Additionally, schools may be the most common setting for adolescent aggressive behavior, which includes verbal abuse, physical fights, and self-harm, posing serious threats to students' physical and psychological well-being and school safety [3,4]. Previous research has shown that adolescent aggressive behavior can lead to irreparable harm for both the aggressors and victims, including emotional distress, academic disengagement, social difficulties [5,6], and even future criminal behavior that is closely associated with aggressive behavior during this period [7]. Therefore, gaining a deeper understanding of adolescent aggressive behavior and exploring the mechanisms of its risk factors are of great significance for the positive development of adolescents. This study aims to explore the relationship between childhood harsh discipline and the development of adolescent aggressive behavior, as well as the potential mediating role of self-compassion in this association.

Adolescence is a critical period for the development of aggressive behavior [8], which can be manifested through both the initial level and the rate of change. The social–cognitive

information-processing model of aggression [9] suggests that harsh and punitive parenting styles by parents are important risk factors for adolescents' adoption of aggression as a problem-solving strategy. Therefore, the developmental changes in adolescent aggressive behavior may be related to the experiences of harsh parenting during childhood. Harsh discipline is a common form of negative parenting during childhood, including harsh psychological aggression and corporal punishment [10]. Previous research has found that parents often employ harsh parenting styles during childhood to teach social norms and correct undesirable behavior [11]. However, adults who have experienced harsh discipline during childhood have been found to exhibit more external aggressive behavior in daily life [12]. It is worth noting that only a few studies have explained the relationship between harsh discipline and the level of adolescent aggressive behavior development [13], and there has been limited attention to the impact of harsh discipline on the rate of change in adolescent aggressive behavior. Moreover, existing research on the relationship between parental harsh discipline and children's aggressive behavior has mainly focused on corporal punishment or overall harsh discipline, while little attention has been paid to the unique effects of two common types of harsh discipline, psychological aggression and corporal punishment, and the underlying mechanisms between the two and adolescent aggression.

1.1. Relationship between Psychological Aggression/Corporal Punishment during Childhood and Developmental Changes in Adolescent Aggressive Behavior

Adolescence is often referred to as a period of "storm and stress", characterized by heightened fluctuations in emotions and interpersonal distress [14], as well as a heightened desire for sensation seeking and risk taking [15]. Meanwhile, the brain mechanisms and neural circuits associated with aggressive behavior are in a state of developmental mismatch or imbalance during this period, which may make it difficult for adolescents to regulate and inhibit their aggressive impulses, increasing the risk of engagement in aggressive behavior [16]. Although previous research indicates that the majority of adolescents show an overall decline in aggressive behavior as they age [17,18], there is still a subset of adolescents who exhibit persistently high levels of aggression [17,19]. Moreover, considering that the consequences of aggressive behavior often accumulate and may have long-lasting negative effects on subsequent outcomes [20,21], further exploration of risk factors that contribute to the development of adolescent aggressive behavior is necessary. Additionally, there are distinctions between the initial level and developmental trajectories of aggressive behavior [22]. The former reflects both the development of adolescent aggression and significantly predicts future levels of aggression [23], whereas the latter reflects the rate of change in adolescent aggressive behavior. Therefore, examining both the initial level and the rate of change in adolescent aggressive behavior is conducive to further revealing the pattern of change in adolescent aggressive behavior and the role of risk factors in the developmental changes in adolescent aggressive behavior.

In recent years, there has been increasing attention on the impact of harsh discipline on the development of aggressive behavior in children and adolescents [24,25]. Researchers have distinguished between psychological aggression and corporal punishment within harsh discipline. Psychological aggression refers to the use of language and symbolic behaviors by parents to cause psychological pain or fear in children, while corporal punishment involves the use of physical force to make children experience pain, without the intention to cause deliberate harm [26], both of which are widely used by parents in childhood. The social–cognitive information-processing model of aggression suggests that both types of harsh discipline may provide children with negative examples of physical and verbal aggression, making them more likely to adopt the same strategies to cope with emotions or interpersonal problems in the future. Furthermore, various forms of corporal punishment have been found to be risk factors for different stages of aggressive behavior [27,28]. In contrast, previous research has paid less attention to the relationship between psychological aggression and the development of aggressive behavior. Compared to physical violence, psychological aggression is more common and hidden, and some parents may not even be

aware of the potential threats to their children's future development posed by this parenting style [11,29]. However, similar to corporal punishment, parental psychological aggression may also increase children's aggressive behavior [25,30]. Therefore, it is necessary to comprehensively examine the potential adverse effects of childhood psychological aggression and corporal punishment on the development of adolescent aggressive behavior.

Additionally, there is limited evidence indicating a relationship between harsh discipline and the initial level and rate of change in adolescent aggressive behavior. Research with children by Prinzie et al. [31] suggests that higher levels of coercive parenting behaviors by parents are associated with higher initial levels of child aggressive behavior and slower declines. Moreover, Baydar and Akcinar [32] found that harsh parenting at age 4 positively predicts the developmental trajectory of aggressive behavior in children aged 4–7. These two studies are most relevant to the research question proposed in this study, but neither of them distinguishes between psychological aggression and corporal punishment, and Baydar and Akcinar only examined the parenting styles of mothers. Furthermore, the developmental characteristics of aggressive behavior during childhood and adolescence may differ [33]. In contrast, this study will comprehensively examine the impact of experiencing different types of harsh discipline during childhood on the initial level and rate of change of aggressive behavior during adolescence. Based on the literature mentioned above, we propose the following hypotheses:

Hypothesis 1. *Aggressive behavior continues to develop during adolescence and shows a declining trend.*

Hypothesis 2. *Parental psychological aggression and corporal punishment in children positively and directly predict the initial level of adolescent aggressive behavior.*

Hypothesis 3. *Parental psychological aggression and corporal punishment in children negatively predict the rate of change of adolescent aggressive behavior.*

1.2. The Mediating Role of Self-Compassion

The general aggression model [34,35] and recent research suggest that self-compassion may serve as a potential mediator between harsh discipline during childhood and the development of aggressive behavior in adolescence [13]. In this model, negative parenting styles experienced in childhood serve as distal environmental factors that increase the likelihood of engaging in aggressive behavior by interfering with an individual's internal states (i.e., cognition, affect, and arousal) [34]. Self-compassion refers to adopting a supportive, connected, and present attitude when experiencing failure, inadequacy, and suffering [36]. This adaptive cognitive–emotional regulation strategy consists of three relative components: self-kindness rather than self-judgment, mindfulness rather than overidentification, and recognition that one's pain and struggles are part of shared humanity rather than isolated experiences [37].

Firstly, childhood psychological aggression and corporal punishment may impair adolescent self-compassion. Evidence exploring the developmental pathways of self-compassion suggests that self-compassion stems from positive interactions with caregivers in childhood (for reviews, see [36,38]). Specifically, parents who express care and warmth may guide children in forming positive beliefs about themselves and their relationships with others, leading to a tendency to provide support for themselves and others [39]. Conversely, children who are chronically exposed to low-warmth, high-rejection parenting environments are more likely to perceive the external environment as hostile and unsafe and view themselves and others negatively, thus making it difficult for them to develop self-compassion [40]. Once such internal processing patterns are formed during childhood, they may persist into adolescence and influence the development of aggressive behavior [38].

In addition, self-compassion may reduce the occurrence and development of adolescent aggressive behavior. Previous research in adult samples has shown that individuals

with self-compassion are more accepting of their own and others' flaws, exhibit more positive interpersonal behaviors, and display less detachment, control, and verbal or physical aggression, compared to individuals lacking self-compassion [13,41,42]. However, representative evidence for adolescents is lacking in such studies. Moreover, there is a lack of focus on the development trajectory of aggressive behavior rather than its level of development. Adolescence is a unique period of self-awareness development, during which individuals become increasingly concerned about their own successes and setbacks, and their understanding of these events may directly influence their coping strategies with themselves and others [43]. Therefore, it is necessary to enhance understanding of the role of self-compassion in reducing the initial level and rate of development of adolescent aggressive behavior.

In conclusion, we have reason to believe that self-compassion may mediate the relationship between harsh discipline during childhood and the development changes of adolescent aggressive behavior. However, this hypothesis has received limited attention and it is not yet clear how different forms of harsh discipline are linked to the initial level and rate of development of adolescent aggressive behavior through self-compassion. Based on the above theory and the findings of previous studies, we propose the following hypotheses:

Hypothesis 4. *Self-compassion mediates the relationship between psychological aggression during childhood and the initial level/development rate of adolescent aggressive behavior*.

Hypothesis 5. *Self-compassion mediates the relationship between corporal punishment during childhood and the initial level/development rate of adolescent aggressive behavior*.

1.3. Current Study

This study aims to further explore the relationship between harsh discipline during childhood and the development of adolescent aggressive behavior and to reveal the potential mechanisms underlying this relationship. The main research objectives include: (1) exploring the developmental changes of adolescent aggressive behavior; (2) simultaneously examining the impact of psychological aggression and corporal punishment during childhood on the initial level and rate of change of adolescent aggressive behavior; (3) investigating the mediating role of self-pity in the relationship between psychological aggression and corporal punishment during childhood and the initial level and rate of change of adolescent aggressive behavior. Considering that adolescent gender, age, and SES may have an impact on adolescent aggressive behavior [34,44], this study will control for these variables in subsequent analyses.

2. Materials and Methods

2.1. Participants

Using a cluster sampling method, high-school students from an urban middle school in an eastern province of China were selected as the participants for this study. Three consecutive questionnaire surveys were conducted with a 6-month interval. A total of 1214 questionnaires were distributed in the first test, with the average age of the participants being 15.46 $\pm$ 0.71 years and 60.7% being male. Due to transfers and leaves, 1037 and 964 questionnaires were collected in the second and third tests, respectively.

2.2. Measurements

2.2.1. Harsh Discipline during Childhood

The parental conflict tactics scale, developed by Straus et al. [45] and revised by Leung et al. [46], was used to assess the level of harsh discipline during childhood as perceived by adolescents. The psychological aggression and physical punishment subscales consisted of 16 items on a 7-point scale, with 1 indicating "never" and 7 indicating "almost every

day". Participants were asked to recall the frequency of experiencing two types of harsh discipline from their parents during their childhood. The mean score was calculated, with higher scores indicating higher levels of harsh discipline from parents. Previous research has shown that this questionnaire has good reliability and validity when used with Chinese adolescent populations [26]. The Cronbach's α for the psychological aggression scale in this study was 0.86, and for the corporal punishment scale it was 0.96.

2.2.2. Self-Compassion

The Self-Compassion Scale by Neff [47] was used to measure self-compassion in this study. The scale consists of 26 items and is composed of six subscales: self-kindness, common humanity, mindfulness, isolation, self-judgment, and over-identification. The first three subscales represent the positive aspects of self-compassion, while the last three subscales reflect the negative aspects of self-compassion (reverse scored). All items were rated on a 5-point scale (1 = strongly disagree, 5 = strongly agree). The Chinese version of the scale has been shown to have good reliability and structural validity in Chinese samples [48]. In the present study, the Cronbach's α for the scale was 0.87.

2.2.3. Aggressive Behavior

The present study was assessed using the aggression subscale of the Youth Risk Behavior Questionnaire (YRBS) developed by Brener et al. [49] and adapted by Zhou et al. [50]. The Chinese version of this scale has been demonstrated to have good reliability and construct validity in Chinese samples [51]. The aggressive behavior scale includes three items: "engaging in violent conflicts with others", "getting into arguments with others", and "engaging in self-harming behavior". Participants rate their behavior on a 3-point scale (1 = never, 3 = almost always) based on the past six months. In this study, the Cronbach's α values for adolescent aggressive behavior at T1, T2, and T3 were 0.77, 0.84, and 0.87, respectively.

2.2.4. Socio-Economic Status

Participants evaluated their subjective socio-economic status (SES) on a scale from 1 to 10, with 10 representing the highest advantage in terms of money, education, and employment and 1 representing the most disadvantaged position (M = 4.65, SD = 1.40).

2.3. Procedure

First, the purpose, procedures, and instructions of the assessment were explained to the school leaders and teachers by psychologists. Written informed consent forms from the parents and adolescents were collected before conducting the online questionnaire assessment. Specifically, the adolescents were organized by their teachers to fill out the questionnaire in the school's computer room. The instructions for the questionnaire clearly explained the need to answer the questions with as much focus as possible and emphasized that there were no right or wrong answers; they just needed to provide independent responses based on their actual experiences. The participants were informed that they could choose not to complete all the items if they felt uncomfortable or refused to answer. Additionally, the participants were assured that the collected data would be managed by the researchers and kept strictly confidential from their teachers. A unique ID number was assigned to each student for data matching purposes. Finally, ways to seek professional psychological help and advice were provided at the end of the questionnaire. All materials and procedures of this study were approved by the Institute Review Board (IRB) of Zhejiang Normal University; the ethical code is D2020009.

2.4. Data Analysis

Data Integrity: Little's MCAR test [52] revealed that the missing data in this study were completely random (χ^2 = 58.43, df = 48, p = 0.14). Therefore, this study utilized the expectation-maximization (EM)-based multiple imputation method to handle missing data [53,54].

In a preliminary step, the critical assumptions of the SEM were examined using SPSS 26.0. Firstly, the normality assumption was tested to determine whether each study variable approximated a normal distribution. The Shapiro–Wilk test values for childhood psychological abuse and physical punishment, adolescent self-compassion, and aggressive behavior at corresponding time points were all non-significant ($p > 0.05$). Additionally, the skewness and kurtosis values of all variables ranged from 1.08 to 2.34 (<3.29), indicating that the data were approximately normally distributed [55]. Secondly, the multicollinearity analysis results showed that the tolerance values for all predictor variables ranged from 0.48 to 0.57 (>0.1), and the variance inflation factor ranged from 1.05 to 1.75 (<10), indicating the absence of multicollinearity issues among the predictor variables [56]. Thirdly, the assumption of homoscedasticity was examined. The Levene's Test of Equality of Variances showed no statistical differences in the variances of the outcome variables across groups ($0.08 \leq p \leq 0.41$), indicating that the assumption of equal variances was met. Based on these results, descriptive statistics and correlation analyses were performed using SPSS 26.0.

Subsequently, a structural equation model (SEM) was established and analyzed using Mplus 8.3 in three steps based on the research objectives. First, an unconditional latent growth model (LGM) was employed to examine the developmental trajectory of adolescent aggressive behavior [57]. The LGM extracted the intercept and slope when describing the trajectory of variable development. The intercept represented the initial level of variable development, with all factor loadings fixed at 1. The slope represented the rate of variable development. According to the requirements of the LGM, a linear trajectory was fitted in this study; thus, the factor loadings of the slope were fixed at 0, 1, and 2 [57]. Second, a conditional latent growth model was developed using data on childhood psychological aggression and corporal punishment at the first measurement to examine their direct predictive effects on the intercept and slope of adolescent aggressive behavior. At the same time, the influence of adolescent gender, age, and SES on the intercept and slope of aggressive behavior was controlled to reduce potential interference from these variables on the direct effects of childhood harsh discipline. Third, on the basis of the second step, the mediating effect of self-compassion between childhood psychological aggression and corporal punishment and the intercept and slope of adolescent aggressive behavior were further examined, and the significance of the mediation effect was verified using the bootstrap method.

3. Results

3.1. Common Methodological Biases

This study controlled and tested the issue of common method bias through three steps. Firstly, in terms of procedures, this study emphasized anonymity, confidentiality, and the use of data solely for scientific research during the data collection process. Additionally, reverse scoring was applied to certain items. Secondly, Harman's single-factor test was conducted to examine the common method bias in the data. The results showed that 10 factors had eigenvalues greater than 1, and the total variance explained by the first factor was 22.08%, which was below the critical threshold of 40% [58]. Furthermore, this study aggregated the three items with the highest factor loadings from each scale as corresponding latent variable indicators [59]. The confirmatory factor analysis of the single-factor model indicated poor model fit: $\chi^2 = 4206.36$, $df = 103$, CFI = 0.63, TLI = 0.45, RMSEA = 0.23, and SRMR = 0.15. Therefore, there was no apparent common method bias in this study.

3.2. Descriptive Statistics

The descriptive statistics and Pearson correlation coefficients are presented in Table 1. The results showed that, both within waves and across waves, there were positive correlations between harsh discipline during childhood, psychological aggression, and adolescent aggressive behavior. Additionally, self-pity was negatively correlated with harsh discipline during childhood, corporal punishment, and adolescent aggressive behavior.

Table 1. Descriptive statistics and correlations among study variables. (N = 1214.)

	$M \pm SD$	1	2	3	4	5	6	7	8	9
1. T1 PA	2.65 ± 0.92	1								
2. T2 CP	1.69 ± 1.01	0.65 ***	1							
3. T2 SC	3.18 ± 0.40	−0.13 ***	−0.12 ***	1						
4. T1 AB	1.41 ± 0.43	0.15 ***	0.19 ***	−0.23 ***	1					
5. T2 AB	1.35 ± 0.40	0.16 ***	0.17 ***	−0.24 ***	0.32 ***	1				
6. T3 AB	1.31 ± 0.39	0.15 ***	0.17 ***	−0.17 ***	0.30 ***	0.26 ***	1			
7. Gender	-	0.03	−0.07 *	0.01	−0.15 **	−0.12 **	−0.09 **	1		
8. Age	15.46 ± 0.71	−0.01	−0.01	0.04	0.02	0.02	0.03	−0.01	1	
9. SES	4.65 ± 1.40	−0.04	−0.01	0.04	−0.03	−0.07 *	−0.03	−0.05	0.04	1

Note. PA = psychological aggression; CP = corporal punishment; SC = self-compassion; AB = aggressive behavior. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.3. Development Changes of Adolescent Aggressive Behavior

Latent growth models (LGMs) were used to examine the development trajectory of adolescent aggressive behavior. The results from the sample of this study (as shown in Table 2) demonstrated that the model of the development trajectory of adolescent aggressive behavior fit well and exhibited a linear declining trend. Furthermore, there was a significant negative correlation between the initial level (intercept) and the rate of change (slope) in adolescent aggression.

Table 2. Model fit indices with intercepts and slopes for potential growth in adolescent aggressive behavior.

	χ^2/df	RMSEA	CFI	TLI	SRMR	Means		r
						Int	Slp	
Aggressive Behavior	0.76	0.00	1.00	1.00	0.01	1.40 ***	−0.05 ***	−0.10 **

Note. ** $p < 0.01$, *** $p < 0.001$.

3.4. Direct Effects of Psychological Aggression and Corporal Punishment during Childhood on the Initial Level and Rate of Development of Adolescent Aggressive Behavior

Using psychological aggression and corporal punishment during childhood as predictor variables and adolescent aggressive behavior as the outcome variable, a conditional growth model was constructed (see Figure 1) to examine whether psychological aggression and corporal punishment could predict the initial level and rate of development of adolescent aggressive behavior. The results revealed that after controlling for adolescent gender, age, and SES, the conditional model fit well (χ^2/df = 1.04, CFI = 0.999, TLI = 0.998, RMSEA = 0.01). Both psychological aggression and corporal punishment significantly positively predicted the intercept of adolescent aggressive behavior (β = 0.42, $p < 0.001$; β = 0.65, $p < 0.001$). Additionally, only childhood experience of psychological aggression directly slowed down the declining rate of adolescent aggressive behavior (β = −0.09, p = 0.018), and the direct predictive effect of childhood corporal punishment experiences on the rate of development of adolescent aggressive behavior was not significant (β = −0.04, p = 0.289). This suggests that the higher the level of psychological aggression and corporal punishment in childhood, the higher the initial level of adolescent aggression, and that the experience of psychological aggression in childhood impedes the rate of decline in adolescent aggressive behavior.

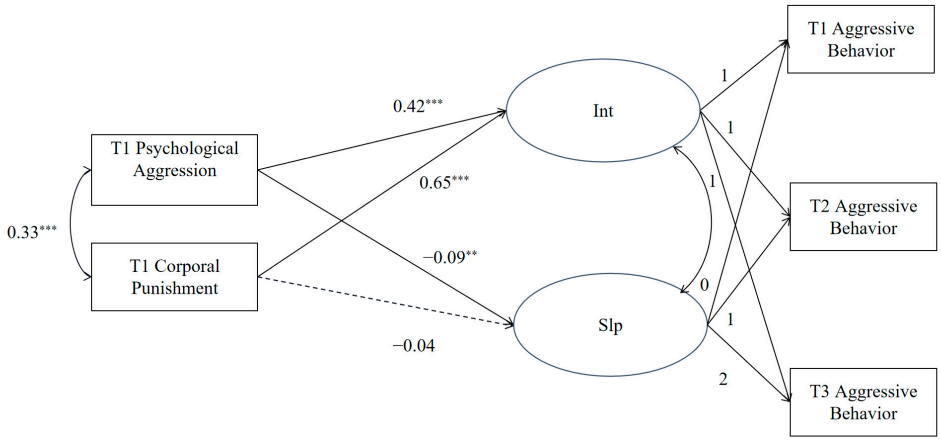

Figure 1. The direct effects model. Int = intercept; Slp = slope. ** $p < 0.01$, *** $p < 0.001$. The gender, age, and SES of adolescents were controlled in the model but not displayed in the figure for clarity of results.

3.5. Mediating Role of Self-Compassion

Based on the direct prediction model, the mediating effect of self-compassion on the relationship between childhood psychological aggression and corporal punishment and the development trajectory of adolescent aggressive behavior was examined. The results showed that the model fit well (χ^2/df = 1.74, CFI = 0.994, TLI = 0.983, RMSEA = 0.03), and the final model is shown in Figure 2.

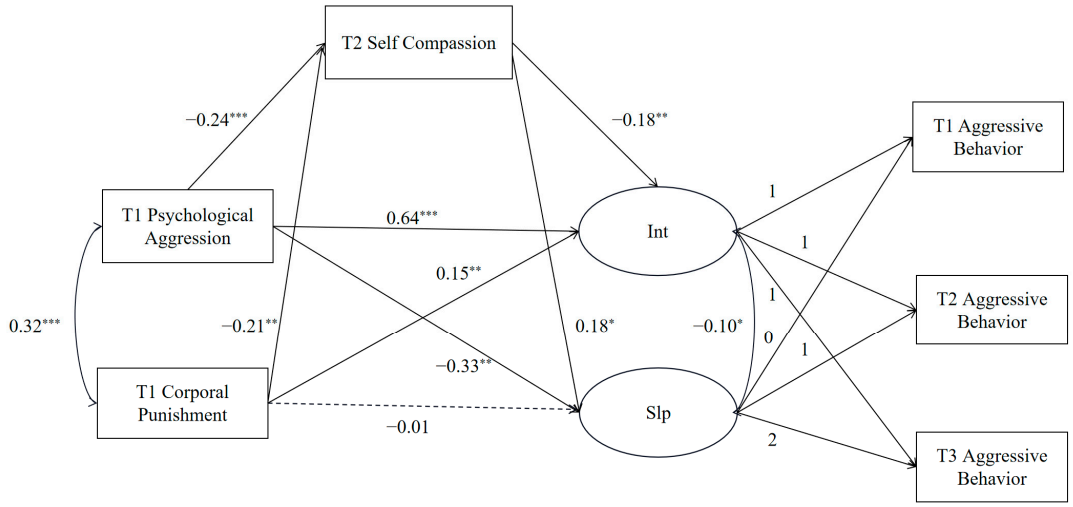

Figure 2. The indirect effects model. Int = intercept; Slp = slope. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. The gender, age, and SES of adolescents were controlled in the model but not displayed in the figure for clarity of results.

The direct paths between childhood psychological aggression and corporal punishment, adolescent self-compassion, and the initial level and rate of development of aggressive behavior are shown in Table 3. After controlling for gender, age, and SES, childhood psychological aggression and corporal punishment significantly and positively predicted initial levels of adolescent aggression and negatively predicted adolescent self-compassion. In addition, childhood psychological aggression negatively predicted the rate of decline in adolescent aggression, and adolescent self-compassion positively predicted the rate of decline in adolescent aggression.

Table 3. Direct paths in the vertical intermediation model.

Direct Paths	B	SE	*p*
PA → SC	−0.24	0.04	0.000
PA → Int	0.64	0.07	0.000
PA → Slp	−0.33	0.08	0.002
CP → SC	−0.21	0.03	0.000
CP → Int	0.15	0.05	0.003
CP → Slp	−0.01	0.09	0.942
SC → Int	−0.18	0.04	0.000
SC → Slp	0.18	0.08	0.015

Note. PA = psychological aggression; CP = corporal punishment; SC = self-compassion.

Moreover, bootstrapping (repeated sampling 1000 times) was used to validate the mediating effect of self-compassion. The model included four indirect paths: (1) psychological aggression → self-compassion → intercept of adolescent aggressive behavior; (2) psychological aggression → self-compassion → slope of adolescent aggressive behavior; (3) corporal punishment → self-compassion → intercept of adolescent aggressive behavior; (4) corporal punishment → self-compassion → slope of adolescent aggressive behavior. The bootstrap results showed that all four indirect paths were significant (see Table 4), indicating that childhood psychological aggression and corporal punishment could indirectly influence the development of adolescent aggressive behavior, and self-compassion played a longitudinal mediating role in these association.

Table 4. Indirect paths in vertical intermediation models.

Indirect Paths	B	*SE*	*p*	Standardized 95% CI	
				Low	High
PA → SC → Int	0.10	0.01	0.000	0.063	0.173
CP → SC → Int	0.10	0.02	0.000	0.057	0.169
PA → SC → Slp	−0.11	0.01	0.002	−0.197	−0.020
CP → SC → Slp	−0.10	0.01	0.004	−0.196	−0.038

Note. PA = psychological aggression; CP = corporal punishment; SC = self-compassion.

4. Discussion

Adolescence was a critical period of individual development, but the imbalance between physiological maturity and psychological development increased the risk of engagement in aggressive behaviors among adolescents [16]. However, previous studies predominantly focused on exploring the influencing factors and underlying mechanisms of adolescent aggressive behavior, lacking attention to the relationship between parenting styles during childhood and the developmental trajectory of adolescent aggression. Therefore, based on the social–cognitive information-processing models of aggression and general aggression models, the present study comprehensively explored the relationship between two typical childhood harsh disciplinary styles, psychological aggression and corporal punishment, and the initial level and developmental rate of adolescent aggression, and innovatively examined the mediating role of self-compassion in these relationships. The findings of this study provided additional evidence for theories related to harsh discipline, adolescent self-compassion, and the development of aggressive behavior. They also offered valuable insights for preventive and intervention programs aimed at improving adolescent aggressive behavior.

4.1. Developmental Changes in Adolescent Aggressive Behavior

Consistent with Hypothesis 1 and previous research suggesting a normative developmental trend of decreasing adolescent aggressive behavior with age [17,18], results from our sample in this study indicated an overall decline in adolescent aggressive behavior during the measurement period. This may be attributed to the gradual development of the

brain cortex and the accumulation of social skills, enabling adolescents to consider the adverse consequences of aggressive behavior in the long term and to adopt more appropriate problem-solving strategies [60]. At the same time, the maturation of self-regulation abilities also helps adolescents to inhibit their destructive emotions and behavioral responses [61]. Additionally, participants in this study were first-year high-school students who were transitioning into high-school life at the time of the initial survey. This transition altered the familiar interpersonal and school environment for adolescents, bringing about more emotional fluctuations and changes in relationships, which increased the occurrence rate of aggressive behavior during this stage [62]. However, as adolescents gradually adapt to the new campus environment and establish new interpersonal relationships, their aggressive behavior also decreases.

Furthermore, there was a negative correlation between the initial level of adolescent aggressive behavior and the rate of decline in aggressive behavior throughout the measurement period. This suggests that the higher the initial level of adolescent aggressive behavior, the faster the rate of decline. Conversely, the lower the initial level of adolescent aggressive behavior, the slower the rate of decline. This finding supports previous research that suggests that the developmental differences in externalizing behavior among adolescents may gradually diminish with age [63,64]. It also indicates that aggressive behavior that does not slow down or even continues to increase during this stage may be atypical and portend significant future social adjustment problems for the individual [16], and it is necessary to focus on early risk factors that may undermine this normative developmental trend.

4.2. Direct Effects of Childhood Psychological Aggression and Corporal Punishment on the Developmental Changes of Adolescent Aggressive Behavior

This study found that, after controlling for adolescent gender, age, and SES, childhood experiences of psychological aggression and corporal punishment positively predicted the initial levels of adolescent aggressive behavior, consistent with Hypothesis 2 and previous research findings [27,30], indicating that harsh discipline during childhood may have profound negative effects on adolescents. According to the social–cognitive information-processing model of aggression, a conflict-ridden and harsh parenting environment reinforces children to use similar aggressive strategies to deal with problems [9]. Specifically, during early life, children learn acceptable behavioral standards and the consequences of not complying with these standards through interactions with caregivers. The more frequently parents restrict and regulate children's behavior through verbal insults, blame, and corporal punishment, the more likely children perceive aggressive behavior as a reasonable and effective problem-solving strategy. When they feel dissatisfied with themselves or others in the future, they tend to apply this strategy to control their emotions or the behavior of others [65].

Interestingly, the results also found that childhood psychological aggression directly slowed down the rate of decline in adolescent aggressive behavior, but the direct predictive effect of childhood corporal punishment was not significant, partially inconsistent with our Hypothesis 3. The reason for this discrepancy may be that psychological aggression tends to cause more covert and enduring psychological injuries to adolescents compared to corporal punishment [66], whereas corporal punishment is characterized by immediate physical pain. Thus, while adolescents who experience childhood corporal punishment show higher levels of aggressive behavior, they still experience a gradual decline in aggression over time. In contrast, negative or derogatory comments from parents during childhood may lead children to have persistent negative evaluations of themselves and the external environment, hindering their acquisition of adaptive problem-solving strategies in adolescence and making it difficult for them to manage their aggressive behavior in a more positive manner. These findings not only support the social–cognitive information-processing model of aggression and previous research findings [31,32], but also further deepen the

understanding of the dynamic relationship between different forms of harsh discipline during childhood and the developmental changes in adolescent aggressive behavior.

4.3. Mediating Role of Self-Compassion

This study also examined the longitudinal mediating role of self-compassion in the relationship between psychological aggression and corporal punishment during childhood and the development of adolescent aggressive behavior. Consistent with Hypotheses 4 and 5, the results of this study indicated that all four indirect paths were significant. This suggests that besides direct predictions, psychological aggression and corporal punishment during childhood also have indirect effects on the development of adolescent aggressive behavior through other pathways. This is in line with the general aggression model and the main findings of previous domestic and international research [13,41,67]. The general aggression model supports the idea that the influence of distal developmental environments on the outcomes of individual aggressive behavior may be mediated through shaping individual internal states [34]. In this study, self-compassion was identified as an important proximal factor that mediates the impact of negative parenting practices on the development of adolescent aggressive behavior.

On one hand, we found that psychological aggression and corporal punishment during childhood hinder the development of self-compassion in adolescents. When children are subjected to long-term criticism, blame, and physical punishment from their parents, they may internalize these negative messages and perceive themselves as unworthy of sympathy and care. Moreover, adolescence is a critical period for the formation of self-concept, and adolescents during this period may exaggerate their negative childhood experiences and incorporate them into their self-evaluation, resulting in negative self-awareness [43,68]. In fact, previous cross-sectional studies have shown that harsh parenting practices lead to the formation of negative self-cognitive schemas in adolescents, hindering the development of self-compassion [69].

On the other hand, harsh discipline during childhood, as a form of psychological aggression and corporal punishment, can further impact the initial level and rate of change of adolescent aggressive behavior. Self-compassion, as a positive cognitive and emotional regulation strategy [67], can help adolescents view setbacks and failures in life more objectively and tend to see their own experiences as part of a shared experience with other adolescents. Conversely, adolescents with low self-compassion may perceive their own suffering as incomprehensible to others and view the world as unjust, thus being more likely to adopt aggression as a strategy for managing emotions and interpersonal problems [70]. Additionally, self-compassion can predict the rate of decline in adolescent aggressive behavior during the tracking period. Adolescents who have experienced more psychological aggression and corporal punishment during childhood may have lower levels of self-compassion. These adolescents find it more difficult to treat themselves and others with understanding and kindness [43] and often exhibit higher levels of anger and lower levels of forgiveness [71], which hinders their ability to adopt more mature defense strategies and coping mechanisms when faced with emotional distress and interpersonal conflict, ultimately leading to a slower decline in adolescent aggressive behavior.

These findings suggest that childhood psychological aggression and corporal punishment may not only directly influence the initial level and rate of change of adolescent aggressive behavior but also enhance adolescent aggression by weakening their self-compassion, impeding the normative development of adolescent aggressive behavior. It is worth noting that adolescence is also an important period for self-concept and personality development [72]. Therefore, prevention and intervention measures aimed at reducing adolescent aggressive behavior may consider cultivating self-compassion as a promising strategy.

5. Limitations and Implications

There are some limitations in this study that need to be improved in future research. Firstly, the experiences of harsh discipline during childhood, self-compassion, and aggressive behavior in this study were all self-reported by adolescents. Although we ensured

anonymity during the data collection process to enhance the truthfulness of the results, it is still difficult to avoid the problem of subjective bias that may arise in questionnaire studies. Future research should consider using multiple informant reports or combining various assessment methods to obtain more objective and diverse sources of data. Secondly, the participants in this study were all high-school students from eastern provinces in China, which may limit the generalizability of the findings to other populations. This limitation can be addressed by increasing sample diversity. Thirdly, although this study used an LGM approach to examine the linear declining trend of adolescent aggressive behavior, the limited number of follow-up assessments prevented explorations of possible curvilinear growth trends. Future research can further explore the developmental trajectory of the secondary growth of the variables of interest by extending the tracking time and increasing the number of tracking times. Lastly, the research question of this study can be further expanded and deepened. For example, this study only examined the overall developmental levels and rates of change of adolescent aggressive behavior. Future research could comprehensively consider the developmental characteristics of different types of aggressive behaviors, such as physical aggression, verbal aggression, and indirect aggression, and systematically explore the similarities and differences in the impacts of harsh discipline during childhood on various aspects of aggressive behavior. In addition, self-compassion and compassion towards others may play different roles in the relationship between parenting styles and the development of adolescent social behavior [73]. Future research can delve into this topic in more detail.

Despite these limitations, this study has important theoretical and practical implications. From a theoretical perspective, the current study systematically examined the unique influences of psychological aggression and corporal punishment, two representative forms of harsh discipline during childhood, on the development of adolescent aggressive behavior through three waves of assessments at six-month intervals and revealed the mediating role of self-compassion. These findings deepen the understanding of the mechanisms linking negative parenting experiences during childhood with the development of aggressive behavior in adolescents, providing a new perspective on how adverse childhood experiences relate to future aggressive behavior. From a practical perspective, this study may provide theoretical guidance for the development of more targeted prevention and intervention efforts to address adolescent aggressive behavior in practice, especially among adolescents who have experienced harsh discipline. For example, this study found that self-compassion is an important mediator linking childhood psychological aggression and corporal punishment to the initial level and rate of change in adolescent aggressive behavior, suggesting that enhancing self-compassion may be an effective way to alleviate adolescent aggression [36]. In addition, the impact of harsh discipline during childhood on the development and changes in adolescent aggressive behavior suggests that parents adopting warm and positive parenting styles rather than strict discipline and negative punishment may be more beneficial for the social development of children and adolescents.

Author Contributions: Q.-F.Y.: conceptualization, methodology, data analysis, writing—original draft preparation, reviewing and editing. R.-B.X.: data curation, writing—original draft preparation. R.Z.: revision of the article. W.D.: conceptualization, data curation, revision of the article, funding acquisition. All authors have read and agreed to the published version of the manuscript.

Funding: This study was funded by the Philosophy and Social Science Planning Project of Zhejiang Province (23NDJC115YB).

Institutional Review Board Statement: All materials and procedures of this study were approved by the Institute Review Board (IRB) of Zhejiang Normal University; the ethical code is D2020009.

Informed Consent Statement: Written informed consent has been obtained from the patients to publish this paper.

Data Availability Statement: The data supporting this study's findings are available from the corresponding author upon reasonable request.

Acknowledgments: We would like to express our sincere gratitude to all those who have contributed to the completion of this research paper. First, we would like to thank our participants who generously gave their time and effort to participate in this study. We also extend our appreciation to the volunteers of the school where the data were collected for their assistance and support in the research process.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Connor, D.F. *Aggression and Antisocial Behavior in Children and Adolescents: Research and Treatment*; Guilford Press: New York, NY, USA, 2004.
2. World Health Organization. Youth Violence. Available online: https://www.who.int/multi-media/details/youth-violence (accessed on 4 February 2020).
3. Esposito, C.; Spadari, E.M.; Caravita, S.C.; Bacchini, D. Profiles of community violence exposure, moral disengagement, and bullying perpetration: Evidence from a sample of Italian adolescents. *J. Interpers. Violence* **2022**, *37*, 5887–5913. [CrossRef]
4. Irwin, V.; Zhang, J.; Wang, X.; Hein, S.; Wang, K.; Roberts, A.; Purcell, S. Report on the Condition of Education 2021 (NCES 2021-144). U.S. Department of Education, National Center for Education Statistics. Available online: https://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2021144 (accessed on 27 July 2023).
5. Ettekal, I.; Ladd, G.W. Developmental pathways from childhood aggression-disruptiveness, chronic peer rejection, and deviant friendships to early-adolescent rule breaking. *Child Dev.* **2015**, *86*, 614–631. [CrossRef] [PubMed]
6. Vuoksimaa, E.; Rose, R.J.; Pulkkinen, L.; Palviainen, T.; Rimfeld, K.; Lundström, S.; Kaprio, J. Higher aggression is related to poorer academic performance in compulsory education. *J. Child Psychol. Psychiatry* **2021**, *62*, 327–338. [CrossRef] [PubMed]
7. Polanin, J.R.; Espelage, D.L.; Grotpeter, J.K.; Spinney, E.; Ingram, K.M.; Valido, A.; El Sheikh, A.; Torgal, C.; Robinson, L. A meta-analysis of longitudinal partial correlations between school violence and mental health, school performance, and criminal or delinquent acts. *Psychol. Bull.* **2021**, *147*, 115–133. [CrossRef] [PubMed]
8. Taylor, L.K.; Merrilees, C.E.; Goeke-Morey, M.C.; Shirlow, P.; Cummings, E.M. Trajectories of adolescent aggression and family cohesion: The potential to perpetuate or ameliorate political conflict. *J. Clin. Child Adolesc. Psychol.* **2016**, *45*, 114–128. [CrossRef] [PubMed]
9. Pakaslahti, L. Children's and adolescents' aggressive behavior in context: The development and application of aggressive problem-solving strategies. *Aggress. Violent Behav.* **2000**, *5*, 467–490. [CrossRef]
10. Kelly, R.J.; Erath, S.A.; Martin-Piñón, O.; El-Sheikh, M. Longitudinal relations between parents' sleep problems and harsh parenting. *J. Fam. Psychol.* **2021**, *35*, 1181–1191. [CrossRef]
11. Wang, M.T.; Kenny, S. Longitudinal links between fathers' and mothers' harsh verbal discipline and adolescents' conduct problems and depressive symptoms. *Child Dev.* **2014**, *85*, 908–923. [CrossRef]
12. He, N.; Xiang, Y. How child maltreatment impacts internalized/externalized aggression among Chinese adolescents from perspectives of social comparison and the general aggression model. *Child Abus. Negl.* **2021**, *117*, 105024. [CrossRef]
13. Zhang, C.; Zhang, Q.; Wang, S.; Xu, W. Childhood trauma and aggression among Chinese college students: The mediation of self-compassion and moderation of left-behind experience. *Psychol. Trauma Theory Res. Pract. Policy* **2023**, *15*, 73–81. [CrossRef]
14. Casey, B.J.; Jones, R.M.; Levita, L.; Libby, V.; Pattwell, S.S.; Ruberry, E.J.; Soliman, F.; Somerville, L.H. The storm and stress of adolescence: Insights from human imaging and mouse genetics. *Dev Psychobiol.* **2010**, *52*, 225–235. [CrossRef] [PubMed]
15. Collado, A.; Felton, J.W.; MacPherson, L.; Lejuez, C.W. Longitudinal trajectories of sensation seeking, risk taking propensity, and impulsivity across early to middle adolescence. *Addict. Behav.* **2014**, *39*, 1580–1588. [CrossRef] [PubMed]
16. Lickley, R.A.; Sebastian, C.L. The neural basis of reactive aggression and its development in adolescence. *Psychol. Crime Law* **2018**, *24*, 313–333. [CrossRef]
17. Yuan, C.; Shao, A.; Chen, X.; Xin, T.; Wang, L.; Bian, Y. Developmental trajectory and gender differences in Chinese adolescents' physical and relational aggression: An analysis using the latent class growth model. *J. Aggress. Confl. Peace Res.* **2014**, *6*, 44–55. [CrossRef]
18. Zuffianò, A.; Colasante, T.; Buchmann, M.; Malti, T. The codevelopment of sympathy and overt aggression from middle childhood to early adolescence. *Dev. Psychol.* **2018**, *54*, 98–110. [CrossRef]
19. Cleverley, K.; Szatmari, P.; Vaillancourt, T.; Boyle, M.; Lipman, E. Developmental trajectories of physical and indirect aggression from late childhood to adolescence: Sex differences and outcomes in emerging adulthood. *J. Am. Acad. Child Adolesc. Psychiatry* **2012**, *51*, 1037–1051. [CrossRef] [PubMed]
20. Coyne, S.M.; Stockdale, L.A.; Warburton, W.; Gentile, D.A.; Yang, C.; Merrill, B.M. Pathological video game symptoms from adolescence to emerging adulthood: A 6-year longitudinal study of trajectories, predictors, and outcomes. *Dev. Psychol.* **2020**, *56*, 1385–1396. [CrossRef]
21. Duggins, S.D.; Kuperminc, G.P.; Henrich, C.C.; Smalls-Glover, C.; Perilla, J.L. Aggression among adolescent victims of school bullying: Protective roles of family and school connectedness. *Psychol. Violence* **2016**, *6*, 205–212. [CrossRef]
22. Karriker-Jaffe, K.J.; Foshee, V.A.; Ennett, S.T.; Suchindran, C. The development of aggression during adolescence: Sex differences in trajectories of physical and social aggression among youth in rural areas. *J. Abnorm. Child Psychol.* **2008**, *36*, 1227–1236. [CrossRef]

23. Huffman, L.G.; Oshri, A.; Caughy, M. An autonomic nervous system context of harsh parenting and youth aggression versus delinquency. *Biol. Psychol.* **2020**, *156*, 107966. [CrossRef]
24. Kingsbury, M.; Sucha, E.; Manion, I.; Gilman, S.E.; Colman, I. Adolescent mental health following exposure to positive and harsh parenting in childhood. *Can. J. Psychiatry* **2020**, *65*, 392–400. [CrossRef] [PubMed]
25. Liu, L.; Wang, M. Parenting stress and children's problem behavior in China: The mediating role of parental psychological aggression. *J. Fam. Psychol.* **2015**, *29*, 20–28. [CrossRef] [PubMed]
26. Wang, M.; Liu, L. Reciprocal relations between harsh discipline and children's externalizing behavior in China: A 5-year longitudinal study. *Child Dev.* **2018**, *89*, 174–187. [CrossRef] [PubMed]
27. Cui, G.; Lan, X. The associations of parental harsh discipline, adolescents' gender, and grit profiles with aggressive behavior among Chinese early adolescents. *Front. Psychol.* **2020**, *11*, 323. [CrossRef] [PubMed]
28. MacKenzie, M.J.; Nicklas, E.; Brooks-Gunn, J.; Waldfogel, J. Spanking and children's externalizing behavior across the first decade of life: Evidence for transactional processes. *J. Youth Adolesc.* **2015**, *44*, 658–669. [CrossRef] [PubMed]
29. Hibbard, R.; Barlow, J.; MacMillan, H.; Committee on Child Abuse and Neglect and American Academy of Child and Adolescent Psychiatry, Child Maltreatment and Violence Committee; Christian, C.W.; Crawford-Jakubiak, J.E.; Flaherty, E.G.; Leventhal, J.M.; Lukefahr, J.L.; Sege, R.D. Psychological maltreatment. *Pediatrics* **2012**, *130*, 372–378. [CrossRef]
30. Gómez-Ortiz, O.; Romera, E.M.; Ortega-Ruiz, R. Parenting styles and bullying. The mediating role of parental psychological aggression and physical punishment. *Child Abus. Negl.* **2016**, *51*, 132–143. [CrossRef]
31. Prinzie, P.; Onghena, P.; Hellinckx, W. A cohort-sequential multivariate latent growth curve analysis of normative CBCL aggressive and delinquent problem behavior: Associations with harsh discipline and gender. *Int. J. Behav. Dev.* **2006**, *30*, 444–459. [CrossRef]
32. Baydar, N.; Akcinar, B. Reciprocal relations between the trajectories of mothers' harsh discipline, responsiveness and aggression in early childhood. *J. Abnorm. Child Psychol.* **2018**, *46*, 83–97. [CrossRef]
33. Xie, H.; Drabick, D.A.; Chen, D. Developmental trajectories of aggression from late childhood through adolescence: Similarities and differences across gender. *Aggress. Behavior.* **2011**, *37*, 387–404. [CrossRef]
34. Allen, J.J.; Anderson, C.A.; Bushman, B.J. The general aggression model. *Curr. Opin. Psychol.* **2018**, *19*, 75–80. [CrossRef] [PubMed]
35. DeWall, C.N.; Anderson, C.A.; Bushman, B.J. The general aggression model: Theoretical extensions to violence. *Psychol. Violence* **2011**, *1*, 245–258. [CrossRef]
36. Neff, K.D. Self-compassion: Theory, method, research, and intervention. *Annu. Rev. Psychol.* **2023**, *74*, 193–218. [CrossRef] [PubMed]
37. Bluth, K.; Gaylord, S.A.; Campo, R.A.; Mullarkey, M.C.; Hobbs, L. Making friends with yourself: A mixed methods pilot study of a mindful self-compassion program for adolescents. *Mindfulness* **2016**, *7*, 479–492. [CrossRef]
38. Raque, T.L.; Ziemer, K.; Jackson, J. Attachment and Self-Compassion: Associations Across the Lifespan. In *Handbook of Self-Compassion*; Finlay-Jones, A., Bluth, K., Neff, K., Eds.; Springer: Cham, Switzerland; New York, NY, USA, 2023; pp. 71–88. [CrossRef]
39. Pepping, C.A.; Davis, P.J.; O'Donovan, A.; Pal, J. Individual differences in self-compassion: The role of attachment and experiences of parenting in childhood. *Self Ident.* **2015**, *14*, 104–117. [CrossRef]
40. Chi, X.; Jiang, W.; Guo, T.; Hall, D.L.; Luberto, C.M.; Zou, L. Relationship between adverse childhood experiences and anxiety symptoms among Chinese adolescents: The role of self-compassion and social support. *Curr. Psychol.* **2022**, *42*, 12822–12834. [CrossRef]
41. Miyagawa, Y.; Taniguchi, J. Sticking fewer (or more) pins into a doll? The role of self-compassion in the relations between interpersonal goals and aggression. *Motiv. Emot.* **2022**, *46*, 1–15. [CrossRef]
42. Neff, K.D.; Beretvas, S.N. The role of self-compassion in romantic relationships. *Self Ident.* **2013**, *12*, 78–98. [CrossRef]
43. Neff, K.D.; McGehee, P. Self-compassion and psychological resilience among adolescents and young adults. *Self Ident.* **2010**, *9*, 225–240. [CrossRef]
44. Fatima, S.; Sheikh, H. Socioeconomic status and adolescent aggression: The role of executive functioning as a mediator. *Am. J. Psychol.* **2014**, *127*, 419–430. [CrossRef]
45. Straus, M.A.; Hamby, S.L.; Finkelhor, D.; Moore, D.W.; Runyan, D. Identification of child maltreatment with the Parent-Child Conflict Tactics Scales: Development and psychometric data for a national sample of American parents. *Child Abus. Negl.* **1998**, *22*, 249–270. [CrossRef]
46. Leung, P.W.; Wong, W.C.; Chen, W.Q.; Tang, C.S. Prevalence and determinants of child maltreatment among high school students in Southern China: A large scale school based survey. *Child Adolesc. Psychiatry Ment. Health* **2008**, *2*, 27. [CrossRef] [PubMed]
47. Neff, K.D. Development and validation of a scale to measure self-compassion. *Self Ident.* **2003**, *2*, 223–250. [CrossRef]
48. Wang, D.; Xie, R.; Ding, W.; Yuan, Z.; Kayani, S.; Li, W. Bidirectional longitudinal relationships between parents' marital satisfaction, parenting stress, and self-compassion in China. *Fam. Process* **2022**, *62*, 835–850. [CrossRef] [PubMed]
49. Brener, N.D.; Collins, J.L.; Kann, L.; Warren, C.W.; Williams, B.I. Reliability of the youth risk behavior survey questionnaire. *Am. J. Epidemiol.* **1995**, *141*, 575–580. [CrossRef] [PubMed]
50. Zhou, X.; Wu, X. Positive Cognition Moderate the Relationship between Posttraumatic Stress Disorder on Sleep Problems among Children Survivors after Wenchuan Earthquake. *Stud. Psychol. Behav.* **2015**, *13*, 242–250.
51. Zhou, X.; Wu, X.; Chen, Q.; Zhen, R. Why did adolescents have sleep problems after earthquakes? Understanding the role of traumatic exposure, fear, and PTSD. *Scand. J. Psychol.* **2017**, *58*, 221–227. [CrossRef]

52. Li, C. Little's test of missing completely at random. *Stata J.* **2013**, *13*, 795–809. [CrossRef]
53. Bennett, D.A. How can I deal with missing data in my study? *Aust. N. Z. J. Public Health* **2001**, *25*, 464–469. [CrossRef]
54. Schlomer, G.L.; Bauman, S.; Card, N.A. Best practices for missing data management in counseling psychology. *J. Couns. Psychol.* **2010**, *57*, 1–10. [CrossRef]
55. Field, A. *Discovering Statistics Using SPSS*, 2nd ed.; Sage: London, UK, 2013.
56. Wen, Z.L.; Huang, B.B.; Tang, D.D. Preliminary work for modeling questionnaire data. *J. Psychol. Sci.* **2018**, *41*, 204–210.
57. Bollen, K.A.; Curran, P.J. *Latent Curve Models: A Structural Equation Perspective*; John Wiley & Sons, Inc.: Hoboken, NJ, USA, 2006.
58. Podsakoff, P.M.; MacKenzie, S.B.; Lee, J.Y.; Podsakoff, N.P. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **2003**, *88*, 879–903. [CrossRef] [PubMed]
59. Wu, Y.; Wen, Z.L. Item parceling strategies in structural equation modeling. *Adv. Psychol. Sci.* **2011**, *19*, 1859–1867.
60. Chang, T.T.; Metcalfe, A.W.; Padmanabhan, A.; Chen, T.; Menon, V. Heterogeneous and nonlinear development of human posterior parietal cortex function. *NeuroImage* **2016**, *126*, 184–195. [CrossRef] [PubMed]
61. Farley, J.P.; Kim-Spoon, J. The development of adolescent self-regulation: Reviewing the role of parent, peer, friend, and romantic relationships. *J. Adolesc.* **2014**, *37*, 433–440. [CrossRef]
62. Williford, A.P.; Brisson, D.; Bender, K.A.; Jenson, J.M.; Forrest-Bank, S. Patterns of aggressive behavior and peer victimization from childhood to early adolescence: A latent class analysis. *J. Youth Adolesc.* **2011**, *40*, 644–655. [CrossRef]
63. Bongers, I.L.; Koot, H.M.; van der Ende, J.; Verhulst, F.C. The normative development of child and adolescent problem behavior. *J. Abnorm. Psychol.* **2003**, *112*, 179–192. [CrossRef]
64. Johnson, M.K.; Crosnoe, R.; Elder, G.H., Jr. Insights on adolescence from a life course perspective. *J. Res. Adolesc.* **2011**, *21*, 273–280. [CrossRef]
65. Van Heel, M.; Bijttebier, P.; Colpin, H.; Goossens, L.; Van Den Noortgate, W.; Verschueren, K.; Van Leeuwen, K. Investigating the interplay between adolescent personality, parental control, and externalizing problem behavior across adolescence. *J. Res. Personal.* **2019**, *81*, 176–186. [CrossRef]
66. Tian, W.; Wang, F.; Wang, M. Parental Marital Quality and Children's Depression in China: The Different Mediating Roles of Parental Psychological Aggression and Corporal Punishment. *J. Fam. Violence* **2023**, *38*, 275–285. [CrossRef]
67. Tao, J.; He, K.; Xu, J. The mediating effect of self-compassion on the relationship between childhood maltreatment and depression. *J. Affect. Disord.* **2021**, *291*, 288–293. [CrossRef]
68. Alberts, A.; Elkind, D.; Ginsberg, S. The personal fable and risk-taking in early adolescence. *J. Youth Adolesc.* **2007**, *36*, 71–76. [CrossRef]
69. Liu, Q.Q.; Hu, Y.T. Self-compassion mediates and moderates the association between harsh parenting and depressive symptoms in Chinese adolescent. *Curr. Psychol.* **2023**, *42*, 16036–16048. [CrossRef]
70. Fresnics, A.; Borders, A. Angry rumination mediates the unique associations between self-compassion and anger and aggression. *Mindfulness* **2017**, *8*, 554–564. [CrossRef]
71. Wu, Q.; Chi, P.; Zeng, X.; Lin, X.; Du, H. Roles of anger and rumination in the relationship between self-compassion and forgiveness. *Mindfulness* **2019**, *10*, 272–278. [CrossRef]
72. Telzer, E.H.; Dai, J.; Capella, J.J.; Sobrino, M.; Garrett, S.L. Challenging stereotypes of teens: Reframing adolescence as window of opportunity. *Am. Psychol.* **2022**, *77*, 1067–1081. [CrossRef] [PubMed]
73. Marshall, S.L.; Ciarrochi, J.; Parker, P.D.; Sahdra, B.K. Is self-compassion selfish? The development of self-compassion, empathy, and prosocial behavior in adolescence. *J. Res. Adolesc.* **2020**, *30*, 472–484. [CrossRef] [PubMed]

behavioral sciences

MDPI

Article

Anxious-Withdrawal and Sleep Problems during Adolescence: The Moderating Role of Peer Difficulties

Julie C. Bowker [1,*], Jessica N. Gurbacki [1], Chloe L. Richard [1] and Kenneth H. Rubin [2]

[1] Department of Psychology, University at Buffalo, The State University of New York, Buffalo, NY 14260-4110, USA; jngurbac@buffalo.edu (J.N.G.); cr237@buffalo.edu (C.L.R.)
[2] Department of Human Development and Quantitative Methodology, University of Maryland, College Park, MD 20742, USA; krubin@umd.edu
* Correspondence: jcbowker@buffalo.edu; Tel.: +1-(716)-645-0187

Abstract: Anxious-withdrawal is a well-established individual risk factor for psychosocial difficulties during adolescence. It is unknown, however, whether it also places youth at increased risk for physical health problems, such as sleep difficulties. This study examines the concurrent and prospective associations between anxious-withdrawal and six types of sleep difficulties (i.e., sleeping too much, sleeping too little, talking/walking in sleep, being overtired, nightmares, and general trouble sleeping). We further evaluate whether these associations differ for adolescents who are high versus low in exclusion and victimization. The participants were 395 adolescents (M_{age} = 13.61 years; 35% ethnic minority) who completed peer nominations of anxious-withdrawal, exclusion, and victimization at Time 1 (T1). Their mothers completed reports of sleep difficulties at T1 and at Time 2 (T2). Path analyses revealed unique associations between anxious-withdrawal and several types of sleep difficulties (e.g., sleeping too much) at T1. Analyses also revealed a significant interaction effect between T1 anxious-withdrawal and exclusion/victimization such that anxious-withdrawal was prospectively associated with trouble sleeping only for those young adolescents who are highly excluded/victimized. Our findings are the first to link anxious-withdrawal to a physical health outcome in adolescence and point to the need for future research to not only examine anxious-withdrawal and physical health but also to include assessments of peer difficulties.

Keywords: anxious-withdrawal; sleep; peer exclusion; peer victimization; adolescence

Citation: Bowker, J.C.; Gurbacki, J.N.; Richard, C.L.; Rubin, K.H. Anxious-Withdrawal and Sleep Problems during Adolescence: The Moderating Role of Peer Difficulties. *Behav. Sci.* **2023**, *13*, 740. https://doi.org/10.3390/bs13090740

Academic Editors: Xuechen Ding and Wan Ding

Received: 25 July 2023
Revised: 29 August 2023
Accepted: 1 September 2023
Published: 5 September 2023

1. Introduction

While most youth desire to engage with their peers, some youth regularly withdraw behaviorally when in the company of their peers [1]. When this behavioral tendency is rooted in social anxieties and fears, it is referred to as anxious-withdrawal (closely related constructs include anxious-solitude, social withdrawal, shyness–sensitivity, e.g., [2]). Understanding anxious-withdrawal is important, because it is related to a broad range of significant psychological difficulties, including anxiety, depressive symptoms, and loneliness [3,4]. Anxious-withdrawal during childhood and adolescence is also associated with numerous peer problems, such as peer exclusion (i.e., being left out of group activities) and victimization (i.e., being subjected to repeated peer abuse), which in turn explain why many anxiously-withdrawn youth suffer psychologically [2,3].

While the negative psychological and peer concomitants of anxious-withdrawal are well-established, less is known about potential related physical health problems. In recent years, it has become clear that peer difficulties during adolescence can foster physical health problems, including numerous types of sleep difficulties (e.g., poor sleep quality [5–7]). In general, the majority of Americans do not get the recommended amount of daily sleep, and this is especially the case for adolescents (10–18 years) [8]. Sleep complications are significant at any age because they are related to other types of physical and psychological

health difficulties (e.g., anxiety, loneliness, obesity [9–11]). However, during adolescence, sleep difficulties also interfere with important developmental tasks, including those in the academic domain (e.g., studying, academic performance), and thus can lead to cascading negative developmental consequences [12,13]).

Anxiously-withdrawn youth are shy and anxious; they also experience problematic peer relations [14]. These intra- and interpersonal difficulties may independently, or interactively, predict sleep difficulties, a novel hypothesis evaluated for the first time in the current investigation. Once we better understand the many different types of health difficulties associated with anxious-withdrawal, we can use this knowledge to develop strategies that help anxiously-withdrawn youth cope with their difficulties and learn to more often approach, rather than avoid, their social worlds.

1.1. Anxious-Withdrawal and Sleep

Most published studies on anxious-withdrawal (and related constructs) have not evaluated the occurrence or development of sleep difficulties. There are several relevant lines of inquiry, however, suggesting that anxious-withdrawal might be related to sleep difficulties. First, it is well-established that anxiety contributes to the development of sleep difficulties during adolescence. Of note, in the extant literature, sleep difficulties can be indexed in numerous ways, including sleeping too much, sleeping too little, talking/walking in sleep, nightmares, general trouble sleeping, sleep quality or sleep efficiency (or percent time in bed sleeping), insomnia, nighttime awakenings, and daytime sleepiness. Anxiety during adolescence has been linked to all of these indices of sleep difficulty (e.g., [5,11]). Although there is some variability across different informants, recent research indicates positive associations between both self- and parent-reports of anxiety and self- and parent-reports of sleep difficulties during adolescence [15].

When clinical samples are considered, sleep problems are found to be extremely common in youth with diagnosed anxiety disorders. For instance, approximately 88 percent of youth with anxiety disorders report at least one type of sleep difficulty, and more than half report greater than three different types of sleep difficulties [16]. In addition, clinically elevated levels of anxiety in early childhood have been found to predict insomnia in middle adulthood [17]. Anxiety is strongly linked with a variety of sleep disturbances due to the heightened physical arousal associated with anxiety as well as the rumination and biased information processing in which many anxious youth engage [7]. Of course, not all anxiously-withdrawn youth report clinically elevated levels of anxiety, but all do withdraw from their peers due to (at least small-to-moderate levels of) social anxieties and fears [18].

Second, there is growing evidence that loneliness, or dissatisfaction with and perceived inadequacy in social relationships, is associated with numerous types of sleep difficulties [19]. For instance, lonely adults report poorer sleep efficiency than do non-lonely adults, such that they experience more restless sleep and spend more time awake after sleep onset [20]. Loneliness is also associated with longer sleep latency, more nighttime awakenings, and lower perceived sleep quality during emerging adulthood [21]. Similarly, in young adults, loneliness has been robustly related to lower sleep quality [22]. Although less commonly studied with samples of adolescents, there is some indication that loneliness similarly interferes with sleep quality during adolescence [23]. Thus, at all ages, loneliness appears to "invade the nights" [20] (p. 364), likely because it promotes such negative social cognitions as hypervigilance to social threats, which keep the individual physically aroused and alert and thus unable to fall and stay asleep [19]. Although anxiously-withdrawn youth actively avoid their peers, they also very much desire to be with them, and as a result, report strong feelings of loneliness [3,24].

Third, there is some indication that social isolation leads to sleep difficulties. In this area of research, social isolation is typically indexed by self-reports of few social interactions, small network sizes, and the lack of social support [25,26]. In addition, these indices have been related positively to several types of sleep difficulties, including insomnia, longer sleep latency, and poor sleep quality [25–27]. For instance, in a sample of young adults,

individuals who rated themselves as socially isolated reported poor sleep quality, long sleep latencies, and high levels of daytime dysfunction [28].

The evidence for links between social isolation and sleep difficulties is most robust in studies of adults. However, several recent studies have revealed associations between social isolation and sleep difficulties during adolescence [26,29]. At any age, social isolation may act as an interpersonal stressor that promotes rumination and interferes with sleep. It is also plausible that the lack of social stimulation interferes with the extent to which individuals are appropriately exhausted and ready for nighttime sleep. By definition, anxiously-withdrawn youth spend considerable time alone and on the periphery of the social scene and thus are usually also socially isolated. That said, there are many youth who are socially isolated who are not also anxiously-withdrawn (e.g., many aggressive youth).

We were not able to locate a single study in which anxious-withdrawal during adolescence was examined as it related to sleep difficulties. However, several studies have shown significant associations between shyness and sleep difficulties during adulthood (e.g., [30]). Conceptually, the constructs of shyness and anxious-withdrawal are related with the shared anxiety and fear of negative evaluation; the difference between these phenomena, however, is that not all shy individuals are socially withdrawn [1]. Nevertheless, the available evidence suggests that anxious-withdrawal may be a risk factor for sleep difficulties during adolescence. The present study is novel in the evaluation of this possibility with the consideration of six types of sleep difficulties: sleeping too much, sleeping too little, talking/walking in sleep, being overtired, nightmares, and general trouble sleeping.

1.2. The Role of Peer Difficulties

The present study also considers the possibility that peer difficulties, in the form of peer victimization and exclusion, may moderate the prospective associations between anxious-withdrawal and sleep difficulties. As noted previously, it is well-established that anxious-withdrawal is associated with and predictive of peer difficulties [31]. This is likely because anxious-withdrawn behaviors are judged to be non-normative and atypical, especially during childhood and adolescence when peer interaction and relationship involvement is expected and valued [32]. It has also been posited that anxiously-withdrawn youth are likely judged to be "easy targets" for peer victimization who are unlikely to retaliate and/or fight back [33].

To our knowledge, no past research has considered anxious-withdrawal and peer problems in relation to sleep difficulties, but peer problems alone have been linked concurrently and prospectively with sleep difficulties during adolescence [34–36]. Moreover, it has been found that peer victimization moderates the associations between loneliness and sleep difficulties, such that loneliness is most strongly associated with sleep difficulties for those who are highly victimized by peers [22]. In this study [22], it was suggested that peer difficulties are an interpersonal stressor that likely exacerbates the sleep difficulties associated with the individual/intrapersonal risk factors of loneliness.

Thus, in the present study, we considered not only whether anxious-withdrawal might represent an intrapersonal behavioral risk factor for sleep difficulties but also whether interpersonal difficulties with peers might enhance the risk for developing increased sleep difficulties. This suggestion seems plausible if both intra- and interpersonal difficulties conspire by increasing intrapersonal stress, rumination, and negatively biased cognitions. Furthermore, this suggested developmental process may be especially likely to occur during early adolescence (10–14 years) when getting along with peers increases in importance, rumination tendencies first begin to develop and become resistant to change, and sleep becomes increasingly disrupted [37].

1.3. The Present Study

In summary, the present study extends past research with its novel consideration of the concurrent and prospective associations between anxious-withdrawal and six types of

sleep difficulties (i.e., sleeping too much, sleeping too little, talking/walking in sleep, being overtired, nightmares, and general trouble sleeping). Peer difficulties in the form of peer exclusion and victimization were also evaluated as a moderator of the prospective associations between anxious-withdrawal and sleep difficulties. Due to the dearth of research in this area, hypotheses were tentative and not specific to different types of sleep difficulties. Instead, it was generally expected that anxious-withdrawal would be related significantly to sleep difficulties (Hypothesis #1) and that anxious-withdrawal in combination with peer exclusion and victimization would predict increases in sleep difficulties over time (Hypothesis #2). To evaluate these hypotheses, we utilized a longitudinal sample of young adolescents and multi-method assessments (maternal-reports of sleep, peer nominations of anxious-withdrawal and peer exclusion and victimization).

2. Materials and Methods

2.1. Participants and Procedures

Participants were 395 (M_{age} = 13.61 years (*SD* = 0.54) at the start of the study; 139 boys, M_{age} = 13.67 years (*SD* = 0.52); 256 girls, M_{age} = 13.56 years (*SD* = 0.55)) young adolescents in the Greater Washington, DC metropolitan area selected from a larger longitudinal project on peer relationships (see [14,33]). These participants (and their mothers) completed measures in Grade 5 and/or Grade 6 and also when they were in Grade 8 (described in more detail below). The sample was racially diverse, with 35% belonging to a racial or ethnic minority group (with 11% African American, 17% Asian, and 5% Hispanic/Latino). In terms of parental education, 66% of the participants' mothers (59% of the fathers) had an undergraduate or advanced graduate university degree, 19% had some college education (12% of the fathers), and 6% had high school or vocational education (12% of the fathers). Comparisons of participants who were included in this study versus those who were not included from the larger project did not reveal any significant differences in the study variables (output available by request).

In the larger project, principals of public elementary and middle schools were first contacted and agreed to participate in the study, and then all students in their schools were invited to participate. Youth with signed parental consent and adolescent assent forms then completed paper-and-pencil peer nomination measures in their schools during the spring of Grade 5 (the final year of elementary school) and/or Grade 6 (the first year of middle school; 70% consent rate; University of Maryland, Institutional Review Board #00475). All participating Grade 5 and 6 youth and their parents (392/395 or 99% of these parents were mothers) were next invited to complete additional measures in the laboratory (where they provided additional signed parent consent and adolescent assent).

The school and laboratory measures collected during Grade 5/Grade 6 are referred to as occurring at Time 1 (T1). Most (75% of the sample) of the T1 data were collected from participants and their mothers when the participants were in Grade 6. There were no significant grade (Grade 5 versus Grade 6) differences, however, in any of the T1 study variables (*p*s > 0.12). Also of note, when participants completed school and laboratory measures in both Grades 5 and 6, only their Grade 6 data were used. Participants and their parents also completed measures in the laboratory or at home when they were in Grade 8 (Time 2; T2; the final year of middle school). In addition to the measures described next, participants completed additional measures, such as a nomination measure of friendship at the T1 school visits and a social information processing measure at the T1 laboratory visits; these were not of interest in this investigation. Participants received gift cards for completing the laboratory measures at each time point.

2.2. Measures

2.2.1. School Measures (T1)

Anxious-withdrawal and peer exclusion/victimization. Participants (and their classmates) completed a 30-item peer nomination measure that included four items descriptive of anxious-withdrawal (e.g., "very shy", "gets nervous about participating in group dis-

cussions" [14,33]). Four items descriptive of peer victimization and exclusion were also included (e.g., "gets hit/kicked", "left out of group activities"). In Grade 5, participants selected one same- and one other-sex peer from their classroom and grade who were most like these items from rosters; in Grade 6, due to school schedules that involved numerous classroom changes throughout the day, participants wrote names for up to three same- and other-sex grade-mates without a roster. Self-nominations were permitted but not considered. For each item, the nominations received were summed, proportionalized, and then standardized within sex and school (to adjust for differences across schools in the number of possible nominations received [38]). Mean scores were calculated with higher scores reflecting greater anxious-withdrawal ($\alpha = 0.84$) and peer exclusion/victimization ($\alpha = 0.90$). Previous psychometric work with the Grade 5 and Grade 6 peer nomination data revealed identical and separate anxious-withdrawal and peer exclusion/victimization factors in each grade [14].

2.2.2. Laboratory Measures (T1, T2)

Sleep problems. Sleep problems at T1 and T2 were measured with the same six items drawn from the parent-reported Child Behavior Checklist (CBCL; [39]) ("nightmares", "sleep less than most kids", "sleep more than most kids", "talks/walks in sleep", "overtired", "trouble sleeping"; for other published studies of 6-to-17-year-old youth that utilized the CBCL to assess sleep, see [15]). At both time points, items were scored on a three-point scale (ranging from 0 = not true to 2 = very/often true). Items were analyzed individually rather than with composite/mean scores due to poor internal consistencies at each time point (αs < 0.50). Self-reports of five of these sleep difficulties ("nightmares", "sleep less than most kids", "sleep more than most kids", "overtired", "trouble sleeping"; with the Youth Self-Report; YSR [40]) were also available, but at T2 only. Therefore, primary models utilized the CBCL data, but an exploratory model was also evaluated with the T2 YSR self-report data utilized.

2.3. Data Analysis

Means and standard deviations for, and zero-order correlations among, the study variables were first examined and are presented in Table 1. To evaluate the primary study objective and hypotheses, Mplus version 6.12 [41] was used to estimate a path model with full information maximum likelihood estimation with robust standard errors. Missing data were minimal, and full information maximum likelihood estimation is appropriate to handle missing data. The path model is depicted in Figure 1 with the main effect from anxious-withdrawal to sleep difficulties included as a test of Hypothesis #1. The stability paths (from T1 to T2) between the sleep variables were also estimated, as were the paths from the interaction term between the centered T1 anxious-withdrawal and exclusion/victimization variables and the T2 sleep problem variables (with the interaction effect included to test Hypothesis #2). Although not shown in the figure, covariances between exogenous variables (each T1 maternal-reported sleep problem variable, T1 anxious-withdrawal, T1 exclusion/victimization) were estimated, as were the covariances between the endogenous variables (each T2 maternal-reported sleep problem variable). Model fit was assessed with chi-square goodness-of-fit and the root-mean-square error of approximation (RMSEA; 0.08 or less), standardized root-mean-square residual (SRMR; 0.09 or less), and comparative fit index (CFI; 0.95 or greater). Only significant effects are described.

Table 1. Zero-order Correlations and Descriptive Statistics.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Anxious-withdrawal T1														
2. Exclusion/Victimization T1	0.320 **													
3. Nightmares T1	0.122 *	0.127 *												
4. Overtired T1	0.101	0.071	0.119 *											
5. Sleeps less T1	0.039	0.037	0.112 *	0.262 **										
6. Sleeps more T1	0.175 **	0.055	0.134 **	0.104 *	0.013									
7. Talks/walks T1	−0.052	−0.054	0.173 **	0.034	−0.005	0.082								
8. Trouble sleeping T1	0.198 **	0.175 **	0.288 **	0.210 **	0.301 **	0.08	0.181 **							
9. Nightmares T2	0.089	0.068	0.244 **	0.057	−0.059	0.004	0.186 *	0.053						
10. Overtired T2	0.1	0.275 **	0.232 **	0.300 **	0.15	0.097	0.021	0.212 **	0.261 **					
11. Sleeps less T2	0.008	0.008	0.015	0.007	0.436 **	0.026	−0.074	0.128	0.036	0.187 *				
12. Sleeps more T2	0.194 *	0.081	0.023	−0.002	0.048	0.202 **	0.018	0.245 **	0.066	0.388 **	0.272 **			
13. Talks/walks T2	−0.145	−0.115	0.011	−0.006	−0.055	0.008	0.433 **	−0.028	0.297 **	0.054	−0.142	0.071		
14. Trouble sleeping T2	0.225 *	0.247 **	0.178 *	0.208 **	0.222 **	0.15	0.074	0.374 **	0.311 **	0.451 **	0.307 **	0.163 *	−0.019	
M	−0.016	−0.005	0.168	0.223	0.168	0.097	0.112	0.125	0.138	0.204	0.174	0.078	0.133	0.156
SD	0.837	0.605	0.381	0.463	0.425	0.344	0.34	0.394	0.379	0.446	0.439	0.29	0.374	0.38

Note. Sleep variables were mother-reported, anxious-withdrawal and victimization/exclusion were based on peer nominations; T1 = Time 1 or Grade 5/6; T2 = Time 2 or Grade 8; * $p < 0.05$; ** $p < 0.001$.

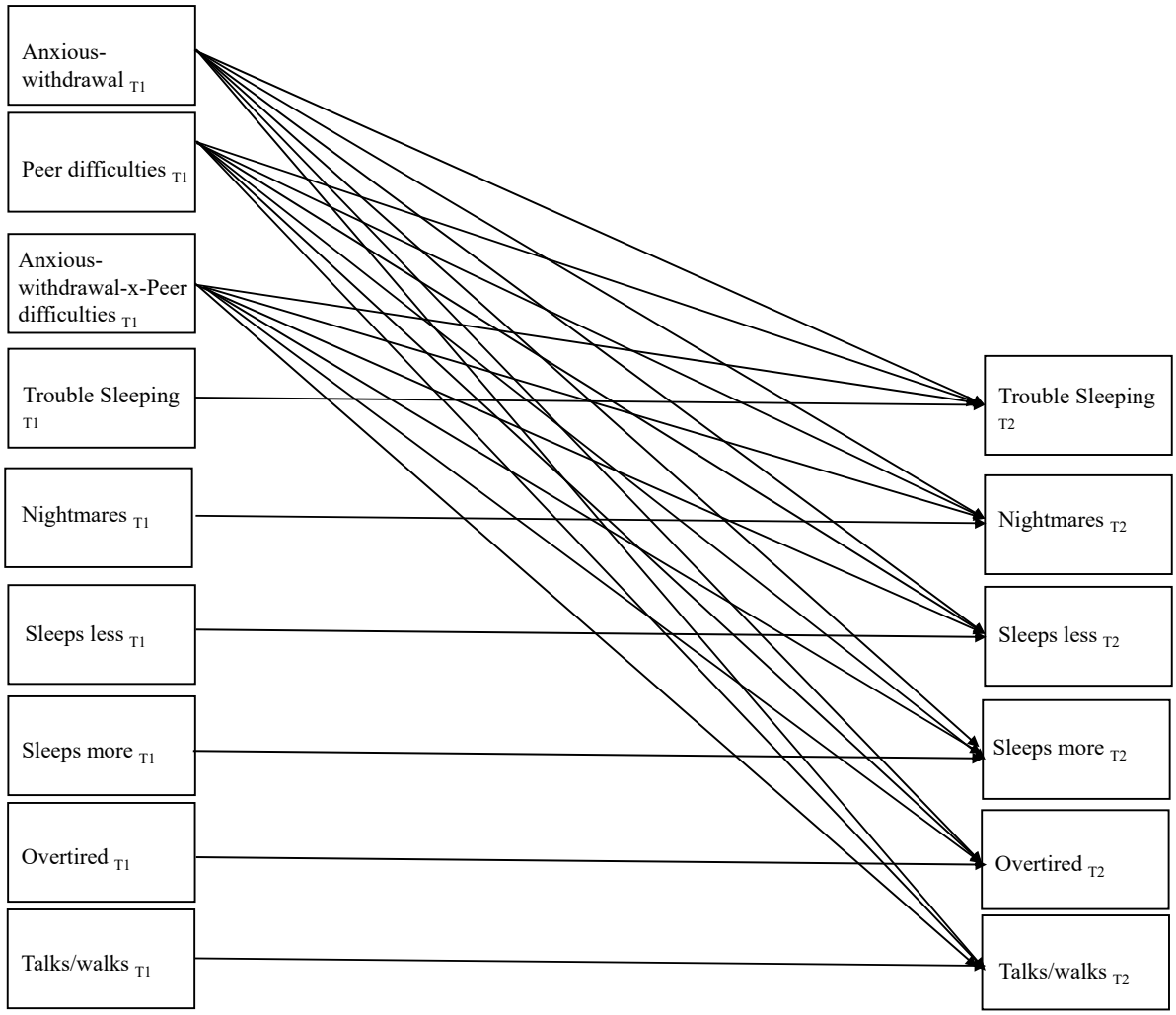

Figure 1. Model Evaluated in the Primary Analyses Predicting Time 2 Sleep Difficulties.

3. Results

3.1. Preliminary Analyses

In the correlational analyses, anxious-withdrawal at T1 was related positively to T1 exclusion/victimization, T1 maternal-reports of nightmares, T1 and T2 maternal-reports of sleeping more than other kids, and T1 and T2 maternal-reports of trouble sleeping. A series of exploratory *t*-tests did not reveal any significant sex differences in any of the study variables (ps > 0.05).

3.2. Primary Analyses

There was a good fit of the model to the data: χ^2 (30) = 40.50, p = 0.096, RMSEA = 0.03, 90% CI [0.000, 0.051], SRMR = 0.048, CFI = 0.94; thus, no post hoc model fitting was performed. As is evident in Figure 2, significant stability was found over time for each type of sleep problem, with the exception of reports of sleeping more than other kids. In terms of additional prospective associations, T1 exclusion/victimization predicted increases in maternal-reports of being overtired and decreases in trouble sleeping over time. T1 anxious-withdrawal predicted decreases in maternal-reports of talking/walking in sleep from T1 to T2. In addition, the interaction between T1 anxious-withdrawal and T1 exclusion/victimization when predicting T2 maternal-reports of trouble sleeping was significant. Simple slope analyses showed that T1 anxious-withdrawal predicted increases in maternal-reports of trouble sleeping (β = 0.34, p = 0.001) at high levels of T1 exclusion/victimization but not at low levels (β = −0.15, p = 0.18).

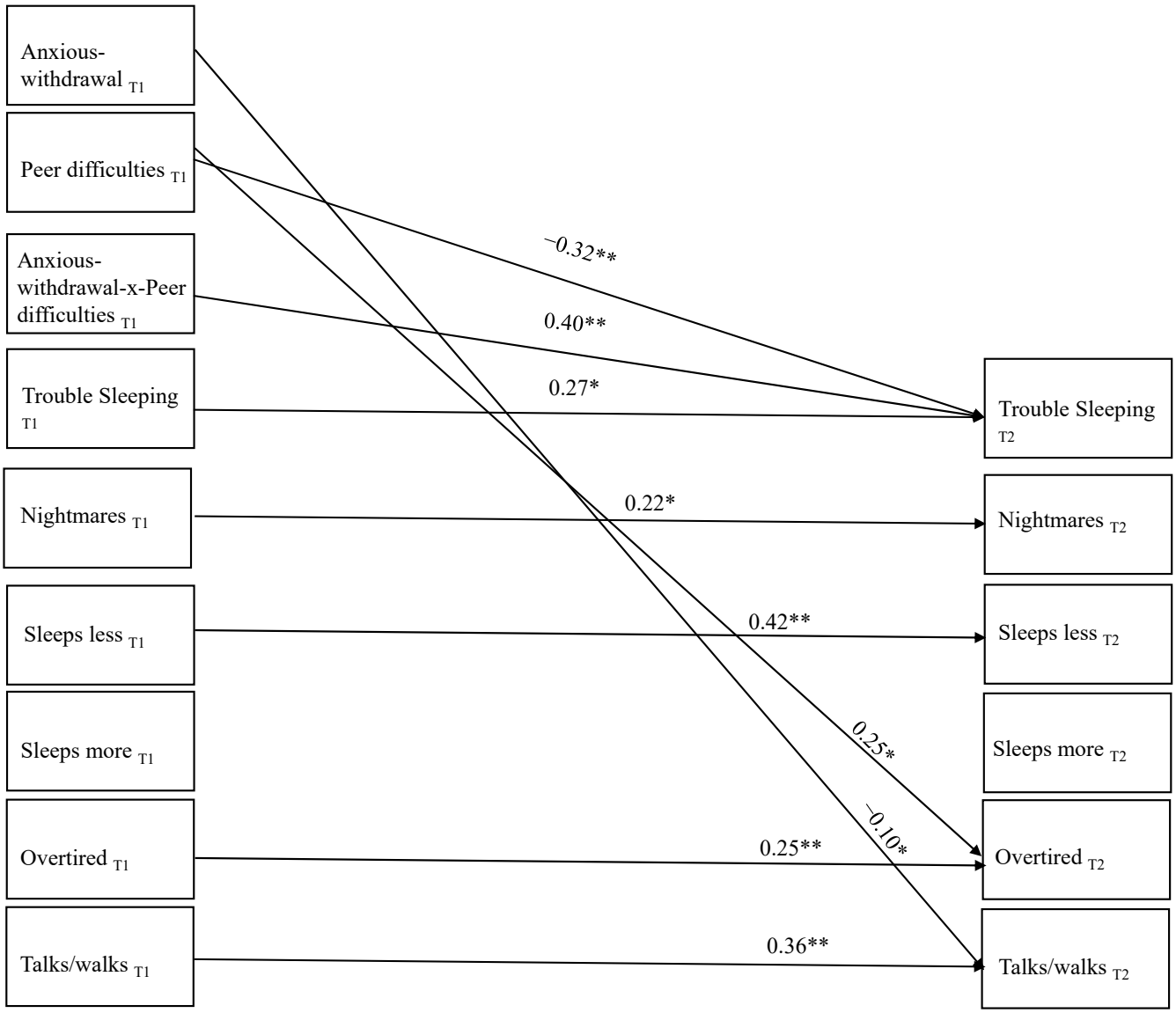

Figure 2. Significant Paths in the Primary Model Predicting Time 2 Sleep Difficulties; * $p < 0.05$, ** $p < 0.001$.

Not shown in the figure for ease of communication were numerous unique within-time significant associations. For example, T1 anxious-withdrawal and T1 victimization/exclusion were significantly related (β = 0.31, $p = 0.001$). T1 anxious-withdrawal was also related uniquely to T1 maternal-reports of sleeping more than other kids (β = 0.16, $p = 0.02$) and trouble sleeping (β = 0.18, $p = 0.01$). T1 exclusion/victimization was associated uniquely with T1 maternal-reports of trouble sleeping (β = 0.16, $p = 0.05$) but was not related significantly with any other types of sleep difficulties at T1.

Within-time unique associations among the sleep difficulties also emerged. At T1, maternal-reports of nightmares were related uniquely to maternal reports of being overtired (β = 0.12, $p = 0.04$), sleeping less than other kids (β = 0.11, $p = 0.05$), sleeping more than other kids (β = 0.13, $p = 0.04$), talking/walking in sleep (β = 0.17, $p = 0.007$), and trouble sleeping (β = 0.29, $p = 0.001$). At T1, maternal-reports of sleeping less than other kids were also correlated with maternal-reports of being overtired (β = 0.26, $p = 0.001$), and maternal-reports of trouble sleeping were associated uniquely with maternal-reports of being overtired (β = 0.21, $p = 0.004$), sleeping less than other kids (β = 0.31, $p = 0.004$), and talking in sleep (β = 0.18, $p = 0.03$).

At T2, maternal-reports of nightmares were associated uniquely with maternal-reports of being overtired ($\beta = 0.23$, $p = 0.044$), talking/walking in sleep ($\beta = 0.27$, $p = 0.01$), and trouble sleeping ($\beta = 0.31$, $p = 0.003$). T2 maternal-reports of sleeping less than other kids were also related uniquely to maternal-reports of being overtired ($\beta = 0.19$, $p = 0.037$) and so were maternal-reports of sleeping more than other kids ($\beta = 0.40$, $p = 0.001$). T2 maternal-reports of sleeping less than other kids, however, were also related uniquely and negatively with T2 maternal-reports of talking/walking in sleep. Finally, T2 maternal-reports of trouble sleeping were associated uniquely with maternal-reports of being overtired ($\beta = 0.43$, $p = 0.001$) and sleeping less than other kids ($\beta = 0.33$, $p = 0.006$).

3.3. Exploratory Analyses

3.3.1. Evaluation of Sex Differences

We next explored, without any a priori predictions, whether sex moderated the proposed associations with a multiple group analysis in which a fully unconstrained model (all paths and covariances freely estimated for both sexes) was compared to a fully constrained model (all regression paths and covariances set equal for both sexes). A significant χ^2 difference test between the constrained and free-to-vary models indicated no differences across sex, $\Delta\chi^2$ (37) = 46.406, $p = 0.13$.

3.3.2. Youth Self-Reports of Sleep Difficulties

We then evaluated the fit of an exploratory model identical to the primary model with one notable difference: T2 sleep variables were reported by the *adolescent*. Adolescent self-reported sleep data were not available at T1, and so we controlled for T1 maternal-reports in these models. There was one other difference: the YSR does not ask youth about the extent to which they are talking/walking in their sleep, and so this model included five (as opposed to six) T1 and T2 sleep variables. Table 2 shows the zero-order correlations between the study variables included in this model.

There was adequate fit to the data for this model: χ^2 (20) = 40.77, $p = 0.004$, RMSEA = 0.05, 90% CI [0.028, 0.074], SRMR = 0.047, CFI =0.85, and no post hoc model fitting was performed. Of note, in this model, maternal-reports of nightmares at T1 predictively positively self-reports of nightmares at T2 ($\beta = 0.19$, $p = 0.03$). Similar prospective effects were found for T1 maternal-reports of trouble sleeping and T2 self-reports of trouble sleeping ($\beta = 0.18$, $p = 0.02$). Surprisingly, T1 maternal-reports of sleeping more than other kids were related *negatively* to T2 self-reports of sleeping more than other kids ($\beta = -0.12$, $p = 0.04$).

In terms of main effects, T1 exclusion/victimization was related positively to T2 self-reports of nightmares ($\beta = 0.26$, $p = 0.02$). Moreover, the interaction between T1 anxious-withdrawal and T1 exclusion/victimization significantly predicted T2 trouble sleeping ($\beta = -0.19$, $p = 0.02$). Simple slope analyses revealed that T1 anxious-withdrawal was a *negative* predictor of T2 trouble sleeping at high levels of peer exclusion/victimization ($\beta = -0.18$, $p = 0.051$) but was not a significant predictor at low levels of peer exclusion/victimization ($\beta = 0.045$, $p = 0.36$).

Table 2. Zero-order Correlations and Descriptive Statistics for Maternal-reported (T1) and Self-reported (T2) Sleep Difficulties.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Anxious-withdrawal T1												
2. Exclusion/Victimization T1	0.320 **											
3. Nightmares T1	0.122 *	0.127 *										
4. Overtired T1	0.101	0.071	0.119 *									
5. Sleeps less T1	0.039	0.037	0.112 *	0.262 *								
6. Sleeps more T1	0.175 **	0.055	0.134 **	0.104 *	0.013							
7. Trouble sleeping T1	0.198 **	0.175 **	0.288 **	0.210 **	0.301 **		0.08					
8. Nightmares T2	0.019	0.166	0.167 *	0.043	0.026	−0.023	−0.042					
9. Overtired T2	0.009	0.088	−0.006	0.067	0.095	0.197 **	0.065	0.231 **				
10. Sleeps less T2	−0.106	−0.09	−0.088	0.027	0.162 *	−0.047	−0.007	0.092	0.206 **			
11. Sleeps more T2	−0.042	0.017	−0.122	−0.076	−0.114	0.008	−0.067	−0.019	0.065	−0.053		
12. Trouble sleeping T2	−0.08	−0.084	0.022	0.038	0.211 **	0.089	0.116	0.171 *	0.429 **	0.408 **	−0.089	
M	−0.016	−0.005	0.168	0.223	0.168	0.097	0.125	0.477	0.465	0.465	0.269	0.374
SD	0.837	0.605	0.381	0.463	0.425	0.344	0.394	0.577	0.652	0.643	0.562	0.614

Note. All T1 sleep variables were maternal-reported, and all T2 sleep variables were self-reported, and T1 anxious-withdrawal and victimization/exclusion were based on peer-nominations; T1 = Time 1 or Grade 5/6; T2 = Time 2 or Grade 8; * $p < 0.05$; ** $p < 0.001$.

4. Discussion

Anxious-withdrawal during childhood and adolescence has been associated concurrently and prospectively with a host of psychological difficulties, including anxiety, depressive symptoms, and loneliness [1]. There is also evidence that anxiously-withdrawn behaviors interfere with positive peer interactions and relationships and instead promote such negative peer difficulties as peer exclusion and peer victimization [31]. However, researchers have yet to investigate whether anxiously-withdrawn behavioral tendencies also place youth at risk for physical health difficulties. The present study aimed to extend previous research by examining, for the first time, whether anxious-withdrawal during early adolescence is related concurrently and prospectively with six different types of sleep problems (nightmares, talking/walking in sleep, sleeping more than other kids, sleeping less than other kids, being overtired, and general trouble sleeping), as well as whether peer difficulties (in the form of peer victimization and exclusion) moderate these associations.

Consistent with expectations (Hypothesis #1), peer-nominated anxious-withdrawal was associated concurrently with several types of maternal-reported sleep problems, including nightmares and sleeping too much, in the zero-order correlational analyses. In path models, anxious-withdrawal was also related uniquely to T1 maternal-reports of sleeping more than other kids and trouble sleeping. Taken together, these findings suggest, for the first time, that adolescents who regularly withdraw from their peers due to social fears and anxieties during the daytime hours also experience difficulties in the nighttime. Although these findings will require replication, they may point to the need for a "24-h approach" in future research to fully understand the multitude of health difficulties associated with anxious-withdrawal. Such approaches, which track social interaction and activities continuously for 24 h, are becoming increasingly common in other areas of developmental and clinical psychology research (e.g., obesity research [42], personality disorder research [43]) but have not yet been utilized in studies of anxious-withdrawal. In fact, most studies of anxious-withdrawal not only neglect functioning and well-being during the nighttime hours but also neglect how anxiously-withdrawn youth fare when they are awake and *not* in school (or before and after school hours).

Young adolescents who are anxiously-withdrawn may experience sleep difficulties due to their nervous and negatively-biased social information processing and cognition tendencies (e.g., rejection-sensitivity, internal blame attributions [44]). Similar to those who are anxious as well as lonely and socially isolated, these negative cognitive styles may interfere with several aspects of the sleep process, such as falling asleep at the start of bedtime. Significantly, the findings from this study suggest that anxious-withdrawal may be related to some, but not all, types of sleep difficulties. As one example, anxious-withdrawal at T1 was related uniquely to T1 sleeping more than other kids and having trouble sleeping; anxious-withdrawal was not associated with T1 reports of sleeping less than other kids and talking/walking in sleep. This may point to the possibility that anxiously-withdrawn young adolescents struggle most with *initially* falling asleep and not *staying* asleep. Additional work with more nuanced assessments of sleep (e.g., physiological assessments of sleep), however, is needed to evaluate this hypothesis.

As shown in previous research, peer-nominated peer victimization and exclusion in this study was related concurrently to several types of sleep problems, including being overtired. Novel to this research, however, was the prospective and interactive effect of anxious-withdrawal and these peer problems on reports of trouble sleeping. Specifically, and consistent with Hypothesis #2, the results showed that anxious-withdrawal at T1 predicted increased maternal-reports of trouble sleeping at T2 for young adolescents who were highly excluded and victimized by their peers at school. The longitudinal relation between anxious-withdrawal and trouble sleeping was not significant for young adolescents who were low in peer victimization and exclusion. It is possible that these findings reflect increased worry, anxieties, and negative social cognitions experienced by anxiously-withdrawn young adolescents who also struggle in their relationships with their peers [45]. It seems that such cognitions and affect may, in turn, interfere with sleep. Past research

has shown that youth with the intrapersonal risk factor of anxious-withdrawal suffer the most psychologically when they also struggle interpersonally with their peers [2,3,45]. The present findings, however, are the first to show similar intra- and interpersonal interactive effects as they pertain to a *physical* health outcome. The findings of the present study may suggest that anxiously-withdrawn young adolescents might benefit from explicit instruction on sleep hygiene. Peer problems can be difficult to change, especially without school-wide intervention efforts, but there is growing evidence to support the efficacy of cognitive–behavioral sleep interventions for not only adults but also adolescents [46–48]. Such therapies might not solve anxiously-withdrawn adolescents' psychological and peer difficulties, but they might help them to be better rested when dealing with them.

Several limitations of this study should be acknowledged. First, even with longitudinal analyses, the present study does not provide evidence about causality. In addition, the conceptualization and analyses for our study were informed by other areas of research which assume that individual risk factors (e.g., anxiety) lead to the development of sleep difficulties over time [49,50]. However, it is certainly plausible that sleep difficulties, and the daytime exhaustion related to many of them, might lead some youth to not have the energy and positive affect necessary to engage with peers. Such direction of effects could not be examined in this study but should be evaluated in future research.

Second, the present study focused on peer victimization and exclusion, the two most commonly considered types of peer difficulties in research on anxious-withdrawal [31]. Although oftentimes discussed as conclusive, the evidence linking anxious-withdrawal and peer rejection (or active dislike) is actually quite mixed, especially in the few studies published on anxious-withdrawal and peer rejection with *adolescent* samples [31]. Nevertheless, future research on anxious-withdrawal and sleep should explore the potential contributions of peer rejection and other types of peer difficulties, including those involving friends (e.g., friendship instability, dissolution, and betrayal), which may also increase anxiously-withdrawn young adolescents' distress and interfere with their sleep. In such research, measures of anxiety and negative cognitions should also be included to evaluate the proposed mechanisms of influence in this study [50,51]. The lack of such assessments in this study is another significant limitation.

Third, this study was further limited by its reliance on *maternal*-reports of sleep difficulties. We did explore self-reports of sleep difficulties at T2, but we are cautious to interpret such findings given the lack of T1 self-reports of sleep difficulties. That said, the results did differ somewhat from those with the maternal-reports of sleep difficulties, which we think may point to the importance of multiple informants in future research in this area of research [52,53]. Perhaps multiple informant assessments might help make sense of several unexpected findings found in this study, such as why T1 exclusion/victimization predicted *decreases* in maternal-reports of trouble sleeping over time and T1 anxious-withdrawal predicted *decreases* in maternal-reports of talking/walking in sleep from T1 to T2; these effects were also not found when T2 self-reports of sleep difficulties were considered.

5. Conclusions

Despite these limitations, the present study extends past research with its consideration of anxious-withdrawal in relation to physical health difficulty. The findings linking anxious-withdrawal concurrently and prospectively to sleep difficulties are novel and should set the stage for future research on anxious-withdrawal that conceptualizes adjustment difficulties more broadly to include physical health difficulties. Also noteworthy was the interaction effect between anxious-withdrawal and peer exclusion/victimization in the prediction of trouble sleeping. This result is the first to show that anxiously-withdrawn young adolescents' peer difficulties contribute to physical heath difficulties (just as they contribute to their social and psychological health difficulties). Thus, we hope this latter finding helps to further highlight the importance of considering peer difficulties in the study of anxious-withdrawal, and perhaps after replication, informs intervention and prevention efforts with youth who regularly withdraw from their peers due to social fears and anxieties.

Author Contributions: Conceptualization: J.C.B., J.N.G., C.L.R. and K.H.R.; methodology: J.C.B. and K.H.R.; software: J.C.B.; analysis: J.C.B. and J.N.G.; writing—original draft: J.C.B., J.N.G., C.L.R. and K.H.R.; writing—reviewing and editing: J.C.B., J.N.G., C.L.R. and K.H.R.; project administration: J.C.B. and K.H.R.; funding acquisition: K.H.R. All authors have read and agreed to the published version of the manuscript.

Funding: This research was supported by National Institute of Mental Health Grant 1R01MH58116 to Kenneth H. Rubin.

Institutional Review Board Statement: All participants and their parents gave their signed informed consent before they participated in this study. This study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Institutional Review Board at the University of Maryland (#00475).

Informed Consent Statement: Written informed consent was obtained from all participants and their parents involved in the study.

Data Availability Statement: De-identified data and code will be made available upon reasonable request to the first author.

Acknowledgments: The authors graciously acknowledge and thank the adolescents and their families who participated in this study.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

References

1. Rubin, K.H.; Chronis-Tuscano, A. Perspectives on social withdrawal in childhood: Past, present, and prospects. *Child Dev. Perspect.* **2021**, *15*, 160–167. [CrossRef] [PubMed]
2. Gazelle, H.; Ladd, G.W. Anxious solitude and peer exclusion: A diathesis-stress model of internalizing trajectories in childhood. *Child Dev.* **2003**, *74*, 257–278. [CrossRef] [PubMed]
3. Boivin, M.; Hymel, S.; Bukowski, W.M. The roles of social withdrawal, peer rejection, and victimization by peers in predicting loneliness and depressed mood in childhood. *Dev. Psychopathol.* **1995**, *7*, 765–785. [CrossRef]
4. Rubin, K.H.; Chen, X.; McDougall, P.; Bowker, A.; McKinnon, J. The Waterloo Longitudinal Project: Predicting adolescent internalizing and externalizing problems from early and mid-childhood. *Dev. Psychopathol.* **1995**, *7*, 751–764. [CrossRef]
5. Alfano, C.A.; Zakem, A.H.; Costa, N.M.; Taylor, L.K.; Weems, C.F. Sleep problems and their relation to cognitive factors, anxiety, and depressive symptoms in children and adolescents. *Depress. Anxiety* **2009**, *26*, 503–512. [CrossRef] [PubMed]
6. Kelly, R.J.; Zeringue, M.M.; El-Sheikh, M. Adolescents' sleep and adjustment: Reciprocal effects. *Child Dev.* **2021**, *93*, 540–555. [CrossRef] [PubMed]
7. Palmer, C.A.; Oosterhoff, B.; Bower, J.L.; Kaplow, J.B.; Alfano, C.A. Associations among adolescent sleep problems, emotion regulation, and affective disorders: Findings from a nationally representative sample. *J. Psychiatr. Res.* **2018**, *96*, 1–8. [CrossRef]
8. Kann, L.; McManus, T.; Harris, W.A.; Shanklin, S.L.; Flint, K.H.; Queen, B.; Lowry, R.; Chyen, D.; Whittle, L.; Thornton, J.; et al. Youth risk behavior surveillance—United States, 2017. *MMWR Surveill. Summ.* **2018**, *67*, 1–114. [CrossRef]
9. Dikeos, D.; Georgantopoulos, G. Medical comorbidity of sleep disorders. *Curr. Opin. Psychiatry* **2011**, *24*, 346–354. [CrossRef]
10. Freeman, D.; Sheaves, B.; Waite, F.; Harvey, A.G.; Harrison, P.J. Sleep disturbance and psychiatric disorders. *Lancet Psychiatry* **2020**, *7*, 628–637. [CrossRef]
11. Orchard, F.; Gregory, A.M.; Gradisar, M.; Reynolds, S. Self-reported sleep patterns and quality amongst adolescents: Cross-sectional and prospective associations with anxiety and depression. *J. Child Psychol. Psychiatry* **2020**, *61*, 1126–1137. [CrossRef]
12. Berger, R.H.; Diaz, A.; Valiente, C.; Eisenberg, N.; Sprinrad, T.L.; Thompson, M.S.; Hernandez, M.M.; VanSchyndel, S.K.; Southworth, J. Sleep duration moderates the association between children's temperament and academic achievement. *Early Educ. Dev.* **2018**, *29*, 624–640. [CrossRef] [PubMed]
13. Simola, P.; Liukkonen, K.; Pitkaranta, A.; Pirinen, T.; Aronen, E.T. Psychosocial and somatic outcomes of sleep problems in children: A 4-year follow-up study. *Child Care Health Dev.* **2012**, *40*, 60–67. [CrossRef]
14. Oh, W.; Rubin, K.H.; Bowker, J.C.; Booth-LaForce, C.L.; Rose-Krasnor, L.; Laursen, B. Trajectories of social withdrawal from middle childhood to early adolescence. *J. Abnorm. Child Psychol.* **2008**, *36*, 553–556. [CrossRef]
15. Lamoureux, V.A.; Glenn, A.L.; Ling, S.; Raine, A.; Ang, R.P.; Fung, D. The role of anxiety and callous-unemotional traits in the relationship between externalizing behaviors and sleep problems in clinic-referred youth. *Clin. Child Psychol. Psychiatry* **2023**, *28*, 654–667. [CrossRef] [PubMed]
16. Alfano, C.A.; Ginsburg, G.S.; Kingery, J.N. Sleep-related problems among children and adolescents with anxiety disorder. *J. Am. Acad. Child Adolesc. Psychiatry* **2007**, *46*, 224–232. [CrossRef]

17. McMakin, D.L.; Alfano, C.A. Sleep and anxiety in late childhood and early adolescence. *Curr. Opin. Psychiatry* **2015**, *28*, 483–489. [CrossRef]
18. Gazelle, H.; Workman, J.O.; Allan, W. Anxious solitude and clinical disorder in middle childhood: Bridging developmental and clinical approaches to childhood social anxiety. *J. Abnorm. Child Psychol.* **2010**, *38*, 1–17. [CrossRef]
19. Hom, M.A.; Chu, C.; Rogers, M.L.; Joiner, T.E. A meta-analysis of the relationship between sleep problems and loneliness. *Clin. Psychol. Sci.* **2020**, *8*, 799–824. [CrossRef]
20. Cacioppo, J.T.; Hawkley, L.C.; Berntson, G.G.; Ernst, J.M.; Gibbs, A.C.; Stickgold, R.; Hobson, J.A. Do lonely days invade the nights? Potential social modulation of sleep efficiency. *Psychol. Sci.* **2002**, *13*, 384–387. [CrossRef]
21. Peng, A.; Tang, Y.; He, S.; Ji, S.; Dong, B.; Chen, L. Association between loneliness, sleep behavior and quality: A propensity-score-matched case-control study. *Sleep Med.* **2021**, *86*, 19–24. [CrossRef] [PubMed]
22. Matthews, T.; Danese, A.; Gregory, A.M.; Caspi, A.; Moffitt, T.E.; Arseneault, L. Sleeping with one eye open: Loneliness and sleep quality in young adults. *Psychol. Med.* **2017**, *47*, 2177–2186. [CrossRef] [PubMed]
23. Eccles, A.M.; Qualter, P.; Madsen, K.R.; Holstein, B.E. Loneliness in the lives of Danish adolescents: Associations with health and sleep. *Scand. J. Public Health* **2020**, *48*, 877–887. [CrossRef] [PubMed]
24. Markovic, A.; Bowker, J.C. Friends also matter: Examining friendship adjustment indices as moderators of anxious-withdrawal and trajectories of change in psychological maladjustment. *Dev. Psychol.* **2017**, *53*, 1462. [CrossRef] [PubMed]
25. Azizi-Zeinalhajlou, A.; Mirghafourvand, M.; Nadrian, H.; Sis, S.S.; Matlabi, H. The contribution of social isolation and loneliness to sleep disturbances among older adults: A systematic review. *Sleep Biol. Rhythm.* **2022**, *20*, 153–163. [CrossRef]
26. Richardson, C.; Oar, E.; Fardouly, J.; Magson, N.; Johnco, C.; Forbes, M.; Rapee, R. The moderating role of sleep in the relationship between social isolation and internalising problems in adolescence. *Child Psychiatry Hum. Dev.* **2019**, *50*, 1011–1020. [CrossRef]
27. Pilcher, J.J.; Dorsey, L.L.; Galloway, S.M.; Erikson, D.N. Social isolation and sleep: Manifestation during COVID-19 quarantines. *Front. Psychol.* **2022**, *12*, 6476. [CrossRef]
28. Cacioppo, J.T.; Hawkley, L.C. Social isolation and health, with an emphasis on underlying mechanisms. *Perspect. Biol. Med.* **2003**, *46*, S39–S52. [CrossRef]
29. Palmer, C.A.; Powell, S.L.; Deutchman, D.R.; Tintzman, C.; Poppler, A.; Oosterhoff, B. Sleepy and secluded: Sleep disturbances are associated with connectedness in early adolescent social networks. *J. Res. Adolesc.* **2022**, *32*, 756–768. [CrossRef]
30. Weissbluth, M. Sleep-loss stress and temperamental difficultness: Psychobiological processes and practical considerations. In *Temperament in Childhood*; Kohnstamm, G.A., Bates, J.E., Rothbart, M.K., Eds.; John Wiley & Sons: Hoboken, NJ, USA, 1989; pp. 357–375.
31. Bowker, J.C.; White, H.I. Studying peers in research on social withdrawal: Why broader assessments of peers are needed. *Child Dev. Perspect.* **2021**, *15*, 90–95. [CrossRef]
32. Bowker, J.C.; Ooi, L.L.; Coplan, R.J.; Etkin, R.G. When is it okay to be alone? Gender differences in normative beliefs about social withdrawal in emerging adulthood. *Sex Roles* **2020**, *82*, 482–492. [CrossRef]
33. Rubin, K.H.; Wojslawowicz, J.C.; Rose-Krasnor, L.; Booth-LaForce, C.; Burgess, K.B. The best friendships of shy/withdrawn children: Prevalence, stability, and relationship quality. *J. Abnorm. Child Psychol.* **2006**, *34*, 139–153. [CrossRef] [PubMed]
34. De Lise, F.; Bacaro, V.; Crocetti, E. The social side of sleep: A systematic review of the longitudinal associations between peer relationships and sleep quality. *Int. J. Environ. Res. Public Health* **2023**, *20*, 2017. [CrossRef] [PubMed]
35. Tu, K.M.; Spencer, C.W.; El-Sheikh, M.; Erath, S.A. Peer victimization predicts sleep problems in early adolescence. *J. Early Adolesc.* **2019**, *39*, 67–80. [CrossRef]
36. Van Geel, M.; Goemans, A.; Vedder, P.H. The relation between peer victimization and sleeping problems: A meta-analysis. *Sleep Med. Rev.* **2016**, *27*, 89–95. [CrossRef]
37. LaFontana, K.M.; Cillessen, A.H. Developmental changes in the priority of perceived status in childhood and adolescence. *Soc. Dev.* **2010**, *19*, 130–147. [CrossRef]
38. Cillessen, A.H.N. Sociometric methods. In *Handbook of Peer Interactions, Relationships, and Groups*; Rubin, K.H., Bukowski, W.M., Laursen, B., Eds.; The Guilford Press: New York, NY, USA, 2009; pp. 82–99.
39. Achenbach, T.M. *Manual for Child Behavior Checklist/4–18 and 1991 Profile*; University of Vermont Department of Psychiatry: Burlington, VT, USA, 1991.
40. Achenbach, T.M.; Rescorla, L.A. *Manual for the ASEBA School-Age Forms & Profiles*; University of Vermont, Research Center for Children, Youth, & Families: Burlington, VT, USA, 2001.
41. Muthén, L.K.; Muthén, B.O. *Mplus User's Guide*, 6th ed.; Muthén & Muthén: Los Angeles, CA, USA, 2010.
42. Rosenberger, M.E.; Fulton, J.E.; Buman, M.P.; Troiano, R.P.; Grandner, M.A.; Buchner, D.M.; Haskell, W.L. The 24-hour activity cycle: A new paradigm for physical activity. *Med. Sci. Sports Exerc.* **2019**, *51*, 454. [CrossRef]
43. McGowan, N.M.; Saunders, K.E. The emerging circadian phenotype of borderline personality disorder: Mechanisms, opportunities and future directions. *Curr. Psychiatry Rep.* **2021**, *23*, 30. [CrossRef]
44. Kingsbury, M.; Coplan, R.J.; Rose-Krasnor, L. Shy but getting by? An examination of the complex links among shyness, coping, and socioemotional functioning in childhood. *Soc. Dev.* **2013**, *22*, 126–145. [CrossRef]
45. Gazelle, H.; Rudolph, K.D. Moving toward and away from the world: Social approach and avoidance trajectories in anxious solitary youth. *Child Dev.* **2004**, *75*, 829–849. [CrossRef]

46. Blake, M.J.; Sheeber, L.B.; Youssef, G.J.; Raniti, M.B.; Allen, N.B. Systematic review and meta-analysis of adolescent cognitive–behavioral sleep interventions. *Clin. Child Fam. Psychol. Rev.* **2017**, *20*, 227–249. [CrossRef]
47. Hendricks, M.C.; Ward, C.M.; Grodin, L.K.; Slifer, K.J. Multicomponent cognitive-behavioural intervention to improve sleep in adolescents: A multiple baseline design. *Behav. Cogn. Psychother.* **2014**, *42*, 368–373. [CrossRef] [PubMed]
48. Kodsi, A.; Bullock, B.; Kennedy, G.A.; Tirlea, L. Psychological interventions to improve sleep in young adults: A systematic review and meta-analysis of randomized controlled trials. *Behav. Sleep Med.* **2022**, *20*, 125–142. [CrossRef]
49. Nguyen, V.V.; Zainal, N.H.; Newman, M.G. Why sleep is key: Poor sleep quality is a mechanism for the bidirectional relationship between major depressive disorder and generalized anxiety disorder across 18 years. *J. Anxiety Disord.* **2022**, *90*, 102601. [CrossRef] [PubMed]
50. Song, Y.; Sznajder, K.; Cui, C.; Yang, Y.; Li, Y.; Yang, X. Anxiety and its relationship with sleep disturbance and problematic smartphone use among Chinese medical students during COVID-19 home confinement—A structural equation model analysis. *J. Affect. Disord.* **2022**, *296*, 315–321. [CrossRef]
51. Chellappa, S.L.; Aeschbach, D. Sleep and anxiety: From mechanisms to interventions. *Sleep Med. Rev.* **2022**, *61*, 101583. [CrossRef]
52. Kim, H.; Kim, S.H.; Jang, S.I.; Park, E.C. Association between sleep quality and anxiety in Korean adolescents. *J. Prev. Med. Public Health* **2022**, *55*, 173. [CrossRef]
53. Chen, Y.; Zhu, J. Longitudinal associations between cybervictimization and adolescent sleep problems: The role of anxiety and depressive symptoms. *J. Interpers. Violence* **2023**, *38*, 2806–2827. [CrossRef] [PubMed]

behavioral sciences

MDPI

Article

Motivations for Social Withdrawal, Mental Health, and Well-Being in Emerging Adulthood: A Person-Oriented Approach

Stefania Sette [1,*], Giulia Pecora [1], Fiorenzo Laghi [1] and Robert J. Coplan [2]

[1] Department of Developmental and Social Psychology, Sapienza University of Rome, 00185 Rome, Italy; giulia.pecora@uniroma1.it (G.P.); fiorenzo.laghi@uniroma1.it (F.L.)
[2] Department of Psychology, Carleton University, Ottawa, ON K1S 5B6, Canada; robertcoplan@cunet.carleton.ca
* Correspondence: stefania.sette@uniroma1.it

Abstract: Emerging adults seek solitude because of different underlying motivational and emotional processes. The current short-term longitudinal study aimed to: (1) identify subgroups of socially withdrawn emerging adults characterized by different motivations for solitude (shyness, unsociability, social avoidance) and affect (positive, negative); and (2) compare these subgroups in terms of indices of internalizing difficulties and life-satisfaction. Participants were N = 348 university students (M_{age} = 21.85 years, SD = 3.84) from Italy, who completed online questionnaires at two-time points separated by three months. Results from a latent profile analysis (LPA) suggested three distinct subgroups characterized by different social withdrawal motivations (i.e., shy, unsociable, and socially avoidant), as well as a non-withdrawn subgroup (characterized by low social withdrawal motivations, low negative affect, and high positive affect). Among the results, the socially avoidant subgroup reported the highest levels of social anxiety, whereas the avoidant and shy subgroups reported the highest loneliness and lowest life satisfaction. The unsociable subgroup appeared to be the most well-adjusted subgroup of socially withdrawn emerging adults and reported similar levels of life satisfaction as the non-withdrawn subgroup. Our findings confirmed the heterogeneity of emerging adults' experiences of solitude, with different motivations for social withdrawal appearing to confer a differential risk for maladjustment.

Keywords: social withdrawal motivations; internalizing difficulties; latent profile analysis (LPA); emerging adulthood

Citation: Sette, S.; Pecora, G.; Laghi, F.; Coplan, R.J. Motivations for Social Withdrawal, Mental Health, and Well-Being in Emerging Adulthood: A Person-Oriented Approach. *Behav. Sci.* **2023**, *13*, 977. https://doi.org/10.3390/bs13120977

Academic Editor: Andrew Soundy

Received: 26 July 2023
Revised: 17 November 2023
Accepted: 20 November 2023
Published: 27 November 2023

1. Introduction

Emerging adulthood is a period of life characterized by substantive changes in many developmental domains involving biological, cognitive, and emotional processes [1]. During this critical developmental phase, solitary experiences acquire new meanings and functions for young people. On the one hand, the time emerging adults spend alone can provide valuable opportunities for developing autonomy and establishing a differentiated identity [2–4], which represent fundamental tasks for this specific life phase. Time alone at this age can also represent a healthy coping strategy for facing social pressure and other demanding challenges, getting back in touch with personal interests, and regulating behaviors [5,6]. On the other hand, when emerging adults spend too much time alone—or when solitude becomes a mechanism to avoid social interactions experienced as anxiety-proving or unpleasant—it can also represent a risk factor for the onset of socialization difficulties, internalizing problems, and occupational issues [7,8]. According to Baumeister and Leary's [9] theoretical model (see also [10]), humans are driven by the *need to belong*, which propels them to form and maintain interpersonal relationships, which, in turn, promote positive affect and well-being. However, when belongingness needs are unmet, it can lead to negative affective outcomes, including feelings of anxiety, depression, and/or loneliness.

In this study, we focused our attention on aspects of solitude related to *social withdrawal*, which is defined as the tendency to remove oneself from opportunities for social interactions with familiar and unfamiliar peers [11]. Socially withdrawn individuals tend to avoid social situations and spend more time alone than their more sociable counterparts [12]. However, social withdrawal is a heterogeneous and multidimensional construct, with distinct motivations for seeking solitude associated with different consequences, including increased risk for depression, social anxiety, and feelings of loneliness [13,14].

There is growing recent interest in the links between social withdrawal and indices of well-being among emerging adults [5,15,16]. However, only a few studies have employed a *person-oriented* approach [13,15,17], which focuses on potential differences among groups of individuals (employing statistical techniques such as profile or class analyses [18]). This differs from a *variable-oriented* approach, which describes associations among variables among all group members (using statistical techniques such as correlations or regressions [18]). More specifically, variable-oriented approaches typically assume a homogeneous population, implying that associations between variables are uniform across all individuals. This may obscure significant individual distinctions [18]. Importantly, emerging adulthood is a unique period characterized by significant developmental changes [1]. From this perspective, a person-oriented approach can help disentangle the intricate connections between various variables by uncovering the underlying structure of the data and providing insights into how social withdrawal motivations might differentiate subgroups of emerging adults. Accordingly, we employed a person-oriented approach in order to: (1) identify subgroups of socially withdrawn emerging adults characterized by different motivations for solitude (shyness, unsociability, and social avoidance) and affect (positive and negative); and (2) compare these groups in terms of their association with indices of internalizing problems (i.e., depression, social anxiety, and loneliness) and life satisfaction—both concurrently and three-months later.

1.1. Motivations for Social Withdrawal

Asendorpf's [19] classic theoretical model characterized social withdrawal as a multidimensional construct defined by the interplay between social approach (i.e., the desire to interact with others) and avoidance (i.e., the tendency to refrain from social interactions and avoid others) motivations. Contemporary perspectives now conceptualize social withdrawal using more complex theoretical mechanisms to identify distinct subtypes of social withdrawal characterized by different underlying motivational and affective substrates [20,21]. A similar theoretical framework has been proposed by Elliot et al. [22] (see also [23]), who postulated the presence of approach and avoidance social goals that drive individuals toward positive outcomes of social relationships (e.g., deepening one's relationships or being accepted) or away from negative outcomes of social relationships for fear of receiving negative evaluations from others (e.g., avoiding conflict in one's relationships or rejection). In this model, social avoidance motivations are not considered as the avoidance of social interactions per se but the avoidance of threats in social situations. Overall, avoidance motivations are generally associated with negative affect (e.g., nervousness), whereas approach motivations are related to positive affect (e.g., happiness).

The prevailing conceptual models guiding contemporary research on social withdrawal identify and describe three distinct subtypes of social withdrawal: shyness, unsociability, and social avoidance [11,19,22]. *Shyness* characterizes individuals with ambivalent dispositions to interact with others and seek solitude simultaneously, reflecting an internal conflict between high social approach and avoidance motivations [11]. The term shyness evidences conceptual overlap with other related constructs, such as behavioral inhibition, social reticence, and anxious solitude [24,25]). However, these terms share an underlying theme of wariness in social situations. For the current manuscript, we consider these terms functionally equivalent.

Shy emerging adults often experience high levels of discomfort and anxiety in social situations (particularly among unfamiliar peers), so they may spend much time alone despite a desire to interact with others [13]. As a result, shy individuals may miss out on opportunities to develop social and emotional skills, which can exacerbate clinical social anxiety and adjustment problems [14]. Peer relationships are particularly central during emerging adulthood, since youths spend more time with friends and less time with parents. For instance, emerging adults face unique challenges during the transition to the university environment, such as transferring from senior high school to university and creating new supportive social relationships [8]. Shy emerging adults, who tend to display social anxiety in new contexts, also report more difficulties building new supportive friendships, and their existing relationships are more likely to be characterized by less affection and confidence [26,27]. For instance, Nelson et al. [27] found that U.S. emerging adults attending university with higher levels of shyness reported lower relationship quality with friends, parents, and romantic partners. Similarly, McVarnock and Closson [16] reported that shyness was positively related to test anxiety (i.e., having upset feelings during tests) and negatively associated with intrinsic values (i.e., liking what is being taught in courses) and self-efficacy (i.e., learning the materials for courses) in a sample of Canadian university student emerging adults. However, not all shy individuals are at risk for poorer adjustment. For example, it has been suggested that the positive affect experienced during social situations may yield a more positive type of shyness, allowing these individuals to regulate their arousal and engagement with others [28].

The second subtype of social withdrawal is *unsociability*, which reflects low approach and avoidance motivations to interact with others [11,19]. Unsociability also evidences conceptual overlap with other related constructs, such as affinity for aloneness, preference for solitude, and social disinterest [29]. However, all these terms share a common underlying theme of a non-fearful preference for (enjoyment of) solitude—and we consider them functionally equivalent for this study. Unsociable emerging adults also tend to spend less time in social situations, but unlike their shy counterparts, they do not feel fearful or anxious while interacting with peers. Instead, they spend more time alone because they value and enjoy solitude [11]. It has been widely suggested that unsociability is a comparatively benign form of social withdrawal, as it does not tend to be associated with internalizing difficulties and relationship problems [14,15,30]. For instance, McVarnock and Closson [16] did not find significant associations between unsociability, self-efficacy, and test anxiety in a sample of university students.

The last subtype of social withdrawal is *social avoidance*, characterized by a low approach motivation and high avoidance motivation toward social interactions. This subtype of social withdrawal has been the least studied empirically [11]. Avoidant emerging adults are believed to be not only disinterested in social interactions (in contrast to their shy counterparts), but also prone to actively avoiding opportunities for peer interaction (in contrast to their unsociable counterparts) [11]. Some researchers have proposed that social avoidance might derive from high levels of social anxiety felt during exposure to negative peer experiences, such as rejection or victimization [31]. Others have suggested that this socially withdrawn subtype may represent a highly severe form of shyness [11]. In this regard, socially avoidant individuals would experience such high social anxiety, discomfort, and fear of social judgments that their desire to approach others would progressively decrease until complete extinction. Previous studies have also reported links between social avoidance and social anhedonia (i.e., the lack of pleasure from social interactions [8,32]). For example, Bowker et al. [32] found that although both shyness and social avoidance were related to social anhedonia in a sample of emerging adults in the U.S., the association between social avoidance and social anhedonia was stronger than the link between shyness and social anhedonia.

1.2. Implications of Motivations for Social Withdrawal in Emerging Adulthood

There is now considerable research indicating that different subtypes of social withdrawal are differentially associated with indices of socio-emotional functioning, mental health, and well-being [11]. However, most of this research has been conducted in childhood and adolescent samples—and less is known about the implications of social withdrawal subtypes in emerging adults. Emerging adults face unique challenges, such as entering the university environment and creating new supportive social relationships [8]. Compared to their more sociable counterparts, socially withdrawn emerging adults report more difficulties building new supportive friendships and are at greater risk of developing internalizing difficulties [26,27]. Therefore, examining the implications of distinct forms of social withdrawal in this unique developmental period is particularly relevant.

The implications of shyness have been the most studied. Shyness is a relatively stable temperamental trait throughout development [11]. It is also robustly related to internalizing problems (e.g., negative affect, social anxiety, loneliness) and peer difficulties (e.g., rejection, victimization) from early childhood through emerging adulthood [31,33]. Among emerging adults, shyness has demonstrated associations with depressive symptoms, existential concerns, test anxiety, and lower levels of academic self-efficacy [16,34]. Indeed, Closson et al. [35] found that shy young adults reported the lowest levels of social support, happiness, life satisfaction, and self-worth compared to other groups of withdrawn and non-withdrawn peers.

There has been growing interest in the implications of unsociability [36], which is generally linked to a lower risk of social maladjustment [37,38]. As aforementioned, unsociability represents a non-fearful preference for solitude rather than a negative attitude determined by emotional or social concerns. Coplan et al. [36] discussed the potential of *developmental timing* effects related to unsociability, arguing that the pattern of associations between unsociability and socio-emotional problems increases from early childhood to early adolescence—and then decreases from early adolescence to emerging adulthood. In support of these assertions, unsociability appears to be strongly associated with peer problems in late childhood and adolescence, when expectations for peer interaction are high, along with increased peer pressure and desire for conformity, leading to solitary behaviors being viewed as quite deviant [11]. Conversely, during adolescence, preference for solitude becomes progressively more adaptive [39], as attitudes toward spending time alone become more positive and normative [40]. This positive trend regarding unsociability appears to continue into emerging adulthood [15]. For example, Nelson et al. [41] found that unsociability among emerging adults was not related to problematic media use, depression, or externalizing problems one year later. Similarly, Bowker et al. [32] reported that unsociability among emerging adults was not related to anhedonia or anxiety sensitivity but was positively associated with creativity.

Finally, social avoidance is a subtype of social withdrawal that appears to have the most adverse effects on adjustment [11]. Indeed, as compared to their shy and unsociable counterparts, socially avoidant children and young adolescents reported the most pervasive socio-emotional problems, with the lowest levels of positive affect and the highest levels of negative affect [13]. Results from previous studies also indicate that avoidant adolescents and emerging adults experience a range of socio-emotional difficulties, including poorer quality relationships, and lower self-esteem, as well as higher levels of emotion dysregulation, social anhedonia, and depression [14,32,42]. In a sample of undergraduate students, Nelson et al. [14] found that the socially avoidant group reported higher scores on suicidal ideations and self-harm and lower scores on paternal relationship quality than the shy and unsociable groups. Most recently, Bowker et al. [7] conducted a 10-country cross-cultural study of social withdrawal among university students and reported that social avoidance was positively associated with loneliness in all sites. Examining the motivations underlying adolescents' social withdrawal can provide helpful insights into the processes that lead adolescents and emerging adults to forgo social opportunities and shed light on the possible consequences of socio-emotional adjustment.

1.3. The Present Study

The present study aimed to identify subgroups of emerging adults based on their social withdrawal motivations and positive/negative affect. To accomplish this purpose, we adopted a person-oriented approach and employed latent profile analysis in a longitudinal sample of emerging adults. In particular, we first aimed to delineate different subgroups characterizing emerging adults' tendency to spend time alone based on individual differences in social motivations (i.e., shyness, unsociability, social avoidance) and affect (i.e., positive, negative). Accordingly, university students completed assessments at two time points near the beginning (Time 1) and at the end of a university term (Time 2, 3-months later; for a study aimed to assess students' adjustment using a similar time interval see [43]). At Time 1, we expected socially withdrawn emerging adults to differentiate themselves into three subgroups: shy, unsociable, and socially avoidant [13]. We also speculated to identify a subgroup characterized by lower levels of social withdrawal motivations and higher positive affect, representing more sociable individuals.

We also investigated how the individuated profiles at Time 1 differed in terms of indices of internalizing problems and life satisfaction, both concurrently and at Time 2 (3-months later, to reflect the start and end of classes). It was hypothesized that these social withdrawal subgroups would differ regarding maladaptive developmental outcomes, both contemporaneously and three months later. Specifically, we expected groups characterized by shyness, social avoidance, and negative affect to report higher depression, social anxiety, and feelings of loneliness, as well as lower life satisfaction, compared to those who displayed more unsociability [14,32,35,43].

Finally, it is important to consider gender differences in the meaning and implications of social withdrawal, but to date, the empirical evidence in this regard remains mixed [35,44]. For instance, Closson et al. [35] did not report significant gender differences in socially withdrawn emerging adults' well-being (e.g., social support, happiness, life satisfaction), whereas Nelson et al. [44] found that socially avoidant females reported lower self-image than males in a sample of established adults (aged 30–35 years). Accordingly, gender effects were tested on a more exploratory basis.

Previous studies of motivations for social withdrawal among emerging adults that have adopted a person-oriented approach remain scarce [13,15,17], and none have included a specific measure of social avoidance. In this regard, the present study seeks to fill a gap in the extant literature and expand our knowledge of the implications of social withdrawal among emerging adults across two time-points spanning a university semester.

2. Methods

2.1. Study Design

The study employed a longitudinal design with data collection at two time points (approximately three months apart). For this study, we recruited a convenience sample of university students.

2.2. Setting

After providing informed consent, participating university students completed assessments of motivations for social withdrawal, affect (positive, negative), internalizing problems (i.e., depression, social anxiety, loneliness), and life satisfaction. Measures were completed online via Limesurvey at T1 (March 2017) and T2 (approximately three months apart).

2.3. Participants

Participants were N = 348 university students (90% females; M_{age} = 21.85, SD = 3.84; *Time 1*, T1) enrolled in a psychology course in a large urban center in Italy. Of these, n = 159 students (97% females) participated again approximately three months later, at the end of classes (*Time 2*, T2). A large majority of the sample (96%, n = 333) self-identified as

Caucasian, with a variety of other ethnicities also represented (2.9% Hispanic/Latin, 0.6% Asiatic, 0.3% Arabic, and 0.6% "Other").

2.4. Measurement

Social Withdrawal Motivations. Motivations for social withdrawal were assessed using the *Social Preference Scale—Revised* (SPS—R; [7]). The scale was translated into Italian and then back-translated into English by independent blinded experts. A multiple-group factor analysis alignment identified the items that displayed the best psychometric properties across countries, leading to the final version including 10 items out of 21 of the original form. SPS-R is a self-report questionnaire assessing social withdrawal motivations during adolescence and emerging adulthood. Participants answered each item on a 5-point scale (from 1 = *not at all*, to 5 = *a lot*). The measure is composed of three subscales. In the current study, the shyness subscale included 4 items (e.g., "Feeling nervous to interact with others despite the desire to do so") and showed good reliability at both T1 (α = 0.87) and T2 (α = 0.83). The unsociability subscale included 2 items (e.g., "Preferring to hang out with others than to spend time alone"—reverse-scored) and showed acceptable internal consistency at both T1 (α = 0.76) and T2 (α = 0.66). Finally, the avoidance subscale, including 4 items (e.g., "Choosing to spend time alone due to dislike of others"), was found to be reliable at both T1 (α = 0.84) and T2 (α = 0.82).

Positive and negative affect. Affect was assessed using the *Positive and Negative Affect Schedule* (PANAS; [45]; for use in Italy see [46]), which is commonly used to measure mood and emotions. This scale includes 20 items, with 10 items examining positive affect (e.g., excited, determined) and 10 examining negative affect (e.g., nervous, distressed). Participants rated the extent to which they experienced a specific affect on a 5-point scale (from 1 = *very slightly or not at all*, to 5 = *extremely*). Reliability was good for both scales and time points (positive affect: α_{t1} = 0.81; α_{t2} = 0.85; negative affect: α_{t1} = 0.83; α_{t2} = 0.89).

Loneliness. Loneliness was assessed via the 20-item version of the *UCLA Loneliness Scale* ([47]; for use of the scale in Italy, see [48]). The scale was used to investigate subjective feelings of loneliness and social isolation. For this study, consistent with Bowker et al. [7], we considered 5 items (e.g., "I feel isolated from others"), which were found to be appropriate for cross-cultural comparisons [49]. Participants rated each item on a 4-point scale from 0 ("*I never feel this way*") to 3 ("*I often feel this way*"). Reliability for this measure's short version was good at T1 (α = 0.84) and T2 (α = 0.82).

Social anxiety. Participants completed the *Social Interaction Anxiety Scale* (SIAS; [50]; for use in Italy see [51]), a widely used measure of social anxiety in both clinical and non-clinical populations. The instrument includes 19 items (e.g., "I have difficulty making eye contact with others") on a 5-point scale, from 0 (*not at all characteristic or true of me*) to 4 (*extremely characteristic or true of me*). Reliability was high at T1 (α = 0.94) and T2 (α = 0.93).

Depression. Participants also completed the Italian version of the *Beck Depression Inventory* ([52]; for its use in Italy see [53]), a widely used self-report questionnaire to screen for depressive symptoms in adolescents and adults. It is comprised of 21 items rated on a 4-point scale, indicating progressively greater severity symptoms (e.g., "I have as much energy as ever"; "I have less energy than I used to have"; "I don't have enough energy to do very much"; "I don't have enough energy to do anything", coded as 0, 1, 2, and 3, respectively). The item evaluating suicidal ideation was removed for this study, thus reducing the total number of items to 20. Internal reliability was good at T1 (α = 0.87) and T2 (α = 0.92).

Life Satisfaction. Finally, participants completed the *Satisfaction With Life Scale* (SWLS; [54]; for its use in Italy see [55]) to examine global cognitive judgments of life satisfaction. The scale consists of 5 items (e.g., "In most ways my life is close to my ideal"), which are statements that participants have to rate using a 7-point scale, from 1 (*strongly disagree*) to 7 (*strongly agree*). Reliability for this measure was good at T1 (α = 0.85) and T2 (α = 0.86).

2.5. Statistical Methods

We first computed descriptive statistics and Pearson's correlations among the study variables. Based on our theoretical framework (e.g., [20,21] and for more direct comparisons with previous studies [13]), we conducted a latent profile analysis (LPA) to individuate the number of emerging adulthood subgroups considering positive affect, negative affect, shyness, unsociability, and social avoidance at T1 (N = 348 university students). We estimated models with one- to sixth-class solutions with 20 random sets of starting values in the first stage and 5 optimizations in the last stage (we did not include any other model specifications). To better interpret each class solution, each variable at T1 was first standardized in the LPA. We used multiple fit indices, model parsimony, and theory to choose the best class solution. In terms of model fit indices, for the best class solution, we considered (1) the lower log-likelihood, Akaike information criterion (AIC), the Bayesian information criterion (BIC), and the sample-adjusted BIC, (2) an entropy closer to 1, and (3) a significant Lo–Mendell–Ruben (LMR) and bootstrap likelihood ratio test (BLRT; [56]). Also, for the best class solution, each individuated subgroup had to represent at least 5% of the overall sample ([57]). We estimated models using the maximum likelihood estimator with robust standard errors (MLR). Then, to understand possible differences between the individuated subgroups on variables at T1 included in the LPA and other additional variables, both at the baseline and three-months later (i.e., social withdrawal motivations at T2, internalizing difficulties at T1 and T2, and satisfaction with life at T1 and T2), we conducted a series of analyses of variance (ANOVAs), with Bonferroni post hoc comparisons. At T1, we considered the total sample of participants (N = 348 university students); at T2, we only considered university students who also completed T2 assessments (n = 159). SPSS 27 and MPlus 8.4 [58] were used to run the analyses.

3. Results

3.1. Preliminary Analyses

Descriptive statistics and correlations among the study variables are reported in Tables 1 and 2. Overall, the pattern of correlations among the study variables was in the expected direction. For instance, shyness at T1 was positively related to high social anxiety, depression, and loneliness at T1 and T2. Unsociability at T1 was positively correlated with social anxiety and loneliness at T1 but not at T2. Finally, social avoidance at T1 was positively associated with social anxiety, depression, and loneliness both at T1 and T2. Males reported higher scores on T1 social avoidance and T2 negative affect than females.

Table 1. Descriptive statistics for the study variables.

	Mean	***SD***	**Range**
Time 1 (N = 348)			
Negative affect	2.25	0.70	1.00–4.20
Positive affect	3.31	0.65	1.20–4.80
Shyness	2.02	1.00	1.00–5.00
Unsociability	2.36	0.91	1.00–5.00
Avoidance	1.75	0.72	1.00–4.25
Loneliness	0.88	0.70	0.00–3.00
Social anxiety	1.46	0.74	0.00–3.85
Depression	0.51	0.39	0.00–1.75
Life satisfaction	4.46	1.37	1.40–7.00
Time 2 (N = 159)			
Negative affect	2.12	0.78	1.00–4.60
Positive affect	3.18	0.69	1.20–4.60
Shyness	1.67	0.74	1.00–4.25
Unsociability	2.21	0.86	1.00–4.50
Avoidance	1.61	0.64	1.00–4.25
Loneliness	0.63	0.60	0.00–2.60
Social anxiety	1.30	0.66	0.15–3.15
Depression	0.45	0.43	0.00–2.40
Life satisfaction	4.78	1.28	1.00–7.00

Table 2. Zero-order correlations among study variables.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
Time 1																			
1. Negative affect	–																		
2. Positive affect	−0.23 **	–																	
3. Shyness	0.44 **	−0.32 **	–																
4. Unsociability	0.09	−0.12 *	0.24 **	–															
5. Avoidance	0.28 **	−0.20 **	0.57 **	0.57 **	–														
6. Loneliness	0.47 **	−0.32 **	0.63 **	0.23 **	0.42 **	–													
7. Social anxiety	0.48 **	−0.42 **	0.79 **	0.26 **	0.52 **	0.61 **	–												
8. Depression	0.65 **	−0.34 **	0.40 **	0.10	0.30 **	0.54 **	0.39 **	–											
9. Life satisfaction	−0.41 **	0.47 **	−0.37 **	−0.18 **	−0.29 **	−0.45 **	−0.37 **	−0.54 **	–										
Time 2																			
10. Negative affect	0.61 **	−0.03	0.38 **	0.04	0.32 **	0.40 **	0.42 **	0.48 **	−0.26 **	–									
11. Positive affect	−0.22 **	0.65 **	−0.21 **	0.01	−0.21 **	−0.31 **	−0.35 **	−0.37 **	0.39 **	−0.16 *	–								
12. Shyness	0.35 **	−0.32 **	0.76 **	0.17 *	0.51 **	0.33 **	0.66 **	0.30 **	−0.31 **	0.42 **	−0.26 **	–							
13. Unsociability	0.04	−0.07	0.19 *	0.52 **	0.48 **	0.11	0.22 **	0.05	−0.16 *	0.15	0.01	0.24 **	–						
14. Avoidance	0.19 *	−0.29 **	0.38 **	0.35 **	0.72 **	0.43 **	0.38 **	0.19 *	−0.28 *	0.33 **	−0.21 **	0.55 **	0.41 **	–					
15. Loneliness	0.30 **	−0.23 **	0.39 **	0.09	0.32 **	0.76 **	0.39 **	0.48 **	−0.42 **	0.47 **	−0.29 **	0.46 **	0.17 *	0.45 **	–				
16. Social anxiety	0.43 **	−0.35 **	0.62 **	0.08	0.42 **	0.33 **	0.84 **	0.40 **	−0.20 *	0.51 **	−0.30 **	0.65 **	0.24 **	0.35 **	0.39 **	–			
17. Depression	0.28 **	−0.01	0.20 *	0.05	0.22 **	0.40 **	0.26 **	0.53 **	−0.27 **	0.69 **	−0.24 **	0.25 **	0.17 *	0.25 **	0.54 **	0.39 **	–		
18. Life satisfaction	−0.29 **	0.36 **	−0.31 **	−0.12	−0.38 **	−0.40 **	−0.29 **	−0.46 **	0.66 **	−0.37 **	0.40 **	−0.39 **	−0.14	−0.36 **	−0.49 **	−0.29 **	−0.43 **	–	
19. Gender	0.05	−0.07	−0.03	−0.01	−0.12 *	0.02	0.04	0.04	−0.03	−0.18 *	−0.11	−0.03	−0.12	−0.04	−0.14	0.03	−0.38	0.05	–
20. Age	−0.10	0.19 **	−0.15 **	0.05	−0.05	−0.14 **	−0.15 **	−0.09	0.07	−0.13	0.31 **	−0.08	0.09	0.03	−0.12	−0.16 *	−0.13	0.11	0.01

Note: * $p < 0.05$, ** $p < 0.01$; Gender (0 = *males*, 1 = *females*).

3.2. Latent Profile Analysis (LPA): Social Withdrawal Motivations and Affect at T1

We estimated sixth-class solutions with the total sample at T1 ($N = 348$), as reported in Table 3. Model 4 reported the best model fit for the data compared to all the tested LPA models. The model consisted of four subgroups, which were labeled, in line with the previous literature, shy ($n = 59$, 16.9%), unsociable ($n = 41$, 11.8%), socially avoidant ($n = 23$, 6.6%), and non-withdrawn ($n = 225$, 64.7%). The results for each subgroup are displayed in Figure 1. Overall, the results from a series of ANOVAs, with Bonferroni post hoc comparisons, revealed that the shy subgroup reported higher scores on shyness than their unsociable and non-withdrawn counterparts (but lower than the socially avoidant subgroup), $F(3, 344) = 429.54$, $p < 0.001$, $\eta^2_p = 0.79$. The unsociable subgroup reported higher scores of unsociability than the shy and non-withdrawn subgroups (but no differences emerged between the unsociable and socially avoidant subgroups), $F(3, 344) = 36.41$, $p < 0.001$, $\eta^2_p = 0.24$. The socially avoidant subgroup displayed the highest scores on social avoidance, $F(3, 344) = 259.37$, $p < 0.001$, $\eta^2_p = 0.69$. Finally, the non-withdrawn subgroup reported higher scores of positive affect, $F(3, 344) = 15.51$, $p < 0.001$, $\eta^2_p = 0.12$, and lower scores of negative affect, $F(3, 344) = 23.85$, $p < 0.001$, $\eta^2_p = 0.17$, than the other socially withdrawn subgroups, which did not differ among them.

Table 3. Model fit indices for each LPA solution.

Model	Log-Likelihood	AIC	BIC	SABIC	Entropy	Smallest Class %	LMR *p*-Value	BLRT *p*-Value
1-group	−2466.303	4952.606	4991.128	4959.405	---	---	---	---
2-groups	−2300.923	4633.846	4695.482	4644.724	0.84	27	0.47	<0.001
3-groups	−2258.033	4560.066	4644.814	4575.023	0.85	9.2	0.04	0.04
4-groups	**−2215.169**	**4486.338**	**4594.200**	**4505.375**	**0.88**	**6.6**	**0.05**	**<0.001**
5-groups	−2195.828	4459.655	4590.630	4482.771	0.87	3.4	0.18	0.19
6-groups	−2172.698	4425.396	4579.484	4452.591	0.87	4.6	0.37	<0.001

Note: AIC = Akaike's information criterion; BIC = Bayesian information criterion; SABIC = sample-adjusted BIC; LMR = Lo–Mendell–Ruben; BLRT = bootstrap likelihood ratio test. In bold, we report the best LPA solution.

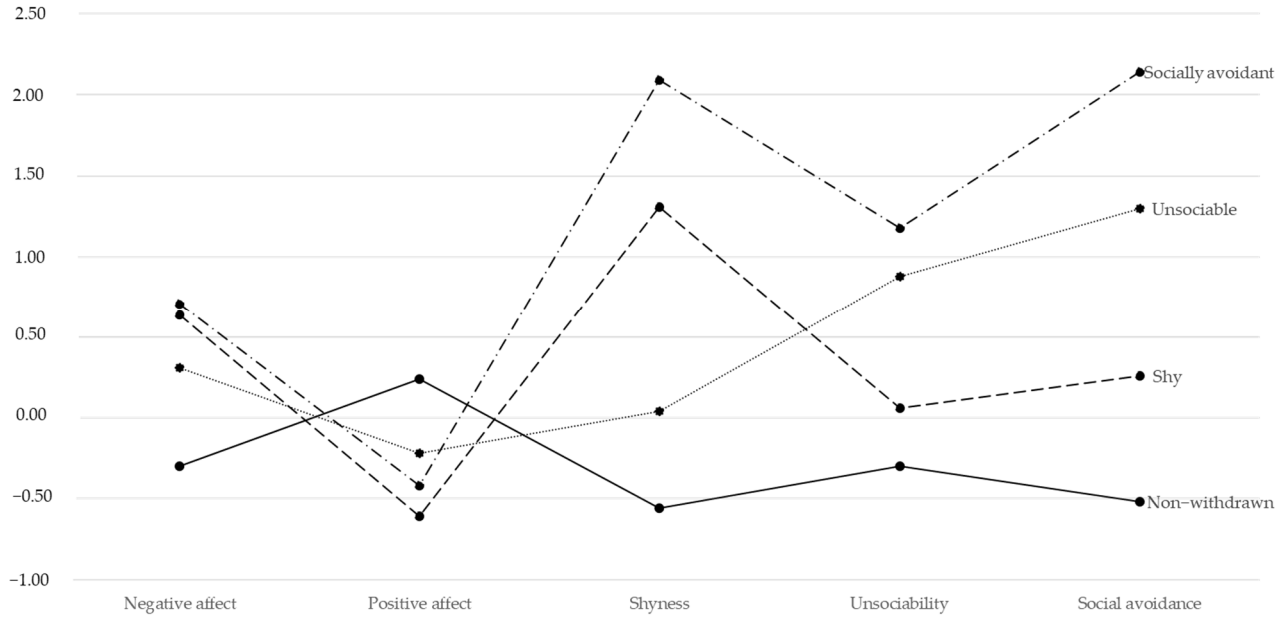

Figure 1. Results of latent profile analysis (LPA) with four class solution. Note: For each variable, we represent the standardized means.

No significant age differences emerged between the latent profile subgroups, $F(3, 344) = 1.56$, $p = 0.20$, $\eta^2_p = 0.01$. However, the results from Fisher's exact test indicated significant gender differences ($p = 0.01$). The results from follow-up tests (standardized residuals) indicated that the unsociable subgroup was composed of a higher number of males than expected ($n = 10$ males, 24%, vs. $n = 31$ females, 76%). No other differences between the observed and the expected frequencies were observed in the shy ($n = 10$ males, 17%, vs. $n = 49$ females, 83%), socially avoidant ($n = 1$ males, 4%, vs. $n = 22$ females, 96%), and sociable ($n = 15$ males, 7%, vs. $n = 210$ females, 93%) subgroups.

3.3. Characteristics of Social Withdrawn Subgroups at T1 and T2

To compare the four individuated latent profile subgroups, we conducted several ANOVAs on the other study variables at T1 ($N = 348$ university students) and T2 (3-months later; $n = 159$ university students who also participated at this time point; Table 4). We report the results without controlling for gender because each subgroup was composed of a small number of males compared to females. However, when this control was included, the results of the ANOVAs were equivalent to those reported in Section 3, except for T1 life satisfaction and T2 depression. For T1 life satisfaction, the results did not reveal differences between the non-withdrawn and the socially avoidant subgroups. For T2 depression, the findings suggested that the shy subgroup reported higher scores than the non-withdrawn subgroup. At T2, the Bonferroni post hoc comparisons did not consider the socially avoidant subgroup since it comprised only a few participants ($n = 3$). The findings revealed that the *shy* subgroup displayed higher social anxiety and loneliness scores at T1 than the unsociable and non-withdrawn subgroups. At T2, the shy subgroup reported higher social anxiety and loneliness scores than the non-withdrawn subgroup (no differences emerged with the unsociable subgroup at T2). The shy subgroup reported higher scores on shyness at T2 than the unsociable and non-withdrawn subgroups and lower scores on positive affect than the non-withdrawn subgroup. The *unsociable* subgroup displayed higher scores on loneliness and social anxiety at T1 than the non-withdrawn subgroup. No significant differences emerged between the unsociable and non-withdrawn subgroups on life satisfaction at T1. At T2, the unsociable subgroup reported higher scores on social anxiety than the non-withdrawn subgroup. The unsociable subgroup reported higher scores on unsociability at T2 than the non-withdrawn subgroup and higher scores on avoidance than the shy and

non-withdrawn subgroups. No differences emerged on loneliness, depression, and life satisfaction at T2 between the unsociable and non-withdrawn subgroups.

Table 4. Characteristics of the four groups from latent profile analysis.

Variable	Shy	Unsociable	Socially Avoidant	Non-Withdrawn	*F*	η^2_p
Time 1						
Loneliness	1.45_{a}	1.06_{b}	1.81_{a}	0.60_{c}	58.03	0.34
Social anxiety	2.18_{b}	1.63_{c}	2.64_{a}	1.12_{d}	103.09	0.47
Depression	0.71_{a}	0.63_{a}	0.86_{a}	0.41_{b}	21.13	0.16
Life satisfaction	3.83_{bc}	4.24_{ba}	3.32_{c}	4.78_{a}	15.71	0.12
Time 2						
Negative affect	2.71_{a}	2.57_{a}	---	1.98_{b}	10.10	0.12
Positive affect	2.74_{b}	3.03_{ba}	---	3.27_{a}	4.84	0.06
Shyness	2.89_{a}	2.30_{b}	---	1.42_{c}	66.84	0.47
Unsociability	2.50_{ab}	2.93_{a}	---	2.07_{b}	8.07	0.09
Avoidance	1.86_{b}	2.57_{a}	---	1.45_{c}	30.86	0.29
Loneliness	1.06_{a}	0.73_{ab}	---	0.55_{b}	6.18	0.07
Social anxiety	2.24_{a}	1.77_{a}	---	1.12_{b}	35.96	0.32
Depression	0.64_{a}	0.57_{a}	---	0.41_{a}	2.70	0.03
Life satisfaction	3.91_{b}	4.49_{ba}	---	4.97_{a}	6.07	0.07

Note: For T1, all the ANOVAs were significant at $p < 0.001$. For T2, all the ANOVAs were significant at $p < 0.001$, except for positive affect ($p = 0.01$), loneliness ($p = 0.01$), depression ($p = 0.07$), and life satisfaction ($p = 0.01$). Degrees of freedom were $df = 3, 344$ at T1 and $df = 2, 153$ at T2 for all variables; η^2_p indicates partial eta-squared; means with different subscripts in the same row differ at $p < 0.05$ (Bonferroni *p*-value for multiple comparisons); socially avoidant subgroup's means at Time 2 are not reported since this subgroup was excluded from comparisons due to small sample size ($n = 3$).

The *socially avoidant* subgroup displayed higher levels of social anxiety at T1 than the shy, unsociable, and non-withdrawn subgroups. The socially avoidant subgroup did not differ from the shy subgroup for loneliness and life satisfaction at T1. However, the socially avoidant subgroup reported higher scores on loneliness and lower scores on life satisfaction at T1 than the unsociable and non-withdrawn subgroups. The *non-withdrawn* subgroup displayed lower levels of depression at T1 than the shy, unsociable, and socially avoidant subgroups, which did not differ among them.

4. Discussion

Investigating emerging adults' motivations for solitude is crucial to understanding the processes underlying social withdrawal and its potential associations with socio-emotional functioning [8,15]. Some previous research has examined how different social withdrawal motivations are associated with indices of internalizing problems and well-being among emerging adults [32,35,42]. However, few studies have taken a person-oriented approach (e.g., [13]). This study identified subgroups of emerging adults based on their social withdrawal motivations (i.e., shyness, unsociability, social avoidance) and affect (i.e., positive, negative). We also investigated whether such subgroups differed in terms of indices of maladjustment (i.e., social anxiety, depression, feelings of loneliness, and life dissatisfaction) concurrently and three-months later (to reflect the start and end of a semester of university). In line with theoretical models and empirical studies of social withdrawal [19,22], our results individuated three socially withdrawn profiles characterized as shy, unsociable, and socially avoidant. A fourth subgroup was comprised of non-withdrawn emerging adults. These findings support prior research individuating different subtypes of social withdrawal (e.g., [13,17]). Moreover, we found that emerging adults with higher levels of social avoidance and shyness reported higher internalizing problems (i.e., social anxiety, loneliness) and dissatisfaction with life compared to their unsociable and non-withdrawn counterparts. Overall, our results indicated that investigating social withdrawal motivations is crucial for understanding how the tendency to spend time alone can play a role in fostering pervasive associations with maladjustment during emerging adulthood.

4.1. Subgroups of Socially Withdrawn Emerging Adults

Results from the latent-profile analysis explored individual differences in our sample by delineating four emerging adult subgroups, differing with regard to social withdrawal motivations and affect. The largest subgroup (which included almost 65% of the sample) described *non-withdrawn* individuals, who were characterized by the lowest levels of shyness, unsociability, and social avoidance, as well as the highest level of positive affect and lowest negative affect, compared to all other subgroups. This result supports prior studies' findings that non-withdrawn individuals are generally characterized by adequate emotional well-being and do not present difficulties in social situations [8,13].

The second largest subgroup (about 17% of the sample) was characterized by higher levels of shyness than the unsociable and non-withdrawn subgroups, as well as lower levels of avoidance and unsociability compared to the other two socially withdrawn subgroups. We labeled this socially withdrawn subgroup as *shy* since it included emerging adults with an internal conflict between the desire to interact with others (i.e., low unsociability and social avoidance) and a fearful approach in social situations (i.e., high shyness and negative affect; [8,11]). In other words, although shy emerging adults might be motivated to approach others and engage socially, their desires are inhibited by social anxiety and socio-evaluative concerns [14].

The third subgroup (about 13% of the sample) was labeled *unsociable*, characterized by comparatively high unsociability, moderate social avoidance, and low shyness (as compared to the other withdrawn subgroups). This group also reported moderate negative and positive affect compared to other subgroups. Finally, the smallest subgroup (about 7% of the sample) was labeled as *socially avoidant*, characterized by the highest levels of social avoidance, shyness, and unsociability, as well as high negative affect and low positive affect. In line with prior research [13,14], this subgroup appeared to be the most impaired compared to all other subgroups, with a strong tendency to avoid social situations, high negative emotionality, and low approach. Notably, the socially avoidant subgroup reported the highest mean levels of shyness, which supports the assumption that social avoidance represents a highly severe form of shyness (e.g., [11]). It has also been suggested that chronic experiences of peer rejection and high levels of fear and anxiety during social situations over time serve to "extinguish" socially avoidant individuals' desire to approach others and exacerbate their avoidance motivations [8].

4.2. Implications of Socially Withdrawn Motivations

4.2.1. Social Anxiety

All subgroups differed significantly regarding social anxiety at T1, with the socially avoidant subgroup reporting the highest means, followed by the shy, unsociable, and non-withdrawn subgroups, respectively. At T2, the socially avoidant subgroup was excluded from comparisons due to the small sample size. However, the results indicated that shy and unsociable emerging adults reported higher social anxiety than the non-withdrawn group. Our findings align with the existing literature, suggesting that individuals who strongly prefer solitude and avoid social interactions are at higher risk of developing clinical social anxiety [44]. The shy subgroup reported significantly lower means than their socially avoidant counterparts at T1. Indeed, although they may experience fear and discomfort in social situations, shy individuals intimately desire to interact with others. This internal motivation to approach others could serve to at least partially reduce the development of the most pervasive effects of social anxiety. Also, in line with previous studies [37,38], unsociability was the most benign form of social withdrawal, with the lowest means of social anxiety compared to the shy and socially avoidant subgroups. This result was likely due to the nature of this socially withdrawn motivation, representing a preference for solitude free of those fearful tendencies and social concerns that generally result in more severe socio-emotional difficulties [12].

4.2.2. Depression

At T1, all three socially withdrawn subgroups reported higher symptoms of depression than the non-withdrawn subgroup but did not differ significantly from one another. These findings were partly in line with expectations. Although we speculated that the shy and avoidant subgroups would report higher levels of depressive symptoms [17], we also expected to find no significant differences between the unsociable and non-withdrawn subgroups. This expectation was based on previous research showing that unsociable adolescents and emerging adults reported lower levels of internalizing problems compared to their shy and avoidant counterparts [32,41]. However, the higher levels of negative affect (i.e., as high as in the shy and socially avoidant subgroups) could help to explain this association with depressive symptoms in the unsociable subgroup.

Emerging adults face different challenges during their university years, such as transferring from senior high school to the university, moving to a new city, or initiating social interactions with novel peers [59]. The critical developmental period of our students may have exacerbated the levels of depression in all socially withdrawn subgroups, including the unsociable subgroup. At T2, no differences emerged among all subgroups, most likely because of the comparatively small sample size and the exclusion of the socially avoidant subgroup from comparisons. However, it should also be noted that, as we will discuss, the unsociable group did not differ from the non-withdrawn comparison group in terms of loneliness or life satisfaction.

4.2.3. Loneliness

The results at T1 revealed that the socially avoidant and shy subgroups both reported higher means of loneliness than the unsociable and non-withdrawn subgroups. This finding was expected since shy and socially avoidant emerging adults experience negative affect and anxiety in social situations, which can enhance their tendency to spend time alone, thus leading to more intense feelings of loneliness (e.g., [31]). The results at T2 support this interpretation since the shy subgroup again showed significantly higher means of loneliness than the non-withdrawn group. In other words, when the desire to approach others is not fully satisfied, shy emerging adults may be dissatisfied with their social network [7]. Of note, the unsociable subgroup did not differ significantly from the non-withdrawn subgroup in terms of loneliness at either T1 or T2. This result further corroborates the hypothesis that a non-fearful proneness for solitude can be considered a relatively benign form of social withdrawal, which becomes more adaptive in this developmental stage [32,40,41].

4.2.4. Life Satisfaction

Similar to the results for loneliness, the shy and socially avoidant subgroups reported lower life satisfaction than the unsociable and non-withdrawn subgroups. These findings were replicated at T2 (except for the socially avoidant subgroup, which was excluded from these analyses). Once again, individuals with the worst consequences at the expense of adjustment and well-being scored higher on negative affect and social anxiety and lower on positive affect. These findings are in line with other studies (e.g., [35]) and suggest that distancing oneself from social opportunities because it feels hard to face such situations has different meanings and more negative implications for adjustment compared to deciding to spend time alone because of a preference and enjoyment for solitary activities [8]. From this perspective, clarity on the motivations behind the choice to withdraw from others can disentangle processes that seem similar but are profoundly different.

4.3. Limitations, Strengths, and Future Directions

The present study focused on social withdrawal during emerging adulthood, with a novel approach that permitted the exploration of the individual differences characterizing social withdrawal motivations and investigating whether and how these differences were related to indices of maladjustment. We also followed up a sub-sample of students three months subsequent to the first data collection, providing short-term longitudinal data

not typical of previous studies of social withdrawal among emerging adults. The focus on emerging adulthood is also relevant, since this represents a critical phase in which solitude and time spent alone not only heighten the risk for negative outcomes, but also offer a context beneficial to individual development (e.g., [15]) and which is remarkably adaptive for the achievement of specific developmental tasks (e.g., identity differentiation, autonomy, occupation obtainment; e.g., [5]). Despite these strengths, our study presents some limitations that should be considered for future research.

First, there was a low participation rate at T2 (three-months after T1), especially for males, which led to the exclusion of the socially avoidant subgroup from analyses and might have weakened the power of our results. We did not assess the reasons for the participant attrition, but it is possible that the high avoidance characterizing this subgroup also affected their participation at T2. Similarly, the low proportion of males in our sample made it difficult to assess potential gender differences among the groups. Because the evidence is mixed on whether socially withdrawn emerging adult males and females differ in terms of indices of maladjustment/adjustment [35,44], it would be of interest for future research to test the moderating role of gender in these associations. It would also be relevant to consider how other individual factors (e.g., socio-economic status, sexual orientation, and ethnicity) intersect and influence experiences of solitude and indices of maladjustment (see [60] for a similar approach). Also, since this study adopted a quantitative approach with an online questionnaire, using qualitative methods (e.g., interviews and focus groups) could provide a deeper understanding of emerging adults' motivations and experiences of solitude [6,61].

The three-month time frame from T1 to T2 was intended to reflect the start and end of a semester of university, but a larger temporal window between time points should be adopted in future studies to better understand the longer-term implications of different developmental trajectories of social withdrawal in emerging adulthood. In addition, future research could explore a wider range of adjustment outcomes across other domains relevant to emerging adults in university (e.g., academic success, romantic relationships, substance use, stress, etc.; e.g., [16]) Furthermore, we believe that the role of protective factors for social withdrawal during this specific developmental phase should be explored in future research, such as positivity, characterizing individuals who have the dispositional tendency to view themselves, their own life, and the future through a positive lens [62]. Future research should also aim to assess positive shyness, to see if such a group might emerge based on emerging adults' ability to display positive emotional expressions and engage with others [28]. Finally, our study only focused on university students from Italy recruited using convenience sampling, which limits the generalizability of the results to other cultural contexts and to the population. Indeed, although there are some similarities in the consequences of social withdrawal motivations across cultures, there are also cultural-specific patterns [7]. Thus, to enhance the applicability of the study findings to other cultural contexts, it is essential to replicate this research across different cultural backgrounds.

5. Conclusions

In conclusion, a person-oriented approach allowed us to identify distinct groups of socially withdrawn emerging adults with different socio-emotional profiles. The results from our study are relevant not only to scholars but also provide helpful indications to practitioners (especially those in university settings), policymakers, parents, and emerging adults themselves for implementing intervention programs to reduce the costs of social withdrawal during the challenging period of university years, especially for the more at-risk subgroups (i.e., shy and socially avoidant). Therefore, intervention programs could increase practitioners', policymakers', and parents' awareness about the different motivations and experiences of solitude and direct their attention to shy and socially avoidant individuals with high social anxiety, loneliness, and life dissatisfaction. Enhanced psychological support programs could be implemented for shy and socially avoidant emerging adults to address issues related to anxiety and depression during a period of

life marked by unique challenges. For instance, specific training programs aiming at enhancing emotional and social skills could benefit shy and socially anxious people [63]. This also could allow practitioners, policymakers, and parents to not over-pathologize all experiences of solitude since some socially withdrawn individuals reported similar levels of life satisfaction as the non-withdrawn subgroup.

Author Contributions: Conceptualization: S.S. and R.J.C.; methodology: S.S. and R.J.C.; formal analysis: S.S. and G.P.; writing—original draft preparation: S.S. and G.P.; writing—review and editing: S.S., G.P., F.L. and R.J.C.; supervision: S.S., R.J.C. and F.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki. Ethical review and approval were waived for this study. The study complied with the Italian Psychologists' Code of Ethics (article number 9): https://www.psy.it/la-professione-psicologica/codice-deontologico-degli-psicologi-italiani/codice-deontologico-vigente/ (accessed on 18 November 2023).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data is unavailable due to privacy.

Acknowledgments: The authors would like to express their thanks to the students who participated in the present study.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Casey, B.J.; Heller, A.S.; Gee, D.G.; Cohen, A.O. Development of the Emotional Brain. *Neurosci. Lett.* **2019**, *693*, 29–34. [CrossRef] [PubMed]
2. Arnett, J.J. Emerging adulthood: A Theory of Development from the Late Teens through the Twenties. *Am. Psychol.* **2000**, *55*, 469–480. [CrossRef] [PubMed]
3. Doumen, S.; Smits, I.; Luyckx, K.; Duriez, B.; Vanhalst, J.; Verschueren, K.; Goossens, L. Identity and Perceived Peer Relationship Quality in Emerging Adulthood: The Mediating Role of Attachment-Related Emotions. *J. Adolesc.* **2012**, *35*, 1417–1425. [CrossRef] [PubMed]
4. Hopmeyer, A.; Terino, B.; Adamczyk, K.; Corbitt Hall, D.; DeCoste, K.; Troop-Gordon, W. The Lonely Collegiate: An Examination of the Reasons for Loneliness among Emerging Adults in College in the Western United States and West-Central Poland. *Emerg. Adulthood* **2022**, *10*, 237–248. [CrossRef]
5. Nguyen, T.-V.T.; Werner, K.M.; Soenens, B. Embracing Me-Time: Motivation for Solitude during the Transition to College. *Motiv. Emot.* **2019**, *43*, 571–591. [CrossRef]
6. Thomas, V. The Psychological Affordances of Solitude in Emerging Adulthood. *Emerg. Adulthood* **2023**, *11*, 611–625. [CrossRef]
7. Bowker, J.C.; Sette, S.; Ooi, L.L.; Bayram-Ozdemir, S.; Braathu, N.; Bølstad, E.; Castillo, K.N.; Dogan, A.; Greco, C.; Kamble, S.; et al. Cross-Cultural Measurement of Social Withdrawal Motivations across 10 Countries Using Multiple-Group Factor Analysis Alignment. *Int. J. Behav. Dev.* **2023**, *47*, 190–198. [CrossRef]
8. Nelson, L.J.; Millet, M.A. Social Withdrawal during Emerging Adulthood. In *The Handbook of Solitude: Psychological Perspectives on Social Isolation, Social Withdrawal, and Being Alone*, 2nd ed.; Coplan, R.J., Bowker, J.C., Nelson, L.J., Eds.; Wiley: New York, NY, USA, 2021; Chapter 11, pp. 146–162. [CrossRef]
9. Baumeister, R.F.; Leary, M.R. The Need to Belong: Desire for Interpersonal Attachments as a Fundamental Human Motivation. *Psychol. Bull.* **1995**, *117*, 497–529. [CrossRef]
10. Cohen, E.; Davis, A.J.; Taylor, J. Interdependence, Bonding and Support Are Associated with Improved Mental Wellbeing Following an Outdoor Team Challenge. *Appl. Psychol. Health Well-Being* **2023**, *15*, 193–216. [CrossRef]
11. Zava, F.; Sette, S.; Baumgartner, E.; Coplan, R.J. Social Withdrawal. In *The Encyclopedia of Child and Adolescent Health*, 1st ed.; Prinstein, M., Ed.; Elsevier: Amsterdam, The Netherlands, 2023; Volume 3, pp. 4–14. [CrossRef]
12. McVarnock, A.M.; Cheng, T.; Polakova, L.; Coplan, R.J. Are You Alone? Measuring Solitude in Childhood, Adolescence, and Emerging Adulthood. *Front. Psychiatry* **2023**, *14*, 1179677. [CrossRef]
13. Barzeva, S.A.; Meeus, W.H.J.; Oldehinkel, A.J. Social Withdrawal in Adolescence and Early Adulthood: Measurement Issues, Normative Development, and Distinct Trajectories. *J. Abnorm. Child Psychol.* **2019**, *47*, 865–879. [CrossRef] [PubMed]
14. Nelson, L.J. Going It Alone: Comparing Subtypes of Withdrawal on Indices of Adjustment and Maladjustment in Emerging Adulthood. *Soc. Dev.* **2013**, *22*, 522–538. [CrossRef]

15. Borg, M.E.; Willoughby, T. A Latent Class Examination of Affinity for Aloneness in Late Adolescence and Emerging Adulthood. *Soc. Dev.* **2022**, *31*, 587–602. [CrossRef]
16. McVarnock, A.M.; Closson, L.M. Motivations for Social Withdrawal and Academic Adjustment in Emerging Adulthood. *Br. J. Dev. Psychol.* **2022**, *40*, 352–367. [CrossRef] [PubMed]
17. Jorgensen, N.A.; Nelson, L.J. Moving Toward and Away from Others: Social Orientations in Emerging Adulthood. *J. Appl. Dev. Psychol.* **2018**, *58*, 66–76. [CrossRef]
18. Laursen, B.M.; Hoff, E. Person-Centered and Variable-Centered Approaches to Longitudinal Data. *Merrill-Palmer Q.* **2006**, *52*, 377–389. [CrossRef]
19. Asendorpf, J.B. Beyond Social Withdrawal: Shyness, Unsociability, and Peer Avoidance. *Hum. Dev.* **1990**, *33*, 250–259. [CrossRef]
20. Coplan, R.J.; Bowker, J.C. Looking beyond Social Motivations: Considering Novel Perspectives on Social Withdrawal in Childhood and Adolescence. *Merrill-Palmer Q.* **2021**, *67*, 390–415. [CrossRef]
21. Bowker, J.C.; Nelson, L.J.; Markovic, A.K.; Luster, S.S. Social Withdrawal during Adolescence and Emerging Adulthood. In *A Handbook of Solitude: Psychological Perspectives on Social Isolation, Social Withdrawal, and Being Alone*; Coplan, R.J., Bowker, J.C., Eds.; Wiley-Blackwell: New York, NY, USA, 2014; Chapter 10, pp. 167–183. [CrossRef]
22. Elliot, A.J.; Gable, S.L.; Mapes, R.R. Approach and Avoidance Motivation in the Social Domain. *Pers. Soc. Psychol. Bull.* **2006**, *32*, 378–391. [CrossRef]
23. Nikitin, J.; Schoch, S. Social Approach and Avoidance Motivations. In *The Handbook of Solitude: Psychological Perspectives on Social Isolation, Social Withdrawal, and Being Alone*, 2nd ed.; Coplan, R.J., Bowker, J.C., Nelson, L.J., Eds.; Wiley: New York, NY, USA, 2021; Chapter 12, pp. 193–208. [CrossRef]
24. Kagan, J. Temperament and the Reactions to Unfamiliarity. *Child Dev.* **1997**, *68*, 139–143. [CrossRef]
25. Gazelle, H.; Rubin, K.H. Social Withdrawal and Anxiety in Childhood and Adolescence: Interaction between Individual Tendencies and Interpersonal Learning Mechanisms in Development. *J. Abnorm. Child Psychol.* **2019**, *47*, 1101–1106. [CrossRef] [PubMed]
26. White, H.I.; Bowker, J.C.; Adams, R.E.; Coplan, R.J. Solitude and Affect during Emerging Adulthood: When, and for Whom, Spending Time Alone Is Related to Positive and Negative Affect during Social Interactions. *Int. J. Behav. Dev.* **2022**, *46*, 490–499. [CrossRef]
27. Nelson, L.J.; Padilla-Walker, L.M.; Badger, S.; Barry, C.M.; Carroll, J.S.; Madsen, S.D. Associations between Shyness and Internalizing Behaviors, Externalizing Behaviors, and Relationships during Emerging Adulthood. *J. Youth Adolesc.* **2008**, *37*, 605–615. [CrossRef]
28. Poole, K.L.; Schmidt, L.A. Adaptive Shyness: A Developmental Perspective. In *Adaptive Shyness: Multiple Perspectives on Behavior and Development, 1st ed*; Schmidt, L.A., Poole, K.L., Eds.; Springer: Cham, Switzerland, 2020; pp. 25–40. [CrossRef]
29. Burger, J.M. Individual Differences in Preference for Solitude. *J. Res. Pers.* **1995**, *29*, 85–108. [CrossRef]
30. Bowker, J.C.; Ooi, L.L.; Coplan, R.J.; Etkin, R.G. When Is It Okay to Be Alone? Gender Differences in Normative Beliefs about Social Withdrawal. *Sex Roles* **2020**, *82*, 482–492. [CrossRef]
31. Morneau-Vaillancourt, G.; Oginni, O.; Assary, E.; Krebs, G.; Thompson, E.J.; Palaiologou, E.; Lockhart, C.; Arseneault, L.; Eley, T.C. A Cross-Lagged Twin Study of Emotional Symptoms, Social Isolation and Peer Victimisation from Early Adolescence to Emerging Adulthood. *J. Child Psychol. Psychiatry* **2023**, *64*, 1569–1582. [CrossRef]
32. Bowker, J.C.; Stotsky, M.T.; Etkin, R.G. How BIS/BAS and Psycho-Behavioral Variables Distinguish between Social Withdrawal Subtypes during Emerging Adulthood. *Pers. Individ. Differ.* **2017**, *119*, 283–288. [CrossRef]
33. Baardstu, S.; Coplan, R.J.; Karevold, E.B.; Laceulle, O.M.; von Soest, T. Longitudinal Pathways from Shyness in Early Childhood to Personality in Adolescence: Do Peers Matter? *J. Res. Adolesc.* **2020**, *30*, 362–379. [CrossRef]
34. Galanaki, E.P.; Nelson, L.J.; Antoniou, F. Social Withdrawal, Solitude, and Existential Concerns in Emerging Adulthood. *Emerg. Adulthood* **2023**, *11*, 1006–1021. [CrossRef]
35. Closson, L.M.; McVarnock, A.M.; Cook, L.E. Is There an Upside to Social Withdrawal? Considering Well-Being among Socially Withdrawn Emerging Adults. *Appl. Res. Qual.* **2022**, *17*, 3131–3149. [CrossRef]
36. Coplan, R.J.; Ooi, L.L.; Baldwin, D. Does It Matter When We Want to Be Alone? Exploring Developmental Timing Effects in the Implications of Unsociability. *New Ideas Psychol.* **2019**, *53*, 47–57. [CrossRef]
37. Nguyen, T.T.; Ryan, R.M.; Deci, E.L. Solitude as an Approach to Affective Self-Regulation. *PSPB* **2018**, *44*, 92–106. [CrossRef] [PubMed]
38. Thomas, V.; Azmitia, M. Motivation Matters: Development and Validation of the Motivation for Solitude Scale—Short Form (MSS-SF). *J. Adolesc.* **2019**, *70*, 33–42. [CrossRef] [PubMed]
39. Wang, J.M.; Rubin, K.H.; Laursen, B.; BoothLaForce, C.; Rose-Krasnor, L. Preference-for-Solitude and Adjustment Difficulties in Early and Late Adolescence. *J. Clin. Child Adolesc. Psychol.* **2013**, *42*, 834–842. [CrossRef]
40. Wood, K.R.; Coplan, R.J.; Hipson, W.E.; Bowker, J.C. Normative Beliefs about Social Withdrawal in Adolescence. *J. Res. Adolesc.* **2021**, *32*, 372–381. [CrossRef]
41. Nelson, L.J.; Coyne, S.M.; Howard, E.; Clifford, B.N. Withdrawing to a Virtual World: Associations between Subtypes of Withdrawal, Media Use, and Maladjustment in Emerging Adults. *Dev. Psychol.* **2016**, *52*, 933–942. [CrossRef]
42. Braathu, N.; Bølstad, E.; Bowker, J.C.; Coplan, R.J. Evaluating Links between Social Withdrawal Motivations and Indices of Psychosocial Adjustment among Norwegian Emerging Adults. *J. Genet. Psychol.* **2022**, *183*, 549–563. [CrossRef]

43. Gillet, N.; Morin, A.J.S.; Huyghebaert-Zouagh, T.; Alibran, E.; Barrault, S.; Vanhove-Meriaux, C. Students' Need Satisfaction Profiles: Similarity and Change over the Course of a University Semester. *Appl. Psychol.* **2019**, *69*, 1396–1437. [CrossRef]
44. Nelson, L.J.; Jorgensen, N.A.; Clifford, B.N. Shy and Still Struggling: Examining the Relations between Subtypes of Social Withdrawal and Well-Being in the 30s. *Soc. Dev.* **2021**, *30*, 575–591. [CrossRef]
45. Watson, D.; Clark, L.A.; Tellegen, A. Development and Validation of Brief Measures of Positive and Negative Affect: The PANAS Scales. *J. Pers. Soc. Psychol.* **1988**, *54*, 1063. [CrossRef]
46. Caprara, G.V.; Di Giunta, L.; Eisenberg, N.; Gerbino, M.; Pastorelli, C.; Tramontano, C. Assessing Regulatory Emotional Self-Efficacy in Three Countries. *Psychol. Assess.* **2008**, *20*, 227–237. [CrossRef]
47. Russell, D.; Peplau, L.A.; Ferguson, M.L. Developing a Measure of Loneliness. *J. Pers. Assess.* **1978**, *42*, 290–294. [CrossRef] [PubMed]
48. Boffo, M.; Mannarini, S.; Munari, C. Exploratory Structure Equation Modeling of the Ucla Loneliness Scale: A Contribution to the Italian Adaptation. *TPM* **2012**, *19*, 345–363. [CrossRef]
49. Hudiyana, J.; Lincoln, T.M.; Hartanto, S.; Shadiqi, M.A.; Milla, M.N.; Muluk, H.; Jaya, E.S. How Universal is a Construct of Loneliness? Measurement Invariance of the UCLA Loneliness Scale in Indonesia, Germany, and the United States. *Assessment* **2021**, *29*, 1795–1805. [CrossRef] [PubMed]
50. Mattick, R.P.; Clarke, J.C. Development and Validation of Measures of Social Phobia Scrutiny Fear and Social Interaction Anxiety. *Behav. Res. Ther.* **1998**, *36*, 455–470. [CrossRef] [PubMed]
51. Sica, C.; Musoni, I.; Rocco Chiri, L.; Bisi, B.; Lolli, V.; Sighinolfi, C. Social Phobia Scale (SPS) e Social Interaction Anxiety Scale (SIAS): Traduzione e Adattamento Italiano. *BPA* **2007**, *252*, 59–71. Available online: https://hdl.handle.net/2158/256030 (accessed on 18 November 2023).
52. Beck, A.T.; Steer, R.A.; Brown, G.K. *Beck Depression Inventory*, 2nd ed.; The Psychological Corporation: San Antonio, TX, USA, 1996.
53. Sica, C.; Ghisi, M. The Italian Versions of the Beck Anxiety Inventory and the Beck Depression Inventory-II: Psychometric Properties and Discriminant Power. In *Leading-Edge Psychological Tests and Testing Research*, 1st ed.; Lange, M.A., Ed.; Nova Science Publishers: Hauppauge, NY, USA, 2007; pp. 27–50. Available online: https://hdl.handle.net/11577/1782674 (accessed on 18 November 2023).
54. Diener, E.; Emmons, R.A.; Larsen, R.J.; Griffin, S. The Satisfaction with Life Scale. *J. Pers. Assess.* **1985**, *49*, 71–75. [CrossRef] [PubMed]
55. Di Fabio, A.; Gori, A. Measuring Adolescent Life Satisfaction: Psychometric Properties of the Satisfaction with Life Scale in a Sample of Italian Adolescents and Young Adults. *J. Psychoeduc. Assess.* **2016**, *34*, 501–506. [CrossRef]
56. Ferguson, S.L.; Moore, E.W.G.; Hull, D.M. Finding Latent Groups in Observed Data: A Primer on Latent Profile Analysis in Mplus for Applied Researchers. *Int. J. Behav. Dev.* **2020**, *44*, 458–468. [CrossRef]
57. Speece, D.L. Cluster Analysis in Perspective. *Exceptionality* **1994**, *5*, 31–44. [CrossRef]
58. Muthén, L.K.; Muthén, B.O. *Mplus User's Guide*, 7th ed.; Muthén & Muthén: Los Angeles, CA, USA, 1998–2012.
59. Zahedi, H.; Sahebihagh, M.H.; Sarbakhsh, P. The Magnitude of Loneliness and Associated Risk Factors among University Students: A Cross-Sectional Study. *Iran. J. Psychiatry* **2022**, *17*, 411–417. [CrossRef] [PubMed]
60. Perez, L.G.; Siconolfi, D.; Troxel, W.M.; Tucker, J.S.; Seelam, R.; Rodriguez, A.; Shih, R.A.; D'Amico, E.J. Loneliness and Multiple Health Domains: Associations among Emerging Adults. *J. Behav. Med.* **2022**, *45*, 260–271. [CrossRef] [PubMed]
61. Kirwan, E.M.; O'Súilleabháin, P.S.; Burns, A.; Ogoro, M.; Allen, E.; Creaven, A.-M. Exploring Loneliness in Emerging Adulthood: A Qualitative Study. *Emerg. Adulthood* **2023**, 1–13. [CrossRef]
62. Caprara, G.V.; Alessandri, G.; Eisenberg, N.; Kupfer, A.; Steca, P.; Caprara, M.G.; Yamaguchi, S.; Fukuzawa, A.; Abela, J. The Positivity Scale. *Psychol. Assess.* **2012**, *24*, 701–712. [CrossRef]
63. Zhao, J.; Tan, M.; Gao, L.; Wang, Y. Shyness and Loneliness: Contributions of Emotional Intelligence and Social Support. *Curr. Psychol.* **2019**, *38*, 556–562. [CrossRef]

behavioral sciences

MDPI

Article

Parental Stress and Chinese American Preschoolers' Adjustment: The Mediating Role of Parenting

Suqing Wang, Charissa S. L. Cheah *, Xiaoli Zong and Huiguang Ren

Department of Psychology, University of Maryland, Baltimore County, Baltimore, MD 21250, USA; swang7@umbc.edu (S.W.); zxiaoli1@umbc.edu (X.Z.); hgren@umbc.edu (H.R.)
* Correspondence: ccheah@umbc.edu; Tel.: +1-410-455-5755; Fax: +1-410-455-1055

Abstract: Family contexts, such as parental stress and parenting practices, play critical roles in preschoolers' adjustment. However, these processes have been understudied in Chinese American families. The present study examined the associations between Chinese American mothers' experiences of two types of stress (i.e., general/contextual stress and parenting stress) and their preschoolers' socio-emotional and behavioral adjustment problems; in addition, the mediating roles of maternal psychologically controlling parenting and maternal warmth in these associations were assessed. Participants included 207 first-generation Chinese American mothers (M_{age} = 37.78 years, SD_{age} = 4.36) and their 3- to 6-year-old children (M_{age} = 4.50 years, SD_{age} = 0.90; 52% boys). Mothers reported on their levels of stress, psychologically controlling parenting, and warmth practices; teachers reported on child adjustment in the school setting. The results revealed that higher levels of general/contextual stress and parenting stress were each uniquely associated with more maternal psychologically controlling parenting practices, which in turn was associated with fewer socio-emotional and behavioral adjustment problems in children. Our findings can inform parenting intervention programs designed to improve Chinese American preschoolers' adjustment.

Keywords: socio-emotional and behavioral adjustment; Chinese American preschoolers; general/contextual stress; parenting stress; psychologically controlling parenting practices; warmth practices

Citation: Wang, S.; Cheah, C.S.L.; Zong, X.; Ren, H. Parental Stress and Chinese American Preschoolers' Adjustment: The Mediating Role of Parenting. *Behav. Sci.* **2023**, *13*, 562. https://doi.org/10.3390/bs13070562

Academic Editors: Xuechen Ding and Wan Ding

Received: 7 June 2023
Revised: 1 July 2023
Accepted: 2 July 2023
Published: 6 July 2023

1. Introduction

Preschool children who are socio-emotionally and behaviorally competent are more likely to develop positive peer and adult relationships [1] and are at lower risks for subsequent adjustment problems [2]. Thus, it is important to understand contributors to the socio-emotional and behavioral adjustment of young children. Children's socio-emotional and behavioral adjustment include their pro-social and anti-social behaviors as well as problematic behaviors within the school setting [3]. This study used teachers' reports on children's socio-emotional and behavioral problems to reflect children's adjustment in the school setting. Asian Americans are the fastest-growing immigrant group in the United States [4,5], with Chinese Americans being the largest subgroup. However, the socio-emotional and behavioral adjustment of Chinese American children remains understudied [6].

Parental stress has been noted as a significant contributor to preschoolers' socio-emotional and behavioral adjustment because preschool children spend most of their time with their parents, which enhances the possibility of parents transmitting their feelings of stress to their children [7]. Also, parenting responsibilities can lead to high levels of stress, particularly during the preschool period [8,9]. Indeed, studies have shown that certain parental stress, such as parenting-specific stress, is associated with more child adjustment problems [10]. However, few studies have systematically examined different types of parental stress and their potentially unique associations with child adjustment difficulties [11]. According to Bornstein's specificity principle [12], the development of

specific characteristics in specific individuals is affected by specific experiences in specific ways. Therefore, it is necessary to consider specific family contexts indexed by different types of parental stress in relation to preschool children's adjustment. Furthermore, much is unknown about the experience of stress among Chinese American mothers, who tend to be primary caretakers in these families, and its impact on their children's socio-emotional and behavioral adjustment.

Another limitation in the literature is that the mechanisms through which parental stress may affect child outcomes remain unclear. According to Belsky's process model of determinants of parenting [13] and Abidin's parenting stress model [14], parental stress can negatively influence parenting practices, which in turn, may result in child adjustment problems [15]. However, this mediating process has not received much empirical attention [16,17], and it remains unclear how different parenting practices may be uniquely related to specific types of parenting stress and subsequent child adjustment [18].

We focused on two core dimensions of parenting practices as potential mediators of the association between parental stress and child socio-emotional and behavioral adjustment: control and warmth. Specifically, we examined maternal psychologically controlling parenting (PCP) and maternal warmth practices. PCP refers to parents' attempts to control children's psychological and emotional development by using guilt induction, shaming, and love withdrawal practices [19]. In general, PCP has been shown to contribute to negative child outcomes in diverse cultural settings, including Chinese and Chinese American families [20,21], but some researchers found no relation between certain types of PCP and child outcomes in both Chinese and European American families [22]. In addition, PCP may have different and more nuanced meanings in Chinese and Chinese American compared to Western families [23,24]. Specifically, parents from cultures that focus on interdependence among family members, such as China, may adopt the subtype of PCP, guilt induction, to guide their children to focus on the parents' feelings and perspectives in order to help children develop empathy and connectedness with others [25].

Maternal warmth pertains to the quality of the affectional bond between mothers and their children as well as the physical and verbal behaviors through which mothers' feelings are expressed [26]. Maternal warmth is associated with positive child adjustment across different cultural contexts [27]. However, the positive effect of warmth on child outcomes may be less robust in families with Asian backgrounds, possibly depending on how warmth is expressed in those families. For example, Chinese American parents tend to show warmth in more indirect ways compared to European American families [28].

In order to address the aforementioned gaps in the literature, the present study examined the relations between two types of parental stress, parenting practices, and child adjustment in Chinese American families.

1.1. General/Contextual Stress Versus Parenting Stress

Parents may experience stress of different nature and origin [29]. General/contextual stress is induced by stressors from a variety of sources in an individual's life including work, marriage, finance, and environmental issues, whereas parenting stress originates from the role of being a parent [30] and the perceived accessibility and availability of resources for parenting relative to the demands of parenting [10,14]. Experiences of general/contextual stress and parenting stress may be different in two important ways. First, Lazarus [31] suggests that stress is not unidimensional but has qualitatively different subtypes including harm, threat, and challenge. While general/contextual stress, such as financial stress, may be more of a threat or harm or both, parenting stress may be more of a specific challenge. Second, researchers have argued that all parents experience parenting stress to some degree, regardless of the characteristics of parents and children, family socioeconomic status, and parents' support networks [10]. However, general/contextual stress may not be experienced by all parents. For example, parents with higher socioeconomic status are less likely to experience financial stress than parents with lower socioeconomic status [32].

Parental general/contextual stress is associated with poorer child development [33–36]. For example, Duran et al. [33] found that increased family financial strain (an indicator of general/contextual stress) was negatively associated with delay of gratification among children from low socioeconomic backgrounds. Parents' daily general stress was also positively associated with child psychosocial difficulties [36].

Parenting stress is also associated with both teacher-rated [8] and parent-rated [9,11,16,17] preschoolers' adjustment problems. For instance, Huth-Bocks and Hughes [16] found that parenting stress was strongly associated with mother-reported child behavior problems in African American mother-child dyads. Similarly, Liu and Wang [9] reported that maternal parenting stress was directly associated with Chinese children's internalizing and externalizing problem behaviors. Kochanova et al. [17] found a longitudinally positive association between parenting stress and child internalizing behaviors.

However, most previous research on parental stress and child adjustment focused on single types of stress (mostly parenting stress), whereas the simultaneous contribution of general/contextual stress and parenting stress has been largely neglected [17,37–40]. To our knowledge, only one study examined both stressors simultaneously and found that parenting stress was positively associated with child behavior problems whereas general/contextual stress was negatively associated with children's theory of mind performance but not behavior problems in European American families [34]. In the present study, we examined general/contextual stress and parenting stress simultaneously and their unique associations with teacher-reported child socio-emotional and behavioral adjustment problems in Chinese American families. Based on the literature, we expected that both mothers' perceived general/contextual stress and parenting stress would be positively associated with children's negative adjustment.

1.2. The Mediating Roles of Parenting Practices

Scholars have suggested that parenting practices may serve as a potential mechanism through which parental stress affects child adjustment [14,15]. Negative parenting practices may result from both general/contextual stress and parenting stress. Specifically, parents' allostatic response systems (i.e., systems that respond to physical, psychosocial, and environmental challenges; [41]) may become overburdened and dysregulated when trying to manage both the stress from normative challenges from various roles, such as the parenting role, and the stress unrelated to particular role challenges, such as economic adversity; in turn, the overburdened allostatic response systems may lead to maladaptive parenting practices [42].

Studies on the mediating role of parenting practices in the link between parental stress and child adjustment have yielded inconsistent findings. Some studies found that parenting practices, such as the use of discipline and display of approval [43] and responsiveness [44], mediated the link between parental stress and child adjustment outcomes including child self-control and behavior problems, whereas others found no mediating effect [8,11,16,33]. Furthermore, these previous studies only assessed either general/contextual stress or parenting stress. In this study, we focused on the potential mediating roles of parenting practices that tap into two core dimensions of parenting: control and warmth. Specifically, we focused on the roles of maternal PCP and maternal warmth practices in the relations between two types of parental stress (i.e., general/contextual stress and parenting stress) and child adjustment problems.

1.2.1. Psychologically Controlling Parenting

PCP has been proposed to negatively affect child development by undermining children's universal basic need for autonomy [21,45]. In general, PCP has been shown to be associated with child maladjustment across diverse cultural contexts, including in Chinese and Chinese American families [21,46,47]. However, researchers have argued for the consideration of specific cultural contexts in understanding the implications of parental control on child outcomes [20,48]. PCP may be less detrimental in societies where such practices fit

the socialization goals of collectivistic familial contexts and, therefore, might be perceived as more normative and less maladaptive [21]. Indeed, there is some evidence supporting the culturally unique meanings and greater normativeness of certain subscales of PCP in Chinese cultures [22,49].

Scharf and Goldner [50] suggested that one predictor of PCP is stress from a variety of sources, including objective sources of stress (e.g., general/contextual stress) and factors within the parent (e.g., parenting stress). These authors suggested two ways through which stress can lead to PCP. First, stressful events can exhaust parental resources and force parents to adopt a quick mode of reaction, which might lead parents to adopt PCP practices in order to save time. Second, parents in stressful and challenging circumstances, such as those with fewer resources, may feel overwhelmed and powerless, resulting in more controlling parenting practices such as PCP. Moreover, parenting stress may result in more controlling parenting compared to general/contextual stress, because experiences of stress derived from the parenting role, for example, being worried about children's adjustment problems, are more directly related to parent-child interactions, which may more strongly motivate parents to engage in controlling parenting practices to solve children's adjustment problems.

Empirical studies have shown that parents with higher general/contextual stress tend to use more controlling parenting practices [51] and that parents with higher parenting stress are more likely to engage in authoritarian and coercive parenting practices [8,52–54], including PCP [9,55]. In turn, PCP has been generally found to be associated with greater internalizing and externalizing problems [9,10,56]. However, it should be noted that some studies found some forms of PCP, such as guilt induction, shaming, reciprocity, and social comparison, to be unrelated to Chinese children's behavior problems [22]. In addition, one dimension of PCP, guilt induction, has been found to be associated with less bullying and aggressive behavior in Chinese American preschoolers [49]. In the current study, due to the inconsistent findings on the association between PCP and child adjustment, we did not propose a directional hypothesis but predicted that both types of parental stress would be indirectly related to child adjustment through maternal PCP, and this association would be stronger for parenting stress than general/contextual stress.

1.2.2. Maternal Warmth

Another major dimension of parenting is warmth, which has been found to be associated with positive child adjustment, including fewer socio-emotional [57,58] and behavioral [27,59,60] adjustment problems. Maternal warmth practices were similarly associated with positive child outcomes across cultural contexts, including in Chinese and Chinese American families [58,61], although Chinese and Chinese American mothers express less direct and explicit forms of warmth towards their children compared to European American mothers [28,61,62].

Maternal warmth can be negatively affected by general/contextual stress [63] and parenting stress [8,11]. For example, household chaos [63], work stress [64], and parenting stress derived from parental distress, child characteristics, and parent–child dysfunctional interaction [8], and daily hassles [11], were negatively associated with maternal warmth, nurturing behaviors, and positivity. Moreover, maternal warmth has been found to mediate the negative associations between parental stress and child adjustment. Specifically, Jeon and Neppl [65] found that maternal positivity mediated the longitudinal association between economic pressure and child social competence from toddlerhood through the preschool years. However, the mediating role of maternal warmth in the relation between parenting stress and child adjustment is less supported. For example, Crnic et al. [11] found that the link between parenting daily hassles and child behavior problems was not mediated by parental positivity.

General/contextual stress may negatively impact maternal warmth more strongly than parenting stress because general/contextual stress represents broader concerns and may exhaust parental resources to a greater extent and negatively influence the emotional climate of warmth [66]. For example, Miao et al. [67] found that Chinese Canadian parents

with higher levels of acculturation stress (a source of general/contextual stress) showed a decrease in positive parenting practices, including warmth, whereas stress from within the parent–child relationship (i.e., parenting stress) was associated with an increase in positive parenting practices. The authors explained the unexpected findings with measurement and operationalization considerations: the stress from within the parent–child relationship was measured by asking parents the intensity of conflict between parents and children, and parents may change their parenting practices into a more supportive way to resolve the conflict. Thus, specific parenting stress (e.g., conflicts between parents and children) may not always contribute to lower warmth. Given these findings, we hypothesized that general/contextual and parenting stress would be indirectly related to poorer child adjustment through less maternal warmth, and this association would be stronger for general/contextual stress than parenting stress.

1.3. The Present Study: Aims and Hypotheses

The present study had two aims (see Figure 1 for the conceptual model). The first aim was to examine Chinese American mothers' perceived general/contextual stress and parenting stress in relation to their children's socio-emotional and behavioral adjustment problems. We expected that general/contextual stress and parenting stress would be uniquely and positively associated with children's socio-emotional and behavioral adjustment problems. The second aim of the current study was to investigate whether parenting practices (i.e., maternal PCP and warmth) would mediate the relations between the two types of parental stress and child adjustment problems. We hypothesized that: (a) mothers' general/contextual stress and parenting stress would be positively associated with their PCP, and in turn, their preschool children's adjustment problems, although we did not propose a directional hypothesis for the association between PCP and children's adjustment problems; (b) the indirect effect of parenting stress on child adjustment problems through maternal PCP would be stronger than that of general/contextual stress; (c) mothers' general/contextual stress and parenting stress would be negatively associated with their parental warmth, which in turn, would be associated with fewer adjustment problems in their children; and (d) the indirect effect of general/contextual stress on child adjustment problems through maternal warmth would be stronger than that of parenting stress.

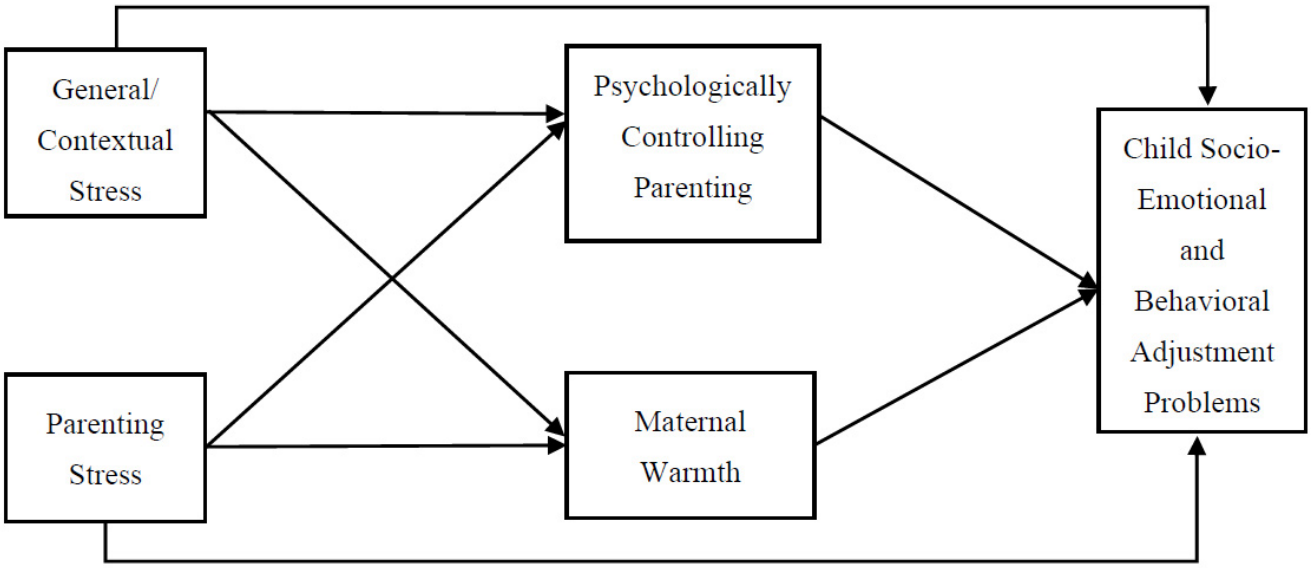

Figure 1. The conceptual mediation model for parental stress, parenting practices, and child adjustment problems. Note: Child age, child gender, maternal age, maternal education level, and maternal behavioral acculturation to the mainstream culture were included as the potential covariates in the model.

The current study utilized cross-sectional data to investigate the links between maternal stress, parenting practices, and child adjustment problems. Despite the limitations of cross-sectional data when testing mediation models [68], the indirect associations proposed in the present study were informed by both theoretical frameworks and empirical evidence. Given the novelty of the data herein, the findings from these cross-sectional data could serve as an initial step in understanding the potential mechanisms linking different types of parental stress and child adjustment outcomes.

Maternal age and education have been found to be related to parenting practices [61,69] and child age and gender and maternal behavioral acculturation to the mainstream culture have been found to be related to parenting practices and child adjustment [70–73]; therefore, these variables were examined as potential covariates in the current study.

2. Method

2.1. Participants

Participants included 207 first-generation Chinese American mothers (M_{age} = 37.78 years, SD_{age} = 4.36) and their 3- to 6-year-old children (M_{age} = 4.50 years, SD_{age} = 0.90, 52% boys) living in the Maryland/Washington D. C. metropolitan area in the United States. Mothers were born in mainland China (82%), Hong Kong (3%), Taiwan (14%), or other countries (1%). Mothers had lived in the United States for an average of 10.57 years (SD = 6.06 years). Most of their children were born in the United States (90%). Most mothers were married (98%) to a partner who also identified as ethnically Chinese, and 94% of mothers had at least a college degree or higher education.

2.2. Procedure

Participants were recruited from preschools, daycare centers, churches, and supermarkets. Mothers' informed consent and children's assent were obtained before data collection. Trained bilingual research assistants collected the data during home visits. Mothers completed the questionnaires about their perceived stress and parenting practices in their preferred language (simplified or traditional Chinese or English). With the parents' permission, the teachers of the participating children were asked to report on the children's socio-emotional and behavioral problems in the school setting. Ethical approval for the study was obtained from the University institutional review board of the University of Maryland, Baltimore County.

2.3. Measures

2.3.1. General/Contextual Stress

The Hassles and Uplifts Scale (HUS) [74] was used to assess mothers' perceived general/contextual stress. This measure consists of 53 items that measure stress appraisals across a variety of contexts (e.g., work, personal life, family, finances). We excluded one item about children to avoid content overlap with the parenting stress variable. Mothers rated each item on how much of a hassle each situation was on a 4-point scale, ranging from 0 (none) to 3 (a great deal). Sample items include, "Fellow workers," "Recreation and entertainment outside the home," "Your parents or parents-in-law," and "Enough money for necessities." The final general/contextual stress score was the sum of the 52 items, with higher scores indicating higher general/contextual stress. The reliability of the HUS in the current study was good (Cronbach's α = 0.95).

2.3.2. Parenting Stress

The Parenting Daily Hassles scale (PDH) [75] was used to assess mothers' perceived parenting stress. The PDH consists of 20 items that measure parental perceptions about minor daily hassles and inconveniences pertaining to parenting (e.g., "Kids are difficult to manage in public places"). Mothers rated each item for how hassled they felt by the event (i.e., intensity) on a 5-point scale, ranging from 1 (no hassle) to 5 (big hassle). The final parenting stress

score was the sum of the 20 items, with higher scores indicating higher parenting stress. The reliability of the PDH in the current study was good (Cronbach's α = 0.91).

2.3.3. Psychologically Controlling Parenting

The Psychological Control and Overprotective/Intrusive Measure (PCOIM) [76] was used to measure maternal PCP. The PCOIM includes 18 items that measure maternal PCP. A sample item for the PCP is, "I ignore my child when he/she tries to get attention." Mothers rated each item on a 5-point scale ranging from 1 (never) to 5 (always). The final score was the sum of the 18 items, with higher scores representing higher levels of maternal PCP. The reliability of the PCP in the current study was good (Cronbach's α = 0.84).

2.3.4. Maternal Warmth

The warmth subscale of the Parenting Styles and Dimensions Questionnaire (PSDQ) [77] was used to measure maternal warmth. This warmth subscale is comprised of seven items. A sample item is, "Gives comfort and understanding when child is upset." Mothers rated each item based on a 5-point scale, ranging from 1 (never) to 5 (always). The final score was the sum of the seven items, with higher scores representing higher levels of maternal warmth. The reliability of the warmth subscale of the PSDQ in the current study was adequate (Cronbach's α = 0.78).

2.3.5. Child Socio-Emotional and Behavioral Adjustment Problems

The Strengths and Difficulties Questionnaire for the teachers (SDQ-T) [78] was used to measure child socio-emotional and behavioral adjustment problems. The SDQ-T includes 20 items that measure the child's problems with peers (e.g., "Rather solitary, prefers to play alone"), emotional symptoms (e.g., "Many worries or often seems worried"), conduct problems (e.g., "Often fights with other children or bullies them"), and hyperactivity/inattention (e.g., "Restless, overactive, cannot stay still for long"). Each of the four subscales has five items. Teachers rated each item on a 3-point scale ranging from 0 (not true) to 2 (certainly true). A total socio-emotional and behavioral adjustment problem score was created by summing all 4 subscales (peer problems, emotional symptoms, conduct problems, and hyperactivity/inattention), with higher scores representing more socio-emotional and behavioral difficulties. The reliability of the SDQ-T in the current study was good (Cronbach's α = 0.81).

2.3.6. Maternal Behavioral Acculturation towards the U.S. Mainstream Culture

In order to control for maternal acculturation level, the Cultural and Social Acculturation Scale (CSAS) [79] was used to measure maternal behavioral acculturation toward the mainstream American culture. The CSAS includes 11 items reflecting individuals' behavioral cultural orientation to the mainstream culture in the domains of social relationships, English language use, and American living styles. A sample item includes, "How often do you read English novels or magazines?" The items were rated on a scale of 1 (almost never) to 5 (almost every day). A sum score of maternal behavioral acculturation toward the mainstream culture was created, with higher scores representing more behavioral acculturation towards the mainstream culture. The reliability in the current study was adequate (Cronbach's α = 0.76).

2.3.7. Data Analysis

First, descriptive statistics of and the zero-order correlations among the study variables were examined using SPSS 27.0. Second, a multiple regression model in which child adjustment problems were regressed on both general/contextual stress and parenting stress was conducted to examine the associations between the two types of stress and child adjustment problems. Third, path analysis was conducted using the "lavaan" package in R studio to examine the mediating roles of maternal PCP and maternal warmth between the two types of parental stress and child socio-emotional and behavioral adjustment problems.

We examined the correlations between potential covariates and the mediators and the outcome variables. The demographic variables significantly correlated with mediators and/or outcomes were included as covariates in the regression and path analyses.

The rate of item-level missing data was smaller than 6%, and the data were missing completely at random based on Little's Missing Completely at Random test: $\chi^2(4793, N = 207) = 4921.47$, $p = 0.096$ [80]. The Mardia's Multivariate Normality (MVN) test [81] revealed that the multivariate normality of the variables of interest was violated. Therefore, we used the robust maximum likelihood (MLR) estimation to correct for the bias and produce more accurate estimates of parameters. The model fit was evaluated by χ^2 statistics, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Statistically non-significant χ^2 value suggests a good model fit. The model fit was deemed acceptable with CFI and TLI values above 0.90, RMSEA below 0.08, and was deemed good with CFI and TLI values above 0.95, RMSEA below 0.05, and SRMR below 0.08 [82,83]. The indirect effects were evaluated using a bootstrapping approach with 95% bias-corrected bootstrapped confidence intervals (CI) based on 1000 bootstrap samples [84].

3. Results

3.1. Preliminary Analyses

Descriptive statistics and correlations are presented in Table 1. The zero-order correlations showed that neither general/contextual stress nor parenting stress was correlated with children's socio-emotional and behavioral adjustment problems. Moreover, general/contextual stress was significantly correlated with higher maternal PCP and lower maternal warmth, whereas parenting stress was only significantly correlated with higher maternal PCP. Finally, neither maternal PCP nor maternal warmth was correlated with children's socio-emotional and behavioral adjustment problems. However, there was a significant and negative partial correlation between maternal PCP and children's adjustment problems ($r = -0.16$, $p = 0.023$), while controlling for the effect of parenting stress. In terms of the potential covariates, child age and gender were each significantly and negatively correlated with child adjustment problems; maternal education was significantly and negatively correlated with parenting stress and child adjustment problems; maternal behavioral acculturation to mainstream culture was significantly and positively correlated with maternal warmth. Maternal age was not correlated with any mediators or the outcome variable and was not included in the subsequent analyses.

Table 1. Descriptive statistics and correlations for all study variables.

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. GCS	28.5	20.4	-									
2. Parenting stress	43.3	12.6	0.51 ***	-								
3. Maternal PCP	39.1	8.6	0.34 ***	0.38 ***	-							
4. Maternal warmth	29.8	3.4	−0.19 **	−0.12	−0.09	-						
5. CSEBAP	6.0	4.7	0.11	0.09	−0.11	−0.08	-					
6. Child age	4.5	0.9	−0.09	−0.05	0.12	−0.05	−0.15 *	-				
7. Child gender [a]	-	-	−0.03	0.07	−0.03	0.01	−0.17 *	−0.11	-			
8. Maternal age	37.8	4.4	−0.05	−0.12	0.07	0.04	0.05	0.32 ***	−0.24 ***	-		
9. Maternal education	-	-	−0.11	−0.19 **	−0.08	0.08	−0.16 *	0.05	−0.00	0.17 *	-	
10. MBAM	33.5	7.0	0.01	0.01	0.07	0.26 ***	−0.12	0.04	−0.10	0.20 **	0.40 ***	-

Note: $N = 207$. GCS = general/contextual stress; PCP = psychologically controlling parenting; CSEBAP = child socio-emotional and behavioral adjustment problems; MBAM = maternal behavioral acculturation to mainstream culture. [a] 1 = boys, 2 = girls. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.2. Association between Parental Stress and Child Adjustment

Child age, child gender, maternal education, and maternal behavioral acculturation to mainstream culture were included as covariates in the multiple regression model. The regression model revealed that neither general/contextual stress ($b = 0.01$, $p = 0.485$) nor parenting stress ($b = 0.02$, $p = 0.531$) was significantly related to children's socio-emotional and behavioral adjustment problems (see Table 2).

Table 2. Regression: associations between parental stress and child adjustment.

Variables (R^2 = 0.30)	*b* (*SE*)	f^2
General/contextual stress	0.01 (0.02)	0.002
Parenting stress	0.02 (0.03)	0.002
Child age	−0.79 * (0.36)	0.02
Child gender	−1.83 ** (0.65)	0.04
Maternal education	−0.69 (0.50)	0.01
Maternal behavioral acculturation to mainstream culture	−0.06 (0.05)	0.01

Note: N = 207. * $p < 0.05$, ** $p < 0.01$.

3.3. The Mediating Roles of Parenting Practices

A path model was conducted to examine the mediating roles of maternal PCP and maternal warmth practices in the relations between two types of parental stress and children's socio-emotional and behavioral adjustment problems (see Figure 2). Child age, child gender, maternal education level, and maternal behavioral acculturation to mainstream culture were treated as covariates. All covariates and exogenous variables were allowed to covary, and the residuals of mediators were allowed to covary. The goodness-of-fit indices indicated a good model fit: $\chi^2(1, N = 207) = 1.00$, $p = 0.606$, CFI = 1.00, TLI = 1.04, SRMR = 0.01, RMSEA = 0.00, 90% CI [0.00, 0.00]. The model explained 20.2% of the variance in maternal PCP, 11.6% of the variance in maternal warmth, and 11.3% of the variance in children's socio-emotional and behavioral adjustment problems.

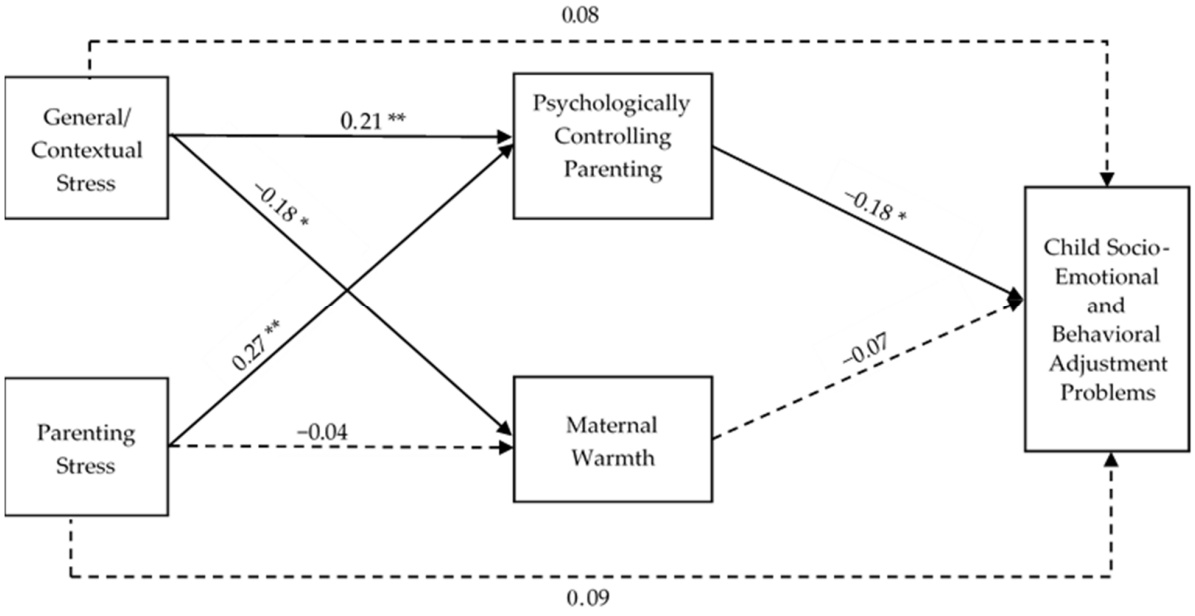

Figure 2. The mediation model for parental stress, parenting practices, and child adjustment problems. Note: Child age, child gender, maternal education level, and maternal behavioral acculturation to mainstream culture were included as covariates in the model. Standardized regression coefficients were indicated. Solid lines represent significant paths and dashed lines represent non-significant paths. * $p < 0.05$, ** $p < 0.01$.

Neither general/contextual stress (b = 0.02, SE = 0.02, p = 0.380, 95% CI [−0.023, 0.060]) nor parenting stress (b = 0.03, SE = 0.03, p = 0.245, 95% CI [–0.023, 0.092]) was directly associated with child adjustment problems. Higher levels of general/contextual stress (b = 0.09, SE = 0.03, p = 0.009, 95% CI [0.022, 0.153]) and parenting stress (b = 0.19, SE = 0.06, p = 0.001, 95% CI [0.079, 0.295]) were each uniquely associated with higher levels of maternal PCP. The difference between the magnitudes of these two associations was not significant. Higher levels of maternal PCP, in turn, were associated with fewer children's

socio-emotional and behavioral adjustment problems ($b = -0.10$, $SE = 0.04$, $p = 0.018$, 95% CI [−0.180, −0.017]). Both general/contextual stress ($ab = -0.01$, $SE = 0.01$, 95% CI [−0.021, −0.001]) and parenting stress ($ab = -0.02$, $SE = 0.01$, 95% CI [−0.043, −0.003]) had a significant and negative indirect effect on children's adjustment problems through maternal PCP.

Maternal warmth was significantly and negatively associated with general/contextual stress ($b = -0.03$, $SE = 0.01$, $p = 0.019$, 95% CI [−0.056, −0.005]) but not parenting stress ($b = -0.01$, $SE = 0.02$, $p = 0.636$, 95% CI [−0.059, 0.036]). However, maternal warmth was not significantly associated with children's socio-emotional and behavioral adjustment problems. Therefore, the indirect effects of general/contextual stress and parenting stress on children's adjustment through maternal warmth practices were not examined.

4. Discussion

Chinese American mothers may experience different types of stress that contribute to their parenting practices and children's socio-emotional and behavioral adjustment in various ways. The current study examined the unique associations between two types of parent-experienced stress (i.e., general/contextual stress and parenting stress) and Chinese American children's adjustment problems as well as the mediating roles of two parenting practices (i.e., maternal PCP and maternal warmth) in these associations.

Contrary to our first hypothesis and previous findings indicating that parental stress is associated with more child adjustment problems [11], our results revealed that neither general/contextual stress nor parenting stress was directly associated with teacher-rated adjustment problems in Chinese American preschool children. The inconsistent findings may be due to the different approaches used to measure children's adjustment problems. For example, Crnic and colleagues [11] used parent-reported child behavioral problems, which may capture child problems in the home setting, while our study used teacher-reported child adjustment problems that reflected child problems in school. Moreover, parents' perceived experiences of stress and their own perceptions of their children's behaviors are more likely to be associated with each other due to shared- or common-method variance [85]. Thus, our use of separate reporters of parental stress and child adjustment is a more robust test of the direct association between these two constructs. Another possible explanation is that Chinese American mothers in our sample did not experience very high levels of stress on average ($M_{\text{general/contextual stress}} = 28.5$, possible range = 0 to 156; $M_{\text{parenting stress}} = 43.3$, possible range = 20 to 100), so the stress experienced by mothers might not be sufficiently salient to be directly associated with child adjustment.

As expected, both general/contextual stress and parenting stress were positively associated with higher levels of maternal PCP, although the magnitudes of the two associations were not significantly different. This finding indicates that both perceptions of general/contextual stress and perceived stress pertaining to the parenting role specifically, such as being overwhelmed by children's behaviors [50], can equally elicit maternal engagement in more controlling practices.

Interestingly, Chinese American children of mothers who reported more PCP showed fewer adjustment problems in the school setting. This finding suggests that the relation between PCP and child adjustment problems might be dependent on the cultural context. In independence-oriented cultures that value individualism, such as in European American families, PCP practices may be perceived as parental rejection and impede positive development in children. In contrast, in interdependence-oriented cultures, such as the Chinese culture, PCP has been found to be perceived as more normative and less maladaptive [22]. Children, especially young children, may be more likely to interpret PCP practices as parental concern for their well-being rather than parental rejection, which may buffer them against the negative effects of PCP [9].

Indeed, our finding is consistent with some previous research in which maternal PCP was found to be less detrimental to preschool-aged children because of the better fit with the interdependent familial socialization goals of first-generation Chinese American

families [49]. Furthermore, young Chinese American children who are exposed to maternal PCP in the family context may learn to be more compliant and be oriented towards fulfilling others' needs in order to receive approval, avoid disappointing others, and maintain social harmony in different contexts, such as the school context. In fact, while some forms of maternal PCP, such as love withdrawal, have been found to be associated with child behavior problems longitudinally, other forms, such as guilt induction, were found to be associated with fewer behavior problems in young children over time [49]. Parents' practices of inducing mild guilt by illustrating the consequences of a child's behaviors to their parents could improve the child's understanding of others' feelings [22]. It shoud be noted that the mean level of maternal engagement in PCP practices in the current study was not high (M_{PCP} = 39.1, possible range = 18 to 90). Thus, mothers may not have enaged in sufficient levels of PCP practices to have a negative impact on their children's adjustment.

Importantly, it needs to be emphasized that although the results showed that Chinese American mothers experiencing higher levels of stress engaged in more PCP, which in turn, contributed to fewer child adjustment problems, these findings do not suggest that stress itself is beneficial to child adjustment. Rather, as discussed above, the specific cultural context and levels at which PCP practices are used, as well as the nature of these PCP practices, need to be considered. In addition, as expected, the indirect effect of parenting stress on child adjustment problems through maternal PCP was larger than that of general/contextual stress. However, although the confidence intervals of the indirect effects of both general/contextual stress and parenting stress did not include zero, the upper limits were close to zero; therefore, future research is needed to replicate the results.

Our hypotheses regarding the two types of parental stress and maternal warmth were partially supported. Specifically, mothers who experienced higher levels of general/contextual stress reported lower levels of warmth; however, mothers' perceived levels of parenting stress were not associated with maternal warmth, indicating the unique contributions of specific types of stress to specific parenting practices [12]. Compared to stress solely caused by the parenting role, general/contextual stress, including financial stress [33], household chaos [63], and work stress [64], may be more likely to be perceived by parents as a threat or harm [31] and drain parental energy to a greater extent [66]. Thus, these parents may be less motivated or resourced to express warmth. Maternal warmth was not associated with child adjustment problems in our sample, which is contrary to prior longitudinal study findings [27,57,60]. This inconsistency may be due to the different research designs used across studies. Specifically, this study used a cross-sectional design that only allowed us to examine the short-term effects of warmth, whereas in previous longitudinal studies, maternal warmth was found to have a long-term effect on children's emotional adjustment [57] and externalizing problems [60]. This inconsistency may also reflect differences in previous studies' examinations of concurrent versus longitudinal associations between maternal warmth and child adjustment. The effect of decreased parental warmth may gradually unfold and negatively influence children's adjustment over time. Moreover, some research found that parental warmth was not related to either Chinese children's externalizing problems or internalizing problems [86].

5. Conclusions

5.1. Limitations and Future Directions

Several limitations of the current study should be noted. First, because of the cross-sectional research design of the current study, no claims about causal or temporal relations between stress predictors, maternal PCP, maternal warmth, and child adjustment problems can be made. In fact, children with adjustment difficulties may evoke more controlling or less warm parenting practices [87,88] and lead to greater experiences of stress for their parents [89,90]. However, the current study serves as a useful initial step for further research because the study followed and met the six conditions of Pieters' guidelines on conducting a meaningful mediation analysis [91]. Specifically, our study had: (a) a solid theoretical basis for the proposed paths' directionality, (b) reliability of measures, (c) controlling significant

confounding variables, (d) mediators and outcomes being conceptually and empirically distinguishable, (e) sufficient statistical power to identify true non-null effects, and (f) statistically significant indirect effects. Future longitudinal research and experimental designs should be employed to examine the temporal and causal associations among these variables as we proposed.

Second, we relied on mothers' self-reports of stress and parenting practices, which may not accurately reflect their actual stress level and parenting practices, and may increase measurement bias and result in shared-method variance [85]. Future studies should consider spousal reports of parental stress and observational assessments of parenting practices. Finally, our sample was comprised of Chinese Americans predominantly from middle-class backgrounds residing in the Maryland/Washington metropolitan area. Thus, generalizations of our results to Chinese American populations with other sociodemographic characteristics and those residing in other parts of the United States should be made cautiously.

5.2. Implications

Previous studies on parent-perceived stress and child outcomes have rarely investigated general/contextual stress and parenting stress simultaneously, but rather focused on one specific type of stress (e.g., parenting stress or financial stress) at a time. The current study contributed to the literature by examining the concurrent and unique roles of both general/contextual stress and parenting stress in child adjustment problems. This study also advanced our knowledge of potential underlying mechanisms between parent-perceived stress and child adjustment by investigating two core dimensions of parenting (i.e., control and warmth) and by bridging these theoretical frameworks [13–15] with the specificity principle [12] in Chinese American families.

General/contextual stress and parenting stress were found to be differentially associated with psychologically controlling and warm parenting practices, which in turn, had unique associations with Chinese American children's socio-emotional and behavioral adjustment problems. This finding supports the specificity principle [12] by demonstrating that parental stress experienced in specific contexts can contribute to children's adjustment through specific parenting practices. We complemented the common assumption that only overall stimulation or a shared experience affects overall development and facilitated our knowledge of the development of specific characteristics in specific individuals. Our findings can also inform the development of more effective and culturally competent parenting intervention programs. Specifically, intervention programs should make more efforts to provide specific coping strategies appropriate to the specific types of stress being experienced by Chinese American parents.

In conclusion, the current study revealed unique associations between specific types of stress experienced by Chinese American mothers and their parenting practices and subsequent socio-emotional and behavioral adjustment problems in their preschool children. These findings provided empirical evidence that parenting practice is a critical proximal process linking maternal stress and child adjustment problems in Chinese American families and set the foundation for future longitudinal research.

Author Contributions: Conceptualization, S.W.; methodology, S.W.; software, S.W.; validation, S.W., C.S.L.C., X.Z. and H.R.; formal analysis, S.W.; investigation, S.W., X.Z. and H.R.; resources, C.S.L.C.; data curation, S.W.; writing—original draft preparation, S.W. and C.S.L.C.; writing—review and editing, C.S.L.C., X.Z. and H.R.; visualization, S.W.; supervision, C.S.L.C.; project administration, S.W., C.S.L.C., X.Z. and H.R.; funding acquisition, C.S.L.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Foundation for Child Development and the National Institute of Child Health and Human Development (1R03HD052827-01) awarded to Charissa S. L. Cheah and the Marjorie Pay Hinckley Endowed Chair seed money grant and the Zina Young Williams Card Professorship at Brigham Young University awarded to Craig H. Hart.

Institutional Review Board Statement: All procedures performed in studies involving human participants were in accordance with the APA ethical institutional standards. This study was approved by the Institutional Review Board of the University of Maryland, Baltimore County (protocol code Y17CC20086 and date of approval 18 September 2021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are available through the authors at reasonable request.

Acknowledgments: We would like to thank the children, mothers, and teachers involved in this study. We would also like to thank our funders for their support.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Mendez, J.L.; McDermott, P.; Fantuzzo, J. Identifying and promoting social competence with African American preschool children: Developmental and contextual considerations. *Psychol. Sch.* **2002**, *39*, 111–123. [CrossRef]
2. Timmermans, M.; Van Lier, P.A.C.; Koot, H.M. Which forms of child/adolescent externalizing behaviors account for late adolescent risky sexual behavior and substance use? *J. Child Psychol. Psychiatry Allied Discip.* **2008**, *49*, 386–394. [CrossRef]
3. Brouzos, A.; Misailidi, P.; Hadjimattheou, A. Associations Between Emotional Intelligence, Socio-Emotional Adjustment, and Academic Achievement in Childhood: The Influence of Age. *Can. J. Sch. Psychol.* **2014**, *29*, 83–99. [CrossRef]
4. Budiman, A. *Key Findings about U.S. Immigrants*; Pew Research Center: Washington, DC, USA, 2020. Available online: https://www.pewresearch.org/fact-tank/2020/08/20/key-findings-about-u-s-immigrants/ (accessed on 12 April 2021).
5. US Census Bureau. Asian/Pacific American Heritage Month: May 2016. 2016. Available online: http://www.census.gov/newsroom/facts-for-features/2016/cb16-ff07.html (accessed on 12 April 2021).
6. Yu, J.; Cheah, C.S.L.; Hart, C.H.; Yang, C. Child inhibitory control and maternal acculturation moderate effects of maternal parenting on Chinese American children's adjustment. *Dev. Psychol.* **2018**, *54*, 1111–1123. [CrossRef] [PubMed]
7. Waters, S.F.; Karnilowicz, H.R.; West, T.V.; Mendes, W.B. Keep it to yourself? Parent emotion suppression influences physiological linkage and interaction behavior. *J. Fam. Psychol.* **2020**, *34*, 784–793. [CrossRef] [PubMed]
8. Anthony, L.G.; Anthony, B.J.; Glanville, D.N.; Naiman, D.Q.; Waanders, C.; Shaffer, S. The relationships between parenting stress, parenting behaviour and preschoolers' social competence and behaviour problems in the classroom. *Infant Child Dev.* **2005**, *14*, 133–154. [CrossRef]
9. Liu, L.; Wang, M. Parenting stress and children's problem behavior in China: The mediating role of parental psychological aggression. *J. Fam. Psychol.* **2015**, *29*, 20–28. [CrossRef]
10. Deater-Deckard, K.; Scarr, S. Parentin? stress among dual-earner mothers and fathers: Are there gender differences? *J. Fam. Psychol.* **1996**, *10*, 45–59. [CrossRef]
11. Crnic, K.A.; Gaze, C.; Hoffman, C. Cumulative parenting stress across the preschool period: Relations to maternal parenting and child behaviour at age 5. In *Infant and Child Development*; John Wiley & Sons: Hoboken, NJ, USA, 2005. [CrossRef]
12. Bornstein, M.H. The specificity principle in acculturation science. *Perspect. Psychol. Sci.* **2017**, *12*, 3–45. [CrossRef]
13. Belsky, J. The determinants of parenting: A process model. *Child Dev.* **1984**, *55*, 83. [CrossRef]
14. Abidin, R.R. The determinants of parenting behavior. *J. Clin. Child Psychol.* **1992**, *21*, 407–412. [CrossRef]
15. Deater-Deckard, K. Parenting stress and child adjustment: Some old hypotheses and new questions. *Clin. Psychol. Sci. Pract.* **1998**, *5*, 314–332. [CrossRef]
16. Huth-Bocks, A.C.; Hughes, H.M. Parenting stress, parenting behavior, and children's adjustment in families experiencing intimate partner violence. *J. Fam. Violence* **2008**, *23*, 243–251. [CrossRef]
17. Kochanova, K.; Pittman, L.D.; McNeela, L. Parenting stress and child externalizing and internalizing problems among low-income families: Exploring transactional associations. *Child Psychiatry Hum. Dev.* **2021**, *53*, 76–88. [CrossRef] [PubMed]
18. Sanner, C.M.; Neece, C.L. Parental distress and child behavior problems: Parenting behaviors as mediators. *J. Child Fam. Stud.* **2018**, *27*, 591–601. [CrossRef]
19. Barber, B.K. Parental psychological control: Revisiting a neglected construct. *Child Dev.* **1996**, *67*, 3296–3319. [CrossRef]
20. Pomerantz, E.M.; Wang, Q. The role of parental control in children's development in Western and East Asian countries. *Curr. Dir. Psychol. Sci.* **2009**, *18*, 285–289. [CrossRef]
21. Wang, Q.; Pomerantz, E.M.; Chen, H. The role of parents' control in early adolescents' psychological functioning: A longitudinal investigation in the United States and China. *Child Dev.* **2007**, *78*, 1592–1610. [CrossRef]
22. Fung, J.; Lau, A.S. Tough love or hostile domination? Psychological control and relational induction in cultural context. *J. Fam. Psychol.* **2012**, *26*, 966–975. [CrossRef]
23. Chao, R.K.; Aque, C. Interpretations of parental control by Asian immigrant and European American youth. *J. Fam. Psychol.* **2009**, *23*, 342–354. [CrossRef]
24. Wu, P.; Robinson, C.C.; Yang, C.; Hart, C.H.; Olsen, S.F.; Porter, C.L.; Jin, S.; Wo, J.; Wu, X. Similarities and differences in mothers' parenting of preschoolers in China and the United States. *Int. J. Behav. Dev.* **2002**, *26*, 481–491. [CrossRef]

25. Yu, J.; Cheah, C.S.L.; Hart, C.H.; Sun, S.; Olsen, J.A. Confirming the multidimensionality of psychologically controlling parenting among Chinese-American mothers: Love withdrawal, guilt induction, and shaming. *Int. J. Behav. Dev.* **2015**, *39*, 285–292. [CrossRef] [PubMed]
26. Rohner, R.P.; Khaleque, A.; Cournoyer, D.E. Parental acceptance-rejection: Theory, methods, cross-cultural evidence, and implications. *Ethos* **2005**, *33*, 299–334. [CrossRef]
27. Khaleque, A. Perceived parental warmth, and children's psychological adjustment, and personality dispositions: A Meta-analysis. *J. Child Fam. Stud.* **2013**, *22*, 297–306. [CrossRef]
28. Cheah, C.S.L.; Li, J.; Zhou, N.; Yamamoto, Y.; Leung, C.Y.Y. Understanding Chinese immigrant and European American Mothers' expressions of warmth. *Dev. Psychol.* **2015**, *51*, 1802–1811. [CrossRef]
29. Pearlin, L.I. The sociological study of stress. *J. Health Soc. Behav.* **1989**, *30*, 241–256. [CrossRef] [PubMed]
30. Teti, D.M.; Nakagawa, M.; Das, R.; Wirth, O. Security of attachment between preschoolers and their mothers: Relations among social interaction, parenting stress, and mother's sorts of the Attachment Q-Set. *Dev. Psychol.* **1991**, *27*, 440–447. [CrossRef]
31. Lazarus, R.S. From psychological stress to the emotions: A history of changing outlooks. *Annu. Rev. Psychol.* **1993**, *44*, 1–21. [CrossRef]
32. Pu, C.; Huang, N.; Chou, Y.-J. Do agreements between adolescent and parent reports on family socioeconomic status vary with household financial stress? *BMC Med. Res. Methodol.* **2011**, *11*, 50. [CrossRef]
33. Duran, C.A.K.; Cottone, E.; Ruzek, E.A.; Mashburn, A.J.; Grissmer, D.W. Family stress processes and children's self-regulation. *Child Dev.* **2020**, *91*, 577–595. [CrossRef]
34. Guajardo, N.R.; Snyder, G.; Petersen, R. Relationships among parenting practices, parental stress, child behaviour, and children's social-cognitive development. *Infant Child Dev.* **2009**, *18*, 37–60. [CrossRef]
35. Robinson, M.; Neece, C.L. Marital satisfaction, parental stress, and child behavior problems among parents of young children with developmental delays. *J. Ment. Health Res. Intellect. Disabil.* **2015**, *8*, 23–46. [CrossRef]
36. Sim, A.; Bowes, L.; Gardner, F. Modeling the effects of war exposure and daily stressors on maternal mental health, parenting, and child psychosocial adjustment: A cross-sectional study with Syrian refugees in Lebanon. *Glob. Ment. Health* **2018**, *5*, e40. [CrossRef] [PubMed]
37. Carapito, E.; Ribeiro, M.T.; Pereira, A.I.; Roberto, M.S. Parenting stress and preschoolers' socio-emotional adjustment: The mediating role of parenting styles in parent–child dyads. *J. Fam. Stud.* **2020**, *26*, 594–610. [CrossRef]
38. Crum, K.I.; Moreland, A.D. Parental stress and children's social and behavioral outcomes: The role of abuse potential over time. *J. Child Fam. Stud.* **2017**, *26*, 3067–3078. [CrossRef]
39. de Maat, D.A.; Jansen, P.W.; Prinzie, P.; Keizer, R.; Franken, I.H.A.; Lucassen, N. Examining longitudinal relations between mothers' and fathers' parenting stress, parenting behaviors, and adolescents' behavior problems. *J. Child Fam. Stud.* **2021**, *30*, 771–783. [CrossRef]
40. Oyarzún-Farías, M.; Cova, F.; Bustos Navarrete, C. Parental stress and satisfaction in parents with pre-school and school age children. *Front. Psychol.* **2021**, *12*, 683117. [CrossRef]
41. McEwen, B.S. Sex, stress and the hippocampus: Allostasis, allostatic load and the aging process. *Neurobiol. Aging* **2002**, *23*, 921–939. [CrossRef]
42. Sturge-Apple, M.L.; Skibo, M.A.; Rogosch, F.A.; Ignjatovic, Z.; Heinzelman, W. The impact of allostatic load on maternal sympathovagal functioning in stressful child contexts: Implications for problematic parenting. *Dev. Psychopathol.* **2011**, *23*, 831–844. [CrossRef]
43. Higgins, G.E.; Kirchner, E.E.; Ricketts, M.L.; Marcum, C.D. Developing self-control: The role of parental stress. *Crim. Justice Stud. A Crit. J. Crime Law Soc.* **2011**, *24*, 183–198. [CrossRef]
44. Ward, K.P.; Lee, S.J. Mothers' and fathers' parenting stress, responsiveness, and child wellbeing among low-income families. *Child. Youth Serv. Rev.* **2020**, *116*. [CrossRef]
45. Ryan, R.M.; Deci, E.L. Overview of self-determination theory: An organismic-dialectical perspective. In *Handbook of Self-Determination Research*; University of Rochester Press: Rochester, NY, USA, 2002.
46. Barber, B.K.; Stolz, H.E.; Olsen, J.A.; Collins, W.A.; Burchinal, M.I. Introduction. *Monogr. Soc. Res. Child Dev.* **2005**, *70*, 1–13. [CrossRef] [PubMed]
47. Soenens, B.; Park, S.Y.; Vansteenkiste, M.; Mouratidis, A. Perceived parental psychological control and adolescent depressive experiences: A cross-cultural study with Belgian and South-Korean adolescents. *J. Adolesc.* **2012**, *35*, 261–272. [CrossRef]
48. Benito-Gomez, M.; Williams, K.N.; McCurdy, A.; Fletcher, A.C. Autonomy-supportive parenting in adolescence: Cultural variability in the contemporary United States. *J. Fam. Theory Rev.* **2020**, *12*, 7–26. [CrossRef]
49. Yu, J.; Cheah, C.S.L.; Hart, C.H.; Yang, C.; Olsen, J.A. Longitudinal effects of maternal love withdrawal and guilt induction on Chinese American preschoolers' bullying aggressive behavior. *Dev. Psychopathol.* **2019**, *31*, 1467–1475. [CrossRef]
50. Scharf, M.; Goldner, L. "If you really love me, you will do/be . . . ": Parental psychological control and its implications for children's adjustment. *Dev. Rev.* **2018**, *49*, 16–30. [CrossRef]
51. Dearing, E. The developmental implications of restrictive and supportive parenting across neighborhoods and ethnicities: Exceptions are the rule. *J. Appl. Dev. Psychol.* **2004**, *25*, 555–575. [CrossRef]
52. Belsky, J.; Wockdworth, S.; Cmic, K. Trouble in the second year: Three questions about family interaction. *Child Dev.* **1996**, *67*, 556–578. [CrossRef]

53. Mak, M.C.K.; Yin, L.; Li, M.; Cheung, R.Y.; Oon, P.-T. The relation between parenting stress and child behavior problems: Negative parenting styles as mediator. *J. Child Fam. Stud.* **2020**, *29*, 2993–3003. [CrossRef]
54. Reitman, D.; Currier, R.O.; Hupp, S.D.A.; Rhode, P.C.; Murphy, M.A.; O'Callaghan, P.M. Psychometric characteristics of the parenting scale in a Head Start population. *J. Clin. Child Adolesc. Psychol.* **2001**, *30*, 514–524. [CrossRef]
55. Cheah, C.S.L.; Yu, J.; Hart, C.H.; Özdemir, S.B.; Sun, S.; Zhou, N.; Olsen, J.A.; Sunohara, M. Parenting hassles mediate predictors of Chinese and Korean immigrants' psychologically controlling parenting. *J. Appl. Dev. Psychol.* **2016**, *47*, 13–22. [CrossRef]
56. Nelson, D.A.; Hart, C.H.; Yang, C.; Olsen, J.A.; Jin, S. Aversive parenting in China: Associations with child physical and relational aggression. *Child Dev.* **2006**, *77*, 554–572. [CrossRef]
57. Chen, X.; Liu, M.; Li, D. Parental warmth, control, and indulgence and their relations to adjustment in Chinese children: A longitudinal study. *J. Fam. Psychol.* **2000**, *14*, 401–419. [CrossRef]
58. Ip, H.M.; Cheung, S.K.; McBride-Chang, C.; Chang, L. Associations of warmth and control of Filipina domestic helpers and mothers to Hong Kong kindergarten children's social competence. *Early Educ. Dev.* **2008**, *19*, 284–301. [CrossRef]
59. Caspi, A.; Moffitt, T.E.; Morgan, J.; Rutter, M.; Taylor, A.; Arseneault, L.; Tully, L.; Jacobs, C.; Kim-Cohen, J.; Polp-Tomas, M. Maternal expressed emotion predicts children's antisocial behavior problems: Using monozygotic-twin differences to identify environmental effects on behavioral development. *Dev. Psychol.* **2004**, *40*, 149–161. [CrossRef]
60. Eisenberg, N.; Zhou, Q.; Spinrad, T.L.; Valiente, C.; Fabes, R.A.; Liew, J. Relations among positive parenting, children's effortful control, and externalizing problems: A three-wave longitudinal study. *Child Dev.* **2005**, *76*, 1055–1071. [CrossRef]
61. Huntsinger, C.S.; Jose, P.E. Relations among parental acceptance and control and children's social adjustment in Chinese American and European American families. *J. Fam. Psychol.* **2009**, *23*, 321–330. [CrossRef]
62. Deater-Deckard, K.; Lansford, J.E.; Malone, P.S.; Alampay, L.P.; Sorbring, E.; Bacchini, D.; Bombi, A.S.; Bornstein, M.H.; Chang, L.; Di Giunta, L.; et al. The association between parental warmth and control in thirteen cultural groups. *J. Fam. Psychol.* **2011**, *25*, 790–794. [CrossRef]
63. Coldwell, J.; Pike, A.; Dunn, J. Household chaos—Links with parenting and child behaviour. *J. Child Psychol. Psychiatry Allied Discip.* **2006**, *47*, 1116–1122. [CrossRef]
64. Hoffman, L.; Youngblade, L. *Mothers at Work: Effects on Children's Well-Being*; Cambridge University Press: Cambridge, UK, 1999. [CrossRef]
65. Jeon, S.; Neppl, T.K. Economic pressure, parent positivity, positive parenting, and child social competence. *J. Child Fam. Stud.* **2019**, *28*, 1402–1412. [CrossRef]
66. Dix, T. The affective organization of parenting: Adaptive and maladaptative processes. *Psychol. Bull.* **1991**, *110*, 3–25. [CrossRef]
67. Miao, S.W.; Costigan, C.L.; MacDonald, S.W.S. Spillover of stress to Chinese Canadian immigrants' parenting: Impact of acculturation and parent–child stressors. *Asian Am. J. Psychol.* **2018**, *9*, 190–199. [CrossRef]
68. Maxwell, S.E.; Cole, D.A.; Mitchell, M.A. Bias in cross-sectional analyses of longitudinal mediation: Partial and complete mediation under an autoregressive model. *Multivar. Behav. Res.* **2011**, *46*, 816–841. [CrossRef]
69. Jose, P.E.; Huntsinger, C.S.; Huntsinger, P.R.; Liaw, F.-R. Parental values and practices relevant to young children's social development in Taiwan and the United States. *J. Cross-Cult. Psychol.* **2000**, *31*, 677–702. [CrossRef]
70. Chao, R.; Tseng, V. Parenting of Asians. In *Handbook of Parenting: Social Conditions and Applied Parenting*, 2nd ed.; Bornstein, M.H., Ed.; Erlbaum: Mahwah, NJ, USA, 2022; pp. 59–93.
71. Ho, D.Y.F. Continuity and variation in Chinese patterns of socialization. *J. Marriage Fam.* **1989**, *51*, 149–163. [CrossRef]
72. Kim, S.Y.; Wong, V.Y. Assessing Asian and Asian American parenting: A review of the literature. In *Asian American Mental Health: Assessment Theories and Methods*; Krasaki, K.S., Okazaki, S., Sue, S., Eds.; Kluwer Academic/Plenum Publishers: Amsterdam, The Netherlands, 2002; pp. 185–201. [CrossRef]
73. Kim, S.Y.; Shen, Y.; Huang, X.; Wang, Y.; Orozco-Lapray, D. Chinese American parents' acculturation and enculturation, bicultural management difficulty, depressive symptoms, and parenting. *Asian Am. J. Psychol.* **2014**, *5*, 298–306. [CrossRef]
74. DeLongis, A.; Folkman, S.; Lazarus, R.S. The impact of daily stress on health and mood: Psychological and social resources as mediators. *J. Personal. Soc. Psychol.* **1988**, *54*, 486–495. [CrossRef]
75. Crnic, K.A.; Greenberg, M.T. Minor parenting stresses with young children. *Child Dev.* **1990**, *61*, 1628–1637. [CrossRef]
76. Olsen, S.F.; Yang, C.; Hart, C.H.; Robinson, C.C.; Wu, P.; Nelson, D.A.; Nelson, L.J.; Jin, S.; Wo, J. Maternal psychological control and preschool children's behavioral outcomes in China, Russia, and the United States. In *Intrusive Parenting: How Psychological Control Affects Children and Adolescents*; American Psychological Association: Washington, DC, USA, 2002; pp. 235–262. [CrossRef]
77. Robinson, C.C.; Mandleco, B.; Olsen, S.F.; Hart, C.H. The parenting styles and dimension questionnaire (PSDQ). In *Handbook of Family Measurement Techniques*; Perlmutter, B.F., Touliatos, J., Holden, G.W., Eds.; Instruments index; Sage: Thousand Oaks, CA, USA, 2001; Volume 3, pp. 319–321.
78. Goodman, R. The strengths and difficulties questionnaire: A research note. *J. Child Psychol. Psychiatry* **1997**, *38*, 581–586. [CrossRef]
79. Chen, X.; Lee, B. *The Cultural and Social Acculturation Scale (Child and Adult Version)*; Department of Psychology, University of Western Ontario: London, ON, Canada, 1996.
80. Little, R.J.A. A test of missing completely at random for multivariate data with missing values. *J. Am. Stat. Assoc.* **1988**, *83*, 1198–1202. [CrossRef]
81. Mardia, K.V. Measures of multivariate skewness and kurtosis with applications. *Biometrika* **1970**, *57*, 519–530. [CrossRef]
82. Bollen, K.A. *Structural Equations with Latent Variables*; Wiley: New York, NY, USA, 1989. [CrossRef]

83. Hu, L.; Bentler, P.M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Model.* **1999**, *6*, 1–55. [CrossRef]
84. Preacher, K.J.; Hayes, A.F. Contemporary approaches to assessing mediation in communication research. In *The Sage Sourcebook of Advanced Data Analysis Methods for Communication Research*; Hayes, A.F., Slater, M.D., Snyder, L.B., Eds.; Sage Publications, Inc.: Thousand Oaks, CA, USA, 2008; pp. 13–54. [CrossRef]
85. Lindell, M.K.; Whitney, D.J. Accounting for common method variance in cross-sectional research designs. *J. Appl. Psychol.* **2001**, *86*, 114–121. [CrossRef]
86. Chen, J.J.-L.; Liu, X. The mediating role of perceived parental warmth and parental punishment in the psychological well-being of children in rural China. *Soc. Indic. Res.* **2012**, *107*, 483–508. [CrossRef]
87. Siqueland, L.; Kendall, P.C.; Steinberg, L. Anxiety in children: Perceived family environments and observed family interaction. *J. Clin. Child Psychol.* **1996**, *25*, 225–237. [CrossRef]
88. Tripp, G.; Schaughency, E.A.; Langlands, R.; Mouat, K. Family interactions in children with and without ADHD. *J. Child Fam. Stud.* **2007**, *16*, 385–400. [CrossRef]
89. Baker, B.L.; Blacher, J.; Olsson, M.B. Preschool children with and without developmental delay: Behaviour problems, parents' optimism and well-being. *J. Intellect. Disabil. Res.* **2003**, *49*, 575–590. [CrossRef]
90. Weiss, J.A.; Sullivan, A.; Diamond, T. Parent Stress and Adaptive Functioning of Individuals with Developmental Disabilities. 2003. Available online: https://yorkspace.library.yorku.ca/xmlui/handle/10315/33100 (accessed on 12 April 2021).
91. Pieters, R. Meaningful mediation analysis: Plausible causal inference and informative communication. *J. Consum. Res.* **2017**, *44*, 692–716. [CrossRef]

behavioral sciences

MDPI

Article

Children's Shyness, Frontal Brain Activity, and Anxiety in the Perioperative Context

Cheryl H. T. Chow [1,*], Kristie L. Poole [1], Richard Y. Xu [1,2], Jhanahan Sriranjan [1,2], Ryan J. Van Lieshout [3], Norman Buckley [4], Graeme Moffat [5] and Louis A. Schmidt [1]

[1] Department of Psychology, Neuroscience & Behaviour, McMaster University, Hamilton, ON L8S 4L8, Canada; poolekristie@gmail.com (K.L.P.); richard.xu@medportal.ca (R.Y.X.); jhanahan.sriranjan@medportal.ca (J.S.); schmidtl@mcmaster.ca (L.A.S.)
[2] Michael G. DeGroote School of Medicine, McMaster University, Hamilton, ON L8S 4L8, Canada
[3] Department of Psychiatry & Behavioural Neurosciences, McMaster University, Hamilton, ON L8S 4L8, Canada; vanlierj@mcmaster.ca
[4] Department of Anesthesia, McMaster University, Hamilton, ON L8S 4L8, Canada; buckleyn@mcmaster.ca
[5] InteraXon Inc., Toronto, ON M5V 3B1, Canada; graeme.moffat@gmail.com
* Correspondence: chowcht@mcmaster.ca

Abstract: Although preoperative anxiety affects up to 75% of children undergoing surgery each year and is associated with many adverse outcomes, we know relatively little about individual differences in how children respond to impending surgery. We examined whether patterns of anterior brain electrical activity (i.e., a neural correlate of anxious arousal) moderated the relation between children's shyness and preoperative anxiety on the day of surgery in 70 children (36 girls, M_{age} = 10.4 years, SD_{age} = 1.7, years, range 8 to 13 years) undergoing elective surgery. Shyness was assessed using self-report approximately 1 week prior to surgery during a preoperative visit (Time 1), preoperative anxiety was assessed using self-report, and regional EEG (left and right frontal and temporal sites) was assessed using a dry sensory EEG headband on the day of surgery (Time 2). We found that overall frontal EEG alpha power moderated the relation between shyness and self-reported preoperative anxiety. Shyness was related to higher levels of self-reported anxiety on the day of surgery for children with lower average overall frontal alpha EEG power (i.e., higher cortical activity) but not for children with higher average overall frontal alpha EEG power (i.e., lower cortical activity). These results suggest that the pattern of frontal brain activity might amplify some shy children's affective responses to impending surgery. Findings also extend prior results linking children's shyness, frontal brain activity, and anxiety observed in the laboratory to a real-world, ecologically salient environment.

Keywords: preoperative anxiety; child; shyness; electroencephalography; temperament; surgery

Citation: Chow, C.H.T.; Poole, K.L.; Xu, R.Y.; Sriranjan, J.; Van Lieshout, R.J.; Buckley, N.; Moffat, G.; Schmidt, L.A. Children's Shyness, Frontal Brain Activity, and Anxiety in the Perioperative Context. *Behav. Sci.* **2023**, *13*, 766. https://doi.org/10.3390/bs13090766

Academic Editors: Xuechen Ding and Wan Ding

Received: 2 August 2023
Revised: 7 September 2023
Accepted: 12 September 2023
Published: 14 September 2023

1. Introduction

One of the most common stressful experiences a child can encounter is the anticipation of surgery. Preoperative anxiety affects up to 75% of the 6 million children who undergo surgery in North America each year [1]. It is associated with adverse clinical (e.g., increased pain and recovery time), psychological (e.g., separation anxiety), and behavioural outcomes (e.g., aggression towards authority figures) [2] that can have significant short- and long-term implications for health and functioning. Children with preoperative anxiety are at increased risk for nightmares, feeding and sleeping problems, and enuresis [3,4]. Given the negative impact preoperative anxiety can have on children and families, researchers have begun to focus their attention on understanding the etiology of this phenomenon as a means of identifying targets for intervention. The ultimate goal of this work is to minimize the prevalence of preoperative anxiety, its severity, and its adverse effects.

1.1. Children's Temperament and Preoperative Anxiety

Relatively few studies have examined whether individual differences in children's temperament might help to predict preoperative anxiety. Kain and colleagues [5] showed that poor social adaptability and an inhibited, shy temperament were independent predictors of increased preoperative anxiety. In another study, children who scored low on sociability (i.e., who were shy) also exhibited increased levels of perioperative anxiety from immediately before the surgery to 2 weeks postoperatively [6]. A previous pilot study also showed that, paradoxically, temperamental shyness was inversely related to preoperative anxiety for school-aged children undergoing elective surgery [7]. This discrepancy may have been due in part to methodological differences between studies, such as small sample sizes and method variance. A recent systematic review and meta-analysis conducted by Chow et al. [8] showed that certain temperament styles, such as emotionality, intensity of reaction, and withdrawal, were associated with increased preoperative anxiety, whereas activity level was associated with reduced anxiety. However, relatively little is known about whether individual differences in shyness are consistently associated with perioperative anxiety.

1.2. Children's Shyness and Anxiety

Outside of the surgical setting, individual differences in temperament have been shown to serve as vulnerability factors for the later development of anxiety (see [9] for a review). For example, temperamental shyness (i.e., a preoccupation with the self in response to real or imagined social interactions) has been consistently linked to an increased risk for anxiety and depression in typically developing children [10]. In general, children who are rated as temperamentally shy have a wide range of social and emotional problems (e.g., emotion dysregulation, poor peer relations, and social rejection) [11]. Moreover, temperamental shyness and anxiety-related symptoms are linked across development and have been noted in children (see [12–14] for reviews). However, not all shy children are the same in their display of anxiety, raising the possibility of moderating factors. One potential moderator factor that might help us understand the relation between shyness and anxiety is individual differences in anterior brain activity.

1.3. Overall Frontal Brain Activity and Emotional Experience

Several investigators [15–17] have argued that the pattern of overall frontal EEG alpha power may track and reflect the intensity of affective experience. Given the inverse relation between EEG alpha power and cortical activity, relatively lower EEG alpha power reflects relatively higher cortical activity [18]. Thus, relatively lower EEG alpha power has been inferred to reflect greater emotional arousal or intensity in studies of emotion.

For example, Dawson and her colleagues [19] reported that infants exhibited a decrease in overall frontal EEG power (i.e., ostensibly more emotional arousal) during maternal separation, and this was paralleled by more behavioural signs of distress. Still, another study conducted on adults found that overall frontal EEG alpha power characterized emotional experiences in people who were shy [20]. Those who were shy exhibited relatively lower overall frontal alpha power (i.e., more cortical activity) in anticipation of a social encounter compared with less shy adults. This raises the possibility that overall frontal EEG alpha power might reflect an endophenotype linking shyness and emotional experience.

Moreover, contrasting EEG patterns of alpha activity have been shown to distinguish two types of anxiety (i.e., anxious arousal and apprehension) in adults, with anxious arousal exhibiting more right than left activity and anxious apprehension showing more bilateral activity [21–23]. Several studies have reported an increase in bilateral hemispheric activity reflecting anxious apprehension [22,23] or the co-occurrence of both anxious arousal and anxious apprehension [24] during intense emotional experiences. In particular, extremely anxious apprehension could make an individual more vulnerable to experiencing anxious arousal simultaneously when confronted with stressful events [23].

The anticipation of an impending surgery is a powerful stressor that can elicit negative emotions (i.e., crying, sadness, fear) and anxiety for children undergoing surgery. One recent pilot study conducted by our group has demonstrated that higher frontal brain activity during preoperative visits was correlated with higher self-reported state anxiety on the day of surgery [25]. Given that previous research has established associations between shyness and anxiety outside of a surgical context and that overall frontal activity is related to emotional experience, it is possible that the pattern of overall frontal brain activity in response to stress (i.e., surgery) may track emotional experience and moderate the relation between individual differences in temperament and anxiety.

To our knowledge, only one study has examined the neural correlates of temperament and anxiety in children in an ecologically salient environment such as the surgical setting [26]. The preoperative setting and time to surgery provide a novel, real-world environment to study fear-related behaviours.

1.4. The Present Study

In this study, we collected study measures on two separate occasions. During a preoperative visit, which occurred 7 to 10 days prior to surgery (Time 1; T1), children self-reported their level of shyness. On the day of the surgery visit (Time 2; T2), we collected 40 min of continuous EEG from the child using the Muse headband, and children also self-reported their level of preoperative anxiety.

The goal of the present study was to examine whether average overall frontal EEG alpha power at T2 moderated the relation between children's self-reported shyness at T1 and self-reported state anxiety at T2. Based on previously published work [25,26], we predicted the average overall frontal brain activity would moderate the relation between shyness and preoperative anxiety, such that shyness would be related to higher levels of self-reported anxiety on the day of surgery for children with lower average overall frontal alpha EEG power (i.e., higher cortical activity; a marker of anxious arousal), but not for children with higher average overall frontal alpha EEG power (i.e., lower cortical activity). We also examined whether average overall temporal EEG alpha power also moderated the relation between shyness and preoperative anxiety to test the hypothesis that the effects were specific to the frontal region.

2. Method

2.1. Participants

Table 1 shows the demographic characteristics of the children and their parents in this study. Seventy children (ages 8 to 13 years) who were scheduled to receive elective outpatient surgery (e.g., tonsillectomy and adenoidectomy) and their parents were included in this study. Children and families in this study were recruited as part of a larger study examining the management of children's preoperative anxiety. Recruitment took place during the child's preoperative clinic visit 7–10 days before surgery at McMaster University Medical Centre's affiliated Children's Hospital located in Hamilton, Ontario. Children diagnosed with significant neurodevelopmental disorders (e.g., organic brain disorders (i.e., brain injury), neurosensory impairment (i.e., visual and/or hearing impairments), etc.) and families who were unable to provide assent and consent, or who could not understand or speak English, were not eligible to participate.

2.2. Procedure

Eligible children were approached during their preoperative visit (T1) at the McMaster Children's Hospital and were invited to participate in the study. During this visit, children and families met with a child life specialist (someone who provides emotional support to help prepare children and families for their surgery), a pediatric nurse, and an anesthetist as part of standard care at the hospital. After obtaining parental consent and child assent, demographic information and a measure of the child's temperament were collected.

On the day of surgery (T2), children and families were met by a research assistant in the surgical waiting area. Children and families were prepared for the surgery by a pediatric nurse, and then children and their parent(s) were moved to a holding area outside of the operating room (OR), where EEG data were collected, and self-reported child anxiety was measured. A $25 gift card was given to all participating families as a token of appreciation for their participation in the study. All procedures were approved by the Hamilton Integrated Research Ethics Board (HiREB).

Table 1. Demographic characteristics of children and families in the study.

Sample	Characteristics	
		$n = 70$
Children		
	Sex, *n* (Boys/Girls)	34/36
	Age, $M \pm SD$	10.4 ± 1.7
	Child life specialist preparation, *n* (Yes/No/unknown)	58/4/8
	Previous hospitalization, *n* (Yes/No)	32/38
Parents		
	Mother/Father/Other *, *n* (Mother/Father/Other)	56/10/4
	Age (in years), $M \pm SD$	41.0 ± 5.8

M = Mean; *SD* = Standard Deviation. * = Grandparent/Stepparent.

2.3. Temperament and Preoperative Anxiety Measures

Child-Report of Shyness. Shyness was measured using the five highest-loaded items [27] from the original Cheek and Buss Shyness Scale [28,29] to reduce participant burden. A sample item from this scale includes "I find it hard to talk to strangers". Children responded on a five-point Likert scale ranging from 0 (not at all characteristic) to 4 (extremely characteristic), and so higher values indicated higher shyness. A mean shyness score was computed using the five items. This scale demonstrated good internal consistency in our sample ($\alpha = 0.80$). Children's shyness was assessed at the preoperative visit, T1.

Children's Perioperative Multidimensional Anxiety Scale (CPMAS). The CPMAS is a validated self-report scale designed to measure children's state anxiety within a surgical context [30]. The CPMAS contains five items, to which the child responds on a visual analog scale (i.e., each item ranging from 0 (Not worried at all) to 100 (Very worried)). The CPMAS was found to have very good internal consistency ($\alpha = 0.93$) in the present study. Children's anxiety was assessed immediately before surgery, T2.

2.4. EEG Data Recording, Reduction, and Analysis

EEG Data Recording and Collection. EEG data were collected with children's eyes open for approximately 40 min while the child was seated waiting for their starting surgery after nurse preparation up until anesthetic induction, T2. EEG data were recorded using a Muse headband (InteraXon Inc., Toronto, ON, Canada). The Muse headband is a wireless quantitative EEG headband equipped with four dry sensor channels (i.e., frontal sites (AF7, AF8) and temporal sites (TP9, TP10)) referenced to a fifth channel located at the medial prefrontal region (Fpz). The Muse headband was paired to an Android tablet (Samsung Galaxy Tab A; Samsung Electronics Co., Ltd., Suwon, Republic of South Korea) via Bluetooth. During the acquisition phase, the Mind Monitor application (an interface software) was used to capture and record data. The raw EEG signals were sampled at 256 Hz. The Muse headband has demonstrated reliability with other existing portable and laboratory-based (i.e., "wet") EEG systems (see ref. [31] for comparison of EEG systems) and demonstrated good psychometric properties in the preoperative setting [25].

EEG Data Reduction and Analysis. A real-time fast Fourier transform (FFT) was employed by the Muse Monitor application to record and compute the power spectral density in the alpha frequency band (7.5 to 13 Hz). We examined EEG power in the alpha frequency range because this frequency band has been consistently linked to individual differences in affective style and anxiety (see [32] for a recent review). A notch filter was set

at 60 Hz to reduce artifacts and noise, and additional noise suppression was applied using the Muse's built-in driven right leg circuit (with a 2 μV noise floor) for all channels. Visual inspection was performed to remove artifacts emerging from signal connectivity issues. The onset and offset time were marked, and those data were eliminated from analyses.

A composite measure of average overall alpha power was computed separately for the frontal and temporal sites by averaging overall alpha power separately across the two frontal sites (i.e., Time 2 (AF7 + AF8)/2) and two temporal sites (i.e., Time 2 (TP9 + TP10)/2)). We collected measures in the temporal region to ensure the effects were specific to the frontal region. Because EEG alpha power is inversely related to cortical activity, lower scores on the overall frontal and temporal metrics reflect more brain activity [18,33,34].

2.5. Data Loss

Due to unforeseen surgery scheduling conflicts (e.g., appointment cancellations, deviations from schedule), a few children were unable to complete all the measures across both visits and were excluded from analyses. All 70 children had self-reported temperament data, 60 had useable EEG data at T2, and 66 had self-reported anxiety data at T2. Across the measures, a total of 59 had complete data and are included in the regression analyses below.

2.6. Statistical Analysis

Descriptive analyses were conducted to summarize the baseline characteristics of the children and families in this study. A series of chi-square and independent samples *t*-tests were performed to examine differences in participant sex, age, handedness, and previous hospitalizations. A series of Pearson correlations were also performed to examine relations among the children's shyness, overall frontal and temporal EEG alpha power, and preoperative anxiety. We used a multiple linear regression model to examine if frontal alpha power at T2 moderated the relation between shyness at T1 and self-reported anxiety at T2. In the first step, we entered shyness; in the second step, we added frontal alpha power; and in the final step, we entered an interaction term that was the cross-product of shyness and frontal alpha power. We also performed identical analyses using average overall temporal alpha power as a moderator to test for specificity between the frontal and temporal brain regions.

All statistical analyses were performed using SPSS Version 24.0, with significance levels set at $\alpha = 0.05$.

3. Results

3.1. Descriptive Statistics

Participant sex, age, handedness, and previous hospitalizations were not related to shyness, overall frontal and temporal EEG alpha power, or preoperative anxiety (ps > 0.05). Intercorrelations, means, and standard deviations (*SD*) for study variables are shown in Table 2.

Table 2. Intercorrelations, means, and standard deviations (SD) for study variables.

Measure	1	2	3	4	Mean (SD)
1. Child-reported shyness T1	-	0.44 **	−0.07	−0.07	1.77 (1.02)
2. Self-reported anxiety T2		-	−0.25	−0.09	152.26 (121.83)
3. Overall frontal alpha power T2			-	0.70 **	0.58 (0.15)
4. Overall temporal alpha power T2				-	0.89 (0.12)

SD = standard deviation; T1 = preoperative visit; T2 = day of surgery visit, ** $p < 0.001$; 1 = Child-reported shyness T1; 2 = Self-reported anxiety T2; 3 = Overall frontal alpha power T2; 4 = Overall temporal alpha power T2.

3.2. Regression Analysis

The final model was significant in predicting self-reported state anxiety, $F(3, 55) = 7.92$, $p < 0.001$, $R^2 = 0.30$. As presented in Table 3, results revealed that average overall frontal alpha EEG power moderated the relation between self-reported shyness and self-reported

state anxiety, $p = 0.019$. To probe this interaction, we examined the influence of shyness on self-reported anxiety at high (1 standard deviation above the mean) and low (1 standard deviation below the mean) levels of frontal alpha EEG power. As illustrated in Figure 1, simple slope analyses revealed that shyness was positively related to state anxiety in children with low levels of average overall frontal alpha power ($\beta = 80.87$; $p < 0.001$), but shyness was unrelated to state anxiety in children with high levels of average overall frontal alpha power ($\beta = 10.67$; $p = 0.619$).

Table 3. Summary of regression model of shyness and overall frontal brain activity predicting self-reported state anxiety on day of elective surgery in children.

		Self-Reported State Anxiety				
	Predictors	**Beta**	***S.E.***	***p*-Value**	**R^2**	**ΔR^2**
Step 1					0.180	0.180 *
	Shyness	51.98	14.67	0.001		
Step 2					0.227	0.047
	Shyness	49.96	14.42	0.001		
	Frontal Alpha EEG Power	−179.881	97.78	0.071		
Step 3					0.302	0.075 *
	Shyness	179.18	55.07	0.002		
	Frontal Alpha EEG Power	282.49	212.56	0.189		
	Shyness X Frontal Alpha EEG Power	−232.83	96.05	0.019		

* $p < 0.05$.

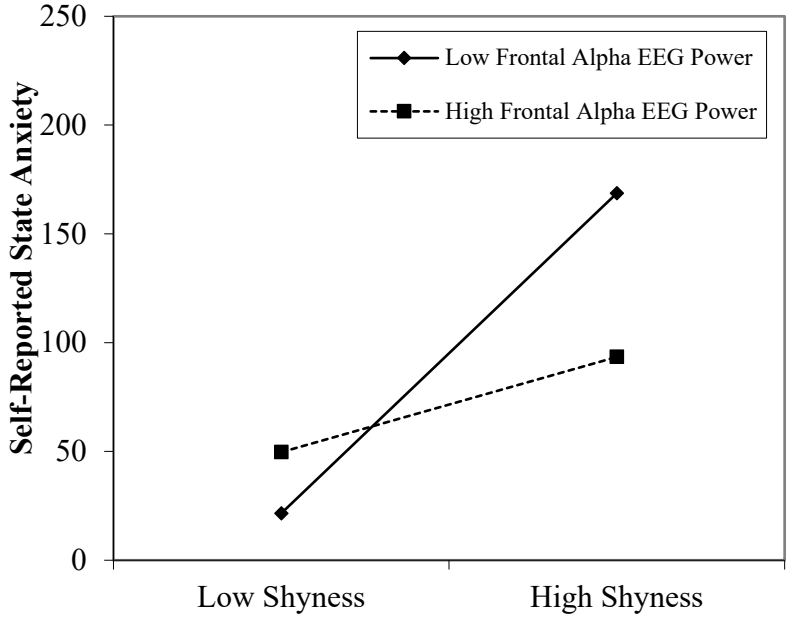

Figure 1. Significant interaction effect of overall frontal alpha power on the relation between individual differences in shyness and state anxiety during the day of elective surgery in children. EEG power is inversely related to activity, so lower overall EEG power reflects greater overall activity. Values are plotted at one standard deviation above and below the mean.

We repeated the above analyses using average overall temporal alpha EEG power for sensitivity analyses. In the first step, shyness was entered and was a significant predictor of self-reported state anxiety ($\beta = 51.98$; $p < 0.001$). In the second step, average overall temporal alpha EEG power was not a significant predictor of self-reported state anxiety ($\beta = -60.04$; $p = 0.625$). Finally, in the third step, the interaction term was not significant ($\beta = -155.25$; $p = 0.206$), indicating that average overall temporal alpha power did not moderate the relation between shyness and state anxiety and specificity to the frontal region.

4. Discussion

In this study, we explored relations among self-reported shyness, average overall anterior EEG alpha power, and self-reported preoperative anxiety in school-age children undergoing elective surgery. Our findings revealed that the average overall frontal EEG alpha power measured on the day of surgery moderated the association between shyness measured during a preoperative visit and preoperative anxiety measured during the day of surgery. We found no such links for temporal brain activity.

The present study extends the existing literature concerning the role of individual differences in temperament in childhood anxiety. Our findings are consistent with previous work that has been conducted outside of the surgical context in children, where shyness has been linked to increased levels of anxiety (e.g., [12,13]; see also [14] for a review). Here, we extend these findings by demonstrating similar associations but within a "real world" ecologically salient context (e.g., surgery).

When compared to work that has been carried out within the surgical context, our study was consistent with prior research that showed that children who had an inhibited temperament (i.e., were shy) experienced higher preoperative anxiety [2] (see also [8] for a recent review). However, our findings were not consistent with the results of a preliminary study carried out by Chow and colleagues [7], where shyness was found to be negatively correlated with preoperative anxiety for school-aged children undergoing elective surgery. This discrepancy may have been due to some methodological differences between the two studies. For example, the proportion of children who had previously been hospitalized in the present study (50%) was greater than in the previous study (29%). It is possible that children who had undergone prior surgical experience(s) might react differently than those who had never been in the preoperative environment. However, the field examining relations between temperament and anxiety in ecologically valid, non-normative contexts is relatively new. Therefore, very little is known about the types of normative behaviours that children exhibit within this context. We postulated that other inhibited temperamental styles may also be associated with anxiety in children undergoing surgery. More research needs to be conducted to examine the possible confounding factors (e.g., other temperamental styles, previous hospitalization, types of preparation, types of stressors, and parenting styles) that could directly and indirectly affect children's behaviours in this unique context for studying children's anxiety.

To further our understanding of the biologically based factors underlying links between shyness and preoperative anxiety, we explored the role of overall frontal EEG alpha power on this relation. Our results suggest that average overall frontal brain power may track preoperative anxiety in shy children in the surgical setting. Consistent with the literature [15,16,20], the pattern of overall frontal alpha brain activity (i.e., the inverse of EEG alpha power) may reflect the intensity of emotional experience during the perioperative period, with relatively higher overall frontal activity reflecting a more intense emotional experience for children who were shy than relatively lower overall frontal brain activity. Furthermore, the elevated overall frontal bilateral EEG activity may track emotional arousal (i.e., anxious apprehension) that is experienced by temperamentally shy children leading up to surgery. This heightened arousal may reflect the hyperactivity of the underlying cortical processes within the prefrontal cortex and related subcortical structures [35].

Limitations

The following limitations should be noted when interpreting the findings of the present study. First, although this study is believed to represent one of the first of its kind (i.e., collecting EEG data in real time) in relation to children's temperament and anxiety in the preoperative context, and given its relatively small sample size and correlational design, our results need to be replicated with a larger sample before causal inferences can be made. Second, although well-validated self-report measures were used to assess temperament and anxiety, these measures may be subject to some bias as they were self-reported. Other validated objective measures, such as behavioural measures of temperament and

physiological indicators of stress (e.g., heart rate, cortisol), could be included in future work in order to more completely characterize the phenomena of temperament and preoperative anxiety in perhaps a more objective and less biased way. In addition, obtaining more data throughout the entire perioperative period (e.g., EEG signals during and after surgery and outside of the surgical context) might also provide further insights into the course of perioperative anxiety and its influence on recovery. Third, while the portable EEG system Muse allows for capturing continuous real-time data non-invasively in the surgical context, only a limited number of recording channels were available. Therefore, the study needs to be replicated in other contexts (e.g., home and the laboratory) using both traditional and more extensive EEG systems to ensure the reliability of the present results. Finally, to maintain a relatively homogenous sample, we restricted our sample to school-age children receiving elective surgery only. This does impose some limitations on the generalizability of our results to all children undergoing surgery (e.g., non-elective), and so future studies should examine the link between temperament and preoperative anxiety across a broader range of developmental stages and elective and non-elective surgical procedures. Finally, future studies should also include a follow up after surgery to measure potential short- and long-term adverse postoperative outcomes (e.g., postoperative behaviour, anxiety, and pain).

5. Conclusions

The findings of this study extend prior work by examining paths linking shyness, frontal brain activity, and anxiety in other stressful contexts to a real-world environment. We believe that this novel work has both theoretical (i.e., understanding the relation between temperament and anxiety) and clinical (i.e., understanding the development and management of preoperative anxiety) implications. On a theoretical level, the findings of the present study extend the current literature on the link between shyness and anxiety by examining these phenomena in other contexts. Our results also provided support for the observation that average overall frontal EEG activity moderated the relation between shyness and preoperative anxiety, providing insight into individual differences and why not all shy children react the same way to impending surgery. Clinically, this preliminary investigation sheds light on the etiology of preoperative anxiety and may help guide future research in the understanding of the biological correlates underlying the links between temperament and anxiety in stressful contexts. Given the prevalence and negative effects of preoperative anxiety, the ultimate goal is to help guide and personalize the future design of preventive and intervention strategies, such as the development of better coping methods in managing preoperative anxiety for children undergoing surgery, specifically for children who are shy, that might target a change in patterns of anterior brain physiology.

Author Contributions: C.H.T.C. and L.A.S. developed the study concept and wrote the manuscript; all authors (C.H.T.C., K.L.P., R.Y.X., J.S., R.J.V.L., N.B., G.M. and L.A.S.) contributed to the study design; C.H.T.C., R.Y.X. and J.S. performed the recruitment and data collection; C.H.T.C., K.L.P., R.Y.X. and J.S. performed data analysis, and interpretation under the supervision of L.A.S.; C.H.T.C., K.L.P., R.Y.X., J.S., R.J.V.L., N.B. and L.A.S. provided critical revisions on manuscript drafts; G.M. provided technical support for the Muse EEG Headband. All authors have read and agreed to the published version of the manuscript.

Funding: This study was supported by an Ontario Mental Health Foundation Studentship awarded to C.H.T. Chow and a project operating grant from the Canadian Institutes of Health Research (CIHR) grant number [148852] awarded to L. A. Schmidt, R. J. Van Lieshout, and N. Buckley.

Institutional Review Board Statement: The study was approved by the Hamilton Integrated Research Ethics Board (HiREB) (protocol code HIREB#1220).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are unavailable due to privacy or ethical restrictions.

Acknowledgments: G. Moffat was employed by InteraXon, the manufacturer of the Muse headband used in the present study. We wish to thank the many children and families who participated in the study; Varun Bhardwaj, Ayesha Rizwan, and Klement Yeung, who assisted with data collection and data entry; the Child Life Specialists and Program; and the McMaster Children's Hospital. And special thanks to Toni Tidy in the Department of Anesthesiology at McMaster University.

Conflicts of Interest: Author Graeme Moffat was employed by the company InteraXon Inc. The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. Perry, J.N.; Hooper, V.D.; Masiongale, J. Reduction of preoperative anxiety in pediatric surgery patients using age-appropriate teaching interventions. *J. PeriAnesth. Nurs.* **2012**, *27*, 69–81. [CrossRef]
2. Kain, Z.N.; Mayes, L.; O'Connor, T.; Cicchetti, D. Preoperative anxiety in children. Predictors and outcomes. *Arch. Pediatr. Adolesc. Med.* **1996**, *150*, 1238–1245. [CrossRef] [PubMed]
3. Kain, Z.N.; Mayes, L.C.; Caldwell-Andrews, A.A.; Karas, D.E.; McClain, B.C. Preoperative anxiety, postoperative pain, and behavioral recovery in young children undergoing surgery. *Pediatrics* **2006**, *118*, 651–658. [CrossRef] [PubMed]
4. Vernon, T.A.; Schulman, J.L.; Foley, J.M. Changes in children's behavior after hospitalization: Some dimensions of response and their correlates. *Am. J. Dis. Child.* **1966**, *111*, 581–593. [CrossRef] [PubMed]
5. Kain, Z.N.; Mayes, L.; Weisman, S.J.; Hofstadter, M.B. Social adaptability, cognitive abilities, and other predictors for children's reactions to surgery. *J. Clin. Anesth.* **2000**, *12*, 549–554. [CrossRef] [PubMed]
6. Fortier, M.A.; DEL Rosario, A.M.; Martin, S.R.; Kain, Z.N. Perioperative anxiety in children. *Pediatr. Anesth.* **2010**, *20*, 318–322. [CrossRef]
7. Chow, C.H.T.; Nejati, N.; Poole, K.L.; Van Lieshout, R.J.; Buckley, N.; Schmidt, L.A. Children's shyness in a surgical setting. *J. Can. Acad. Child Adolesc. Psychiatry* **2017**, *26*, 190–197.
8. Chow, C.H.T.; Rizwan, A.; Xu, R.; Poulin, L.; Bhardwaj, V.; Van Lieshout, R.J.; Buckley, N.; Schmidt, L.A. Association of temperament with preoperative anxiety in pediatric patients undergoing surgery: A systematic review and meta-analysis. *JAMA Netw. Open* **2019**, *2*, e195614. [CrossRef]
9. Murray, L.; Creswell, C.; Cooper, P.J. The development of anxiety disorders in childhood: An integrative review. *Psychol. Med.* **2009**, *39*, 1413–1423. [CrossRef]
10. Prior, M.; Smart, D.; Sanson, A.; Oberklaid, F. Does shy-inhibited temperament in childhood lead to anxiety problems in adolescence? *J. Am. Acad. Child Adolesc. Psychiatry* **2000**, *39*, 461–468. [CrossRef]
11. Rubin, K.H.; Coplan, R.J.; Bowker, J.C. Social withdrawal in childhood. *Annu. Rev. Psychol.* **2009**, *60*, 141–171. [CrossRef] [PubMed]
12. Coplan, R.J.; Arbeau, K.A.; Armer, M. Don't fret, be supportive! maternal characteristics linking child shyness to psychosocial and school adjustment in kindergarten. *J. Abnorm. Child Psychol.* **2008**, *36*, 359–371. [CrossRef] [PubMed]
13. Findlay, L.C.; Coplan, R.J.; Bowker, A. Keeping it all inside: Shyness, internalizing coping strategies and socio-emotional adjustment in middle childhood. *Int. J. Behav. Dev.* **2009**, *33*, 47–54. [CrossRef]
14. Rapee, R.M.; Coplan, R.J. Conceptual relations between anxiety disorder and fearful temperament. *New Dir. Child Adolesc. Dev.* **2010**, *2010*, 17–31. [CrossRef] [PubMed]
15. Dawson, G. Frontal electroencephalographic correlates of individual differences in emotion expression in infants: A brain systems perspective on emotion. *Monogr. Soc. Res. Child Dev.* **1994**, *59*, 135–151. [CrossRef]
16. Fox, N.A. Dynamic cerebral processes underlying emotion regulation. *Monogr. Soc. Res. Child Dev.* **1994**, *59*, 152–166. [CrossRef]
17. Henriques, J.B.; Davidson, R.J. Left frontal hypoactivation in depression. *J. Abnorm. Psychol.* **1991**, *100*, 535. [CrossRef]
18. Davidson, R.J.; Tomarken, A.J. Laterality and emotion: An electrophysiological approach. *Handb. Neuropsychol.* **1989**, *3*, 419–441.
19. Dawson, G.; Panagiotides, H.; Klinger, L.G.; Hill, D. The role of frontal lobe functioning in the development of infant self-regulatory behavior. *Brain Cogn.* **1992**, *20*, 152–175. [CrossRef]
20. Schmidt, L.A.; Fox, N.A. Patterns of cortical electrophysiology and autonomic activity in adults' shyness and sociability. *Biol. Psychol.* **1994**, *38*, 183–198. [CrossRef]
21. Heller, W. Neuropsychological mechanisms of individual differences in emotion, personality, and arousal. *Neuropsychology* **1993**, *7*, 476–489. [CrossRef]
22. Heller, W.; Nitschke, J.B.; Etienne, M.A.; Miller, G.A. Patterns of regional brain activity differentiate types of anxiety. *J. Abnorm. Psychol.* **1997**, *106*, 376–385. [CrossRef] [PubMed]
23. Nitschke, J.B.; Heller, W.; Palmieri, P.A.; Miller, G.A. Contrasting patterns of brain activity in anxious apprehension and anxious arousal. *Psychophysiology* **1999**, *36*, 628–637. [CrossRef] [PubMed]
24. Reiman, E.M.; Raichle, M.E.; Robins, E.; Mintun, M.A.; Fusselman, M.J.; Fox, P.T.; Price, J.L.; Hackman, K.A. Neuroanatomical correlates of a lactate-induced anxiety attack. *Arch. Gen. Psychiatry* **1989**, *46*, 493–500. [CrossRef] [PubMed]
25. Xu, R.Y.; Chow, C.H.; Poole, K.L.; Sriranjan, J.; Mirabelli, J.; Moffat, G.; Schmidt, L.A. Mobile quantitative EEG assessment and children's preoperative anxiety: A psychometric and feasibility study. *J. Technol. Behav. Sci.* **2023**, *8*, 47–56. [CrossRef]

26. Sriranjan, J.; Chow, C.H.; Poole, K.L.; Hassan, R.; Mirabelli, J.; Buckley, N.; Schmidt, L.A. Children's shyness and frontal electroencephalogram delta–beta correlation in the pediatric surgical setting. *Dev. Psychobiol.* **2022**, *64*, e22275. [CrossRef]
27. Bruch, M.A.; Gorsky, J.M.; Collins, T.M.; Berger, P.A. Shyness and sociability reexamined: A multi-component analysis. *J. Personal. Soc. Psychol.* **1989**, *57*, 904–915. [CrossRef]
28. Cheek, J.M.; Wellesley College, Wellesley, MA, USA. The Revised Cheek and Buss Shyness Scale. 1983; *unpublished manuscript*.
29. Cheek, J.M.; Buss, A.H. Shyness and sociability. *J. Personal. Soc. Psychol.* **1981**, *41*, 330–339. [CrossRef]
30. Chow, C.H.T.; Van Lieshout, R.J.; Buckley, N.; Schmidt, L.A. Children's Perioperative Multidimensional Anxiety Scale (CPMAS): Development and validation. *Psychol. Assess.* **2016**, *28*, 1101–1109. [CrossRef]
31. Ratti, E.; Waninger, S.; Berka, C.; Ruffini, G.; Verma, A. Comparison of medical and consumer wireless EEG systems for use in clinical trials. *Front. Hum. Neurosci.* **2017**, *11*, 398. [CrossRef]
32. Reznik, S.J.; Allen, J.J. Frontal asymmetry as a mediator and moderator of emotion: An updated review. *Psychophysiology* **2018**, *55*, e12965. [CrossRef] [PubMed]
33. Laufs, H.; Kleinschmidt, A.; Beyerle, A.; Eger, E.; Salek-Haddadi, A.; Preibisch, C.; Krakow, K. EEG-correlated fMRI of human alpha activity. *NeuroImage* **2003**, *19*, 1463–1476. [CrossRef] [PubMed]
34. Pfurtscheller, G. Event-related synchronization (ERS): An electrophysiological correlate of cortical areas at rest. *Electroencephalogr. Clin. Neurophysiol.* **1992**, *83*, 62–69. [CrossRef] [PubMed]
35. Radley, J.; Morilak, D.; Viau, V.; Campeau, S. Chronic stress and brain plasticity: Mechanisms underlying adaptive and maladaptive changes and implications for stress-related CNS disorders. *Neurosci. Biobehav. Rev.* **2015**, *58*, 79–91. [CrossRef]

behavioral sciences

MDPI

Article

Contributions of Multilevel Family Factors to Emotional and Behavioral Problems among Children with Oppositional Defiant Disorder in China

Ting He [1], Jocelyn Meza [2], Wan Ding [3], Stephen P. Hinshaw [2], Qing Zhou [2], Umair Akram [4] and Xiuyun Lin [1,5,*]

[1] School of Developmental Psychology, Faculty of Psychology, Beijing Normal University, Beijing 100875, China
[2] Department of Psychology, University of California, Berkeley, CA 94720, USA
[3] Department of Psychology, Teacher Education College, Zhejiang Normal University, Jinhua 321004, China
[4] Hangzhou College of Commerce, Zhejiang Gongshang University, Hangzhou 310018, China
[5] Beijing Key Laboratory of Applied Experimental Psychology, Faculty of Psychology, Beijing Normal University, Beijing 100875, China
* Correspondence: linxy@bnu.edu.cn

Abstract: Oppositional defiant disorder (ODD) is one of the most prevalent childhood mental health disorders and is extremely affected by family factors. However, limited studies have addressed the issue from the perspective of family systems. The current study examines the associations between multilevel family factors (i.e., family cohesion/ adaptability at system level, mother–child and father–child attachment at a dyadic level, and child self-esteem at an individual level) and emotional and behavioral problems among children with ODD in China. The participants were 256 Chinese children with ODD and their parents and class master teachers. A multiple-informant approach and structural equation model were used. The results revealed that system level factors (family cohesion/adaptability) were associated with child emotional and behavior problems indirectly through factors at the dyadic level (mother–child attachment) and the individual level (child self-esteem) in sequence. Mother–child, but not father–child, attachment, mediated the linkage between family cohesion/adaptability and the emotional problems of children with ODD. Moreover, child self-esteem mediated the association between mother–child attachment and child emotional and behavioral problems. The findings of the present study underscored that multilevel family factors are uniquely related to emotional and behavioral problems in children with ODD.

Keywords: behavioral problems; Chinese children; emotional problems; multilevel family factors; oppositional defiant disorder

Citation: He, T.; Meza, J.; Ding, W.; Hinshaw, S.P.; Zhou, Q.; Akram, U.; Lin, X. Contributions of Multilevel Family Factors to Emotional and Behavioral Problems among Children with Oppositional Defiant Disorder in China. *Behav. Sci.* **2023**, *13*, 113. https://doi.org/10.3390/bs13020113

Academic Editor: Michele Roccella

Received: 21 December 2022
Revised: 26 January 2023
Accepted: 27 January 2023
Published: 29 January 2023

1. Introduction

Oppositional defiant disorder (ODD) is characterized by a recurrent pattern of angry/irritable mood, argumentative/defiant behavior, and vindictiveness toward authority figures or adults as well [1]. Previous findings indicated that children with ODD have comorbid emotional and behavioral problems, such as depression and aggressive behavior [2]. Indeed, 45.8% of those with a lifetime diagnosis of ODD met the criteria for depressive disorder [3], and depression was a key contributor to behavioral problems in childhood [4]. Additionally, childhood ODD has been associated with an increased risk of conduct disorder ([CD]; [5]), which has a high probability of developing antisocial personality disorder in adulthood [1]. Due to the significant risk that emotional and behavioral problems pose to adjustment in typically developing children [6,7], children with ODD who have comorbid emotional and behavioral problems might be at a much higher risk for child outcomes [1,8,9]. Therefore, it is necessary to examine the influential factors on emotional and behavioral problems in children with ODD. Studies examining these links

would deepen our understanding of ODD and have prominent implications for developing effective intervention programs.

Several family risk factors contribute to the severity of emotional and behavioral problems of children with ODD [10,11]. Notably, Lin and colleagues (2022) proposed a multilevel (i.e., system, dyadic, and individual level) family factors model to illustrate the associations between family factors at different levels and child ODD symptoms [12]. Regarding the system level, family is considered as a complete unit and system consisting of surface characteristics (e.g., social–economic status) and deep characteristics (e.g., family function). The dyadic level refers to the functioning of each subsystem in the family, including the wife–husband subsystem and parent–child subsystem. The individual level considers each family member as a separate subsystem. According to Lin et al.'s model, family factors at different level were associated with child ODD symptoms uniquely. However, it remained unclear exactly how multilevel family factors were, respectively, associated with co-occurring emotional and behavioral problems. To enrich the multilevel family factors model, we constructed a comprehensive model to examine the associations between multilevel family factors and emotional and behavioral problems of children with ODD. Specifically, we considered family cohesion/adaptability at a system level, mother–child and father–child attachment simultaneously at dyadic level, and child self-esteem at an individual level. Identifying modifiable family factors for emerging problem behaviors is necessary for family-based education and intervention programs.

1.1. Factor at System Level Associated with Emotional and Behavioral Problems in Children with ODD

At the system level of family environment, researchers have underscored the contribution of family function to the emotional and behavioral problems of children with ODD [13]. Olson (2000) pointed out that family cohesion and adaptability are two core components of family function. Family cohesion refers to the emotional connection among family members [14,15], while family adaptability refers to the ability of a family system to change its power structure, role relationships, and relationship rules in response to situational and developmental stress [14]. According to the McMaster family functional model theory [16], a poor family function might lead to less open communication and a steady accumulation of negative emotions. Children in such a family environment would gradually learn the negative interaction pattern, which increases the risk of physical diseases and problem behaviors. Empirical research has been carried out on the role of family cohesion/adaptability in child problem behaviors as well. For example, Lavigne and colleagues (2012) found that family cohesion/adaptability attenuated the risk of emotional and behavioral problems in children with ODD. On the contrary, family conflict appeared to facilitate emotional and behavioral problems in children [11].

1.2. Factor at Dyadic Level Associated with Emotion and Behavioral Problems in Children with ODD

Regarding the dyadic level, studies were inclined to explore dysfunctional parent–child interactions independent of other family-related interactions [17,18]. Research concerning attachment theory has revealed that parent–child attachment was associated with children's problem behaviors [6]. Attachment theory implies that parent–child attachment is prominently linked to child problem behaviors by shaping the internal work model of the child. If the caregivers are lacking in sensitivity or are even frightening to the children, children would be insecurely attached and more likely to develop a maladjusted internal work model [19]. Repeated experiences of the insensitivity of the caregiver would lead to dysfunctional cognition about the self and others and negative expectations in interpersonal interactions, which might enhance the risk for problem behaviors. Empirical studies consistently indicated that a lower level of parent–child attachment was associated with more emotional and behavioral problems in children [20,21]. Similar findings have been reported for children with ODD as well [10].

Attachment theory asserts further that children could form multiple attachments, i.e., they might develop distinct attachment with their mothers and fathers [22]. As such, it is important to point out that researchers have emphasized the need to separate the father and mother when examining their respective contributions to child development [7]. For one thing, mothers and fathers play different caregiving roles in families and have distinct interaction patterns with children. Therefore, mother–child and father–child attachments might associate with their children's development uniquely [23]. According to the dominant hypothesis [24], a child's attachment to his or her mother plays a pivotal part in his or her psychological development, due to the fact that the mother and child have more opportunities to spend time together [25]. According to the specificity hypothesis [26], the attachment a child forms with either his or her mother or father has distinct effects on his or her development [27]. Furthermore, during middle childhood, mothers and fathers are inclined to interact with children separately, increasing the opportunities for mother–child and father–child attachment to play different roles in child development [28]. However, mixed findings have emerged regarding the links of mother–child and father–child attachment with problem behaviors in children. Specifically, some have argued that mother–child attachment was closely related to child emotional problems [29], while Pan et al. (2016) proposed that father–child attachment was more crucial than mother–child attachment in predicting psychological health in Chinese children. However, Carter (2014) argued that secure attachments with both mothers and fathers protected children from worse emotional symptoms [30]. We do not yet have a full understanding of how mother–child and father–child attachments predict emotional and behavioral problems in children with ODD uniquely. Therefore, this study intends to distinguish the two different parenting roles and discuss them separately.

1.3. Factor at Individual Level Associated with Emotion and Behavioral Problems in Children with ODD

With regard to individual level factors, according to the multilevel family factors model and the research findings, several individual child factors are associated with the development of child ODD symptoms, such as child individual characteristics (children's temperament), cognitive factors (social cognition), and emotion-related factors (emotion regulation), etc. [12,31,32]. This research focused on child self-esteem, which has been found to play a predictive role in co-occurring emotional and behavioral problems. Given that children with ODD frequently receive negative social feedback throughout their development, they were more likely to experience lower levels of self-esteem [8,9]. Based on the self-esteem theory of depression, low self-esteem is one of the most important susceptibility qualities for depression [33] and the social bonding theory points out that low self-esteem contributes to less consistency in social norms and more problem behaviors [34]. Other studies have also revealed that child self-esteem is linked to the overall outcomes of children, including emotional and behavioral problems. For instance, a longitudinal study conducted by Leeuwis and colleagues (2014) indicated that low self-esteem was a strong predictor of subsequent internalizing symptoms in children [35]. Lin and colleagues (2014) also found that lower self-esteem was associated with higher levels of depression and more aggressive behaviors in children with ODD [36]. However, less is known about the role of child self-esteem in the emotional and behavioral problems of children with ODD in the family context. As such, the present study aims to explore how child self-esteem, as an individual level factor, is related to other family factors at system a level and a dyadic level, and ultimately to child emotional and behavioral outcomes.

1.4. Interplay among Factors at Three Level

According to the person–context interaction theory [37], the environmental factors vary from distal to proximal and the processes of interplay between the distal and proximal environmental factors affect the development of an individual. Magnusson and Stattin (1998) further indicated that the distal factors decide the opportunities and restrictions for

the functioning and development of proximal factors, as well as the individuals. In the family system, family function is a distal environmental factor, parent–child attachment is a proximal environmental factor, and child self-esteem is the most proximal factor for children [12,38]. As such, family function might directly and indirectly predict child problem behaviors via the parent–child relationship and the child's self-esteem. Additionally, the parent–child relationship might directly and indirectly predict child problem behaviors via the child's self-esteem.

Indeed, families with poor function tended to have poor communication, which would lead to less parent–child interaction and a lower level of parent–child attachment. Consequently, children might be likely to form maladaptive internal work models and develop low self-esteem. All of these might cause or exacerbate problem behaviors in children. Some preliminary empirical evidence supported these assumptions. For instance, the effect of family cohesion/adaptability on child depression is likely to be mediated by parenting (dyadic level), parental depression, and child temperament (individual level) [39]. Liu and colleagues (2018) found that child self-esteem mediated the spillover effects between family cohesion/adaptability and the emotional problems of children [40]. Additionally, existing evidence supports that child self-esteem serves as a mechanism explaining the link between parent–child attachment and the emotional and behavioral problems of children [41,42]. However, it remains unknown whether the processes of interplay among three different system levels could be associated with emotional and behavioral problems in children with ODD uniquely. In the current study, we include family cohesion/adaptability at a system level, mother–child and father–child attachment simultaneously at a dyadic level, and child self-esteem at an individual level to explore the role that family factors at different levels play in the emotional and behavioral problems of children with ODD.

1.5. Influence of Chinese Culture

Since the cultural context affects both the whole family and the individual family member, it is essential to comprehend the associations between family factors and child outcomes in the cultural context. In various aspects, Chinese culture differs from Western culture. First, Chinese parents are typically more involved in their children's upbringing than American parents [43]. Under the influence of Confucianism, Chinese society adopted hierarchical parent–child interactions and disciplinarian parental socialization [43], which may contribute a substantial parental effect on child development.

Second, it should be noted that most children in the present study were the only-child in their families. As the only child, some families adopted a "child-centered" parenting style [44]. While this parenting style might improve the quality of parent–child attachments, it might also increase the emotional and behavioral problems in children [45]. For one thing, a child-centered approach means that parents might spoil their children and fail to discipline children's daily behaviors, which increases the risk of behavior problems. For another, a child-centered approach would make parents place high expectations on their children and expect them to achieve excellent school performance, while paying less attention to their children's psychological needs. All of these factors might increase children's emotional and behavioral problems.

Third, there is a well-known expectation in some Asian, African, or economically underdeveloped countries, "men outside the home, women inside (*Nan Zhu Wai, Nv Zhu Nei*)", because of traditional gender roles, and China is one of them [46]. Traditionally, Chinese mothers tend to take on full caregiving responsibilities in the household, while fathers are responsible for providing the financial necessities for the household. This division of household labor may contribute to a closer bond between children and their mothers than their fathers. Additionally, Chinese society expects married women to be "good wives and mothers (*Xian Qi Liang Mu*)", while the men are expected to "earn money to support the family". The different cultural expectations make the mothers devote more time and energy to raising children than the father. Therefore, Chinese mothers may have a greater influence on their children's socio-emotional development.

In contemporary Chinese families, however, parental notions on the parent–child attachment and its influence on children are shifting [47]. Modern Chinese mothers demonstrate less closeness and connection with their children compared with mothers of the previous century [47]; fathers play a less "authoritarian" role in the family and have more intimate interaction with children [48]. Nevertheless, it is plausible that traditional and contemporary parenting practices coexist in Chinese households, and it is unknown how the effects of parent–child attachment on children's development differ depending on the role of the parent.

1.6. The Present Study

The current study examined how multilevel family factors were differently related to emotional and behavioral problems in Chinese children with ODD. Specifically, we included family cohesion/adaptability as the system level factor, mother–child and father–child attachment concurrently as the dyadic level factors, and child self-esteem as the individual level factor (see Figure 1 for the proposed model). Three problems would be explored: (a) whether family cohesion/adaptability is significantly related to the emotional and behavioral problems of children directly or indirectly through both dyadic level (mother–child and father–child attachment) and individual level (self-esteem of children) factors; (b) whether child self-esteem would mediate the linkages between mother–child and father–child attachments and emotional and behavioral outcomes; (c) whether the mother–child attachment would be more closely linked to the emotional and behavioral problems of children rather than the father–child attachment.

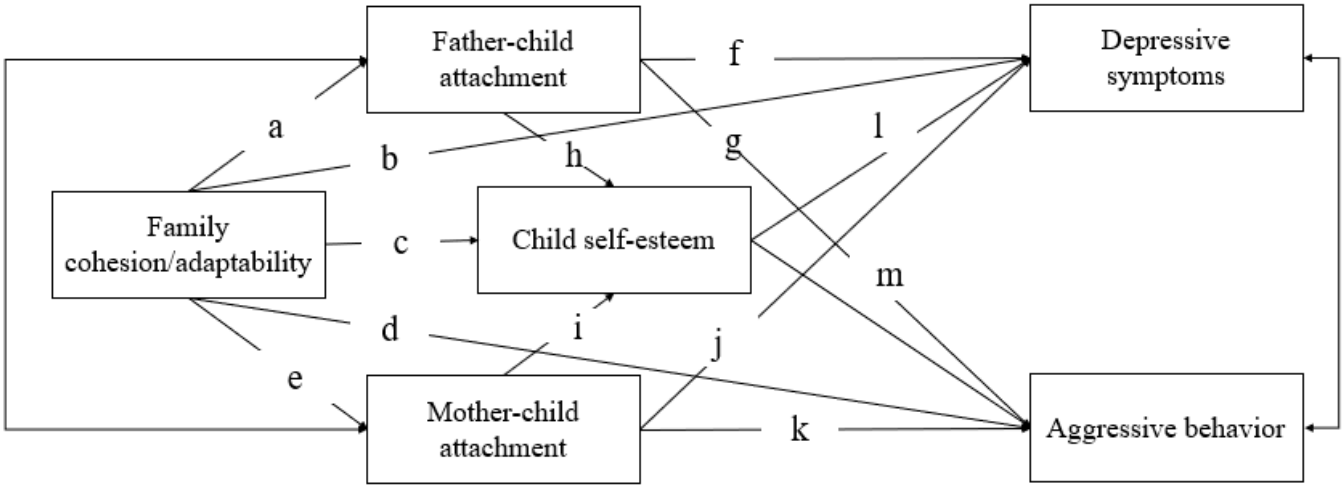

Figure 1. Proposed Model of Multilevel Family Factors and Emotional and Behavioral Problems of Children with ODD. **Note.** a—m indicates the effects of multilevel family factors on child depressive symptoms and aggressive behavior.

Based on the theoretical backgrounds and empirical research, three hypotheses were proposed: (a) family cohesion/adaptability is significantly related to the emotional and behavioral problems of children directly or indirectly through both dyadic level (mother–child and father–child attachment) and individual level (self-esteem of children) factors, (b) child self-esteem would mediate the linkages between mother–child and father–child attachment and emotional and behavioral outcomes, and (c) mother–child attachment would be more closely linked to the emotional and behavioral problems of children than father–child attachment.

2. Method

2.1. Procedure

There were six primary steps in the recruitment process. First, to obtain the informed consent of schools. Using a convenience sampling method, we reached out to the primary

principals and school psychologists of 20 cooperative primary schools and invited them to participate in this study. Of these schools, 14 elementary schools in Beijing (8), Shandong Province (2), and Yunnan Province (4) agreed to participate. The three areas are located in the North, East, and Southwest of the mainland and represent developed, developing, and undeveloped regions in China. All 14 of these primary schools are day schools, four are priority primary schools, and thirteen are situated inside the city. The range of pupils was between 300 and 5000. (2 schools have fewer than 1000 students and 7 schools have more than 2000 students). We first obtained the consent of the principals and school psychologists of these schools.

Second, to obtain the informed consent of class master teachers. We asked the school psychologists to issue research invitations and informed consent forms to class master teachers of grades first through fifth. Eventually, 187 class master teachers signed informed content and agreed to participate in our study.

Third, nomination. These 187 class master teachers were asked to nominate the children who might have ODD symptoms in their classes, according to the eight-item ODD assessment checklist (DSM-IV-TR, 2000), children who displayed four or more symptoms for at least 6 months with damaged relationship functions were nominated.

Fourth, confirmation. Two clinical psychologists from the research team interviewed each participating class master teacher to confirm the accuracy of the nomination. The confirmation criterions were based on DSM-IV-TR diagnostic criteria: (a) elementary students in grades one through five; (b) the child shows four or more symptoms of ODD; (c) the identified ODD symptoms have lasted for six months or more; (d) the child exhibits serious impairment across psychosocial functioning domains; and (e) without intellectual disability and other disorders, such as dyslexia, autism spectrum disorder, etc. Only children with both clinical psychologists' diagnoses of ODD were recruited into this study. Eventually, 305 children were identified to have ODD of the total 7966 children.

Fifth, to obtain the informed consent of parents. Invitation letters and informed consent were sent to 305 parents of children identified with ODD symptoms. A total of 282 pairs of parent and child gave informed consent and assent forms were obtained (92.5% participation rate).

Finally, these 282 children were asked to forward a package containing a parent survey to his or her primary caregiver. The primary caregiver (either the mother or the father, each family decide for themselves according to the reality of raising children) were invited to fill out the survey and to return their completed surveys to the class master teacher within one week. After parents signed informed consent, children completed the student questionnaire in a school conference room or music room, while trained researchers stayed in the room to provide assistance and explain the meaning of sentences when necessary. Specifically, children in grades 3, 4, and 5 were supervised by one teacher and one clinical psychology researcher. Due to the possibility that children in Grades 1 and 2 (ages 6–7) might have trouble comprehending the questionnaire, four to five teachers and researchers were assigned to guarantee that they could assist each child individually if children had difficulty completing questions. Both survey methods required children to independently complete questionnaires; the only difference was the number of researchers. Previous research has shown that the findings of a self-administered survey and an individual interview are compatible and comparable [49]. Class master teachers were also invited to complete a questionnaire to assess the behavior of each child in the study. A total of 256 parent–child dyads completed data collection, which included at least one of their parents and class master teachers' finished questionnaires.

Prior to conducting the study, the Institutional Review Board of [mask for review] University in China approved the research protocol, including the consent procedure [Approval number]. We obtained active consent from parents, students, and teachers prior to data collection, and we promised to keep the participants' information confidential. For interested parents of the identified children, psychiatrists from Anding Hospital, mental

health counselors, and a family therapist from the Center of Family Study and Therapy at [mask for review] University offered opportunities for ODD treatment.

2.2. Participants

The final ODD sample consisted of 256 parent–child dyads, including 83 father–child dyads and 173 mother–child dyads. The participating children included 186 boys and 69 girls, with 1 missing gender information. Among these children, 75.8% were the only child in family. Fathers' ages ranged between 25 and 54 years (M = 38.43, SD = 5.16), and mothers' ages ranged between 26 and 53 years (M = 36.66, SD = 4.29), and children's ages ranged between 6 and 13 years (M = 9.60, SD = 1.57). Regarding educational level, most mothers (56.6%) and fathers (61.6%) had junior college diplomas or above. For family social economic status, 56.3% families had a monthly income over 5000 Chinese Yuan (approximately $720; the average monthly income for Chinese urban families is about 5485 Chinese Yuan in 2015; [50]).

2.3. Measures

2.3.1. ODD Symptoms

Class master teachers, school psychological teachers and two clinical psychologists were asked to assess children's ODD symptoms based on the 8-item diagnosis of ODD scale in DSM-IV-TR (0 = no; 1 = yes; e.g., "often loses temper", "often argues with adults"; [1]). Children who had four or more items of the 8-item scale were identified with ODD. Scores were summed across the eight items and higher sum scores indicated that the child exhibited more ODD symptoms. The Cronbach's α was 0.85 in the current study.

2.3.2. Family Cohesion/Adaptability (Parent Reported)

The family cohesion/adaptability was assessed by the *Family Adaptability and Cohesion Evaluation Scale* (FACES-II; [14]), which has been validated as an appropriate measure for use in China [51]. FACES-II assesses the family function in two dimensions: adaptability (14 items; e.g., "In solving problems, the children's suggestions are followed") and cohesion (16 items; e.g., "Family members like to spend free time with each other"). The correlation coefficient between the adaptability and cohesion was 0.78 ($p < 0.001$) in the current study. Each parent reported their perception of the family function using a 5-point Likert scale 1 = almost never to 5 = almost always). A composite score was created by summing the scores of two dimensions. A higher total of scores on FACES-II indicated better adaptability and cohesion in the family. In the current study, the Cronbach's α for FACES-II was 0.84. Additionally, given that the data of family cohesion/adaptability was collected from either a father or a mother, an independent t-test was conducted to compare fathers' reports and mothers' reports. The result indicated that there was no significant difference in fathers' and mothers' report of family cohesion/adaptability ($t = -0.23$, $p > 0.05$).

2.3.3. Parent–Child Attachment (Child Reported)

Parent–child attachment was measured by child report of the Chinese Version of parent subscales *of the Inventory of Parent and Peer Attachment* (IPPA; [52,53]). This measure and its subscales have been demonstrated as having acceptable construct validity and internal consistency in a sample of Chinese primary school-aged children [54]. Each child was asked to rate their attachment to both mother and father on the following dimensions: trust (5 items; e.g., "'My father/mother respects my feelings"); communication (5 items; e.g., "If my father/mother knows something is bothering me, he/she asks me"); and alienation (5 items; e.g., "I am angry with my father/mother"), with parallel wordings of items for assessing relationships with mothers and fathers. All items are rated on a 5-point frequency response scale ranging from 1 (almost never) to 5 (almost always). A composite score was created for each mother–child and father–child attachment by subtracting the scores of alienation subscale from the sum scores of trust and communication subscales [53]. The higher scores

indicated higher levels of parent–child attachment. In the current study, the Cronbach's α was 0.88 for both mother–child attachment and father–child attachment, respectively.

2.3.4. Child Self-Esteem (Child Reported)

Child self-esteem was assessed using the *Self-Esteem Scale* (SES; [34]. The scale was shown to be a reliable and valid measurement for elementary school-aged children in China [49]. Each participating child reported on their own self-esteem by using a 4-point scale (1 = strongly disagree to 4 = strongly agree) on 10 items (e.g., "I am a person of worth"). A reversed scoring was used for the five items with negative states. Scores were summed to create a composite score, the higher score indicated higher levels of self-esteem. The Cronbach's α was 0.84 in the current study.

2.3.5. Children Depressive Symptoms (Child Reported)

Children's self-report of depressive symptoms were assessed using the *Center for Epidemiological Studies Depression Scale for Children* (CES-DC; [55]), Researchers have validated the CES-DC for the assessment of depressive symptoms in Chinese children [56]. The CES-DC consists of 20 items (e.g., "I was bothered by things that usually don't bother me") and each item was rated on a 4-point scale (1 = not at all to 4 = a lot). Summed scores were used as a measure of child depressive symptoms, with higher scores indicating more severe depressive symptoms. The Cronbach's α of this study was 0.86.

2.3.6. Aggressive Behavior (Teacher Reported)

Child aggression was measured using the "*Aggressive with Peers*" subscale from the Child Behavior Scale (CBS; [57]). Previous study has proved this scale for measuring child aggressive behavior by teacher [58]. Class master teachers rated each child's aggressive behavior toward peers by using a 5-point scale (1 = never to 5 = always) on 7 items (e.g., "This child pushes or shoves other children"). Scores were summed to create a composite score, with a higher score indicating more aggressive behavior towards peers in school. The Cronbach's α was 0.96 in the current study.

2.4. Data Analysis

Preliminary data analyses were performed using SPSS 20.0. and Mplus 7.0. First, given that the data of family cohesion/adaptability was collected from either a father or a mother, the multiple group analysis was implemented in Mplus 7.0 [59] to examine the possibility of a gender difference among reporters. An unconstrained model that allowed the 13 paths (i.e., path a-m, see the Figure 1) estimates to vary among father-report and mother-report group was estimated. This model fit the data well, χ^2 (42) = 41.30, CFI = 1.00, RMSEA = 0.00, SRMR = 0.05. Next, a constrained model that constrained the parameter estimates of 13 paths for the father-report and mother-report group to be equal was estimated. If this constrained model resulted in a statistically significant decrement of model fit (χ^2) in comparison with the unconstrained model, then the pattern of associations could be assumed to vary for the father-report and mother-report groups. This model revealed a good fit for the data, χ^2 (55) = 54.65, CFI = 1.00, RMSEA = 0.00, SRMR = 0.06. Results indicated that the model constraining the 13 paths coefficients to be equal across the two groups did not fit significantly worse than the model with these 13 path coefficients freely estimated across groups ($\Delta\chi^2$ = 13.35, Δ *df* = 13, p = 0.42), suggesting that the current model did not differ across gender of reporters. Therefore, our study did not distinguish them in the model.

Then, descriptive statistics were performed using SPSS 20.0 on all demographic variables (i.e., child gender, child age, educational years of parents, and family monthly income) and observed variables (i.e., family cohesion/adaptability, mother–child and father–child attachment, child self-esteem, depressive symptoms, and aggressive behavior).

After that, the simple Pearson's correlations between observed and demographic variables were computed in order to understand relations between them.

Primary analyses were conducted with the structural equation model (SEM) within Mplus 7.0. The proposed multiple mediation model (see Figure 1) with covariates (i.e., child gender, child age, educational years of parents, and family monthly income) was examined to test for possible mediation effects. The fit indices used to evaluate the model were the chi-square statistic (χ^2), goodness-of-fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean residual (SRMR). Model fit was considered acceptable when the values of χ^2 were not significant, and CFI > 0.95, TLI > 0.95, RMSEA < 0.08, and SRMR < 0.08 [60]. A bootstrapping procedure with 5000 iterations was used to test the indirect effects, in which a 95% confidence interval (CI) excluding zero indicates a significant mediating pathway. Missing data were addressed using Mplus' default of the full information maximum likelihood method (FIML) [61].

3. Results

3.1. Descriptive Statistics among All Variables of Interest

Descriptive characteristics and the correlations among study variables are presented in Table 1. Family cohesion/adaptability, father–child attachment, mother–child attachment, child self-esteem were all positively correlated with each other and in the hypothesized direction (*ps* < 0.01). Furthermore, family cohesion/adaptability, father–child attachment, mother–child attachment, and child self-esteem were negatively associated with child depression (*ps* < 0.01). However, only child self-esteem was significantly and negatively related to child aggressive behavior ($p < 0.01$). Additionally, the demographic variables (i.e., children's gender, paternal age, paternal education, maternal age, maternal education, and family monthly income) were related to several of the observed variables. Thus, these demographic variables were examined as covariates in later data analyses.

Table 1. Means, Standard Deviations, and Correlations Among Study Variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Children's gender	1												
2. Children's age	−0.01	1											
3. Paternal age	0.18 **	0.17 **	1										
4. Maternal age	0.15 *	0.23 **	0.80 **	1									
5. Paternal education	0.06	−0.25 **	0.24 **	0.19 **	1								
6. Maternal education	−0.06	−0.28 **	0.07	0.08	0.75 **	1							
7. Monthly income	0.23 **	−0.20 **	0.32 **	0.24 **	0.60 **	0.48 **	1						
8. Family cohesion/adaptability	−0.13	−0.10	−0.10	−0.05	0.23 **	0.20 **	0.17 *	1					
9. Father–child attachment	−0.11	−0.02	−0.02	0.01	0.08	0.17 *	0.12	0.22 **	1				
10. Mother–child attachment	−0.08	−0.03	−0.09	−0.04	0.09	0.21 **	0.10	0.27 **	0.70 **	1			
11. Child self-esteem	−0.20 **	−0.05	−0.08	−0.01	0.06	0.21 **	0.01	0.28 **	0.39 **	0.48 **	1		
12. Child depression	0.15 *	−0.02	0.04	−0.05	0.10	−0.04	0.09	−0.24 **	−0.58 **	−0.64 **	−0.58 **	1	
13. Aggressive behavior	0.34 **	0.04	0.28 **	0.28 **	0.21 **	0.13 *	0.25 **	−0.06	−0.03	−0.10	−0.20 **	0.21 **	1
Mean		9.60	38.43	36.66	3.87	3.74	2.79	121.06	23.88	25.74	30.53	36.06	17.90
SD		1.57	5.16	4.29	1.33	1.36	1.03	17.19	11.80	12.24	6.16	10.40	7.77

Note. Children's gender was coded 1 for boy and 0 for girl. Parental education was measured on a 6-level categorical variable (1 = elementary school diploma, 6 = master's degree). Family monthly income was measured on a 5-level categorical variable (1 = 2000 Chinese Yuan or less, 5 = 30,000 Chinese Yuan or more). * $p < 0.05$, ** $p < 0.01$.

3.2. The Mediating Roles of Mother–Child and Father–Child Attachment and Child Self-Esteem

The final model with standardized path coefficients is presented in Figure 2. The model fit the data very well, χ^2 (21) = 22.23, $p = 0.39$, CFI = 0.99, TLI = 0.99, RMSEA = 0.02 (90% CI = [0, 0.07]), and SRMR = 0.03. The direct effects of multilevel family factors on emotional and behavioral problems in children with ODD is displayed in Table 2. The results showed that family cohesion/adaptability was not directly associated with child depression ($\beta = -0.04$, $p = 0.45$) or aggressive behavior ($\beta = 0.03$, $p = 0.64$). The direct relation between mother–child attachment and father–child attachment and child depression ($\beta_{\text{mother–child attachment}} = -0.34$, $p < 0.01$; $\beta_{\text{father–child attachment}} = -0.23$, $p < 0.05$) were significant, while mother and father attachments were not related to child aggressive behavior ($\beta_{\text{mother–child attachment}} = 0.09$, $p = 0.39$; $\beta_{\text{father–child attachment}} = 0.11$, $p = 0.25$). Furthermore, a significant association emerged between child self-esteem and child depression ($\beta = -0.28$, $p < 0.001$) and aggressive behavior ($\beta = -0.31$, $p < 0.001$).

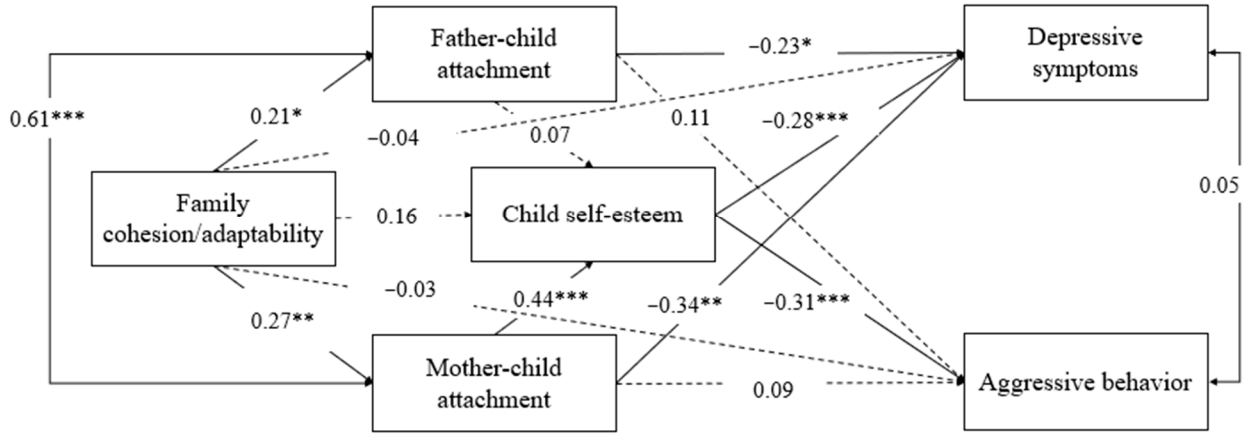

Figure 2. Results Model of Multilevel Family Factors and Emotional and Behavioral Problems of Children with ODD. Note: These are standardized model results and children's gender and age, parents' age and education, and family monthly income (not shown) were included as covariates in the model. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 2. Direct Effects of Multilevel Family Factors on Child Outcomes.

Path	*B*	*SE*	*p*	95%CI
Child depression as outcome				
family cohesion/adaptability → child depression	−0.007	0.03	0.91	[−0.06, 0.07]
father–child attachment → child depression	−0.25	0.10	0.046	[−0.45, −0.03]
mother–child attachment → child depression	−0.36	0.11	0.009	[−0.51, −0.07]
child self-esteem → child depression	−0.31	0.14	<0.000	[−0.82, −0.23]
Child aggression as outcome				
family cohesion/adaptability → child aggression	0.03	0.03	0.64	[−0.08, 0.05]
father–child attachment → child aggression	0.03	0.07	0.21	[−0.06, 0.24]
mother–child attachment → child aggression	−0.05	0.08	0.55	[−0.11, 0.20]
child self-esteem → child aggression	−0.13	0.10	0.001	[−0.60, −0.16]

Note. Covariates are children's gender and age, parents' age and education, family monthly. Income (not shown).

The indirect effects for this mediation model is displayed in Table 3. Family cohesion/adaptability was indirectly associated with child depression ($\beta = -0.03$, $p < 0.05$, 95%CI = [−0.06, −0.01]) and aggressive behavior ($\beta = -0.04$, $p < 0.05$, 95%C.I.=; [−007; −001]) via mother–child attachment and child self-esteem in sequence.

Mother–child attachment also played a significant role as a mediator in the association between family cohesion/adaptability and child depression ($\beta = -0.09$, $p < 0.05$, 95%CI = [−0.17, −0.01]). However, father–child attachment did not mediate the links between family cohesion/adaptability and child depression ($\beta = -0.05$, $p = 0.11$, 95%CI = [−0.11, 0.01]) or between family cohesion/adaptability and aggressive behavior ($\beta = 0.03$, $p = 0.33$, 95%CI = [−0.02, 0.07]).

Additionally, child self-esteem partially mediated the links between mother–child attachment and child depression ($\beta = -0.12$, $p < 0.01$, 95%CI = [−0.20, −0.05]), and completely mediated the relationship between mother–child attachment and child aggressive behavior ($\beta = -0.14$, $p < 0.01$, 95%CI = [−0.22, −0.05]). However, child self-esteem did not mediate the link between father–child attachment and child depression ($\beta = -0.02$, $p = 0.43$, 95%CI = [−0.07, 0.03]) or between father–child attachment and aggressive behavior ($\beta = -0.02$, $p = 0.42$, 95%CI = [−0.07, 0.03]).

The model as a whole account reached 54% of the variance in child depression, 30% of the variance in child self-esteem, 24% of the variance in child aggressive behavior, 7% of the variance in mother–child attachment, and 5% of the variance in father–child attachment, ranging from large to small.

Table 3. Indirect Effects for Mediation Models.

Path	β	*SE*	*p*	95%CI
Child depression as outcome				
family cohesion/adaptability → mother–child attachment → child depression	−0.09	0.04	0.04	[−0.17, −0.01]
family cohesion/adaptability → father–child attachment → child depression	−0.05	0.03	0.11	[−0.11, 0.01]
family cohesion/adaptability → child self-esteem → child depression	−0.04	0.03	0.15	[−0.10, 0.01]
mother–child attachment → child self-esteem → child depression	−0.12	0.04	0.002	[−0.20, −0.05]
father–child attachment → child self-esteem → child depression	−0.02	0.03	0.45	[−0.07, 0.03]
family cohesion/adaptability → mother–child attachment → child self-esteem → child depression	−0.03	0.02	0.03	[−0.06, −0.01]
family cohesion/adaptability → father–child attachment → child self-esteem → child depression	−0.004	0.01	0.54	[−0.02, 0.01]
Child aggression as outcome				
family cohesion/adaptability → mother–child attachment → child aggression	0.03	0.03	0.45	[−0.04, 0.09]
family cohesion/adaptability → father–child attachment → child aggression	0.03	0.03	0.35	[−0.02, 0.07]
family cohesion/adaptability → child self-esteem → child aggression	−0.05	0.03	0.08	[−0.10, 0.01]
mother–child attachment → child self-esteem → child aggression	−0.13	0.05	0.003	[−0.22, −0.05]
father–child attachment → child self-esteem → child aggression	−0.02	0.03	0.46	[−0.07, 0.03]
family cohesion/adaptability → mother–child attachment → child self-esteem → child aggression	−0.04	0.02	0.03	[−0.07, −0.01]
family cohesion/adaptability → father–child attachment → child self-esteem → child aggression	−0.01	0.01	0.54	[−0.02, 0.01]

Note. Covariates are children's gender and age, parents' age and education, family monthly income (not shown).

4. Discussion

The present study aimed to examine the association of multilevel family factors with the emotional and behavioral problems of children with ODD. Our findings indicated that family cohesion/adaptability at system level was indirectly related to emotional and behavioral problems via the mother–child attachment at a dyadic level and child self-esteem at an individual level in sequence. This finding extended previous findings by demonstrating that the multilevel family model could also explain the effects of the system, dyadic, and individual level family factors on the emotional and behavior problems of children with ODD. Regarding dyadic mother– and father–child attachment, we found that only mother–child attachment mediated the association between family cohesion/adaptability and child depression, while father–child attachment was not a significant mediator. These results suggested that mother–child attachment within Chinese families impacts child depressive symptom outcomes to a greater extent. Moreover, child self-esteem partially mediated the link between mother–child attachment and child depression, and completely mediated the relationship between mother–child attachment and child aggressive behavior. This finding highlighted the importance of carefully considering the role of self-esteem as an individual child characteristics on the development of emotional and behavioral problems. Taken together, the findings of the present study provided unique insights into explaining how multilevel family factors differently and uniquely relate to emotional and behavioral problems in children with ODD. Furthermore, the study's results could contribute to the development of educational guidance for families with children who have emotional and behavioral problems.

Our findings that family cohesion/adaptability, at the system level factor, was indirectly linked to emotional and behavioral problems through mother–child attachment and child self-esteem were in line with previous findings [38,39] and consistent with person–context interaction theory and multilevel family factors model. In previous studies conducted in Western cultures, family cohesion, a distal family factor, was found to be associated with child behavioral problems through more proximal factors, such as parent–child interactions [62]. From our findings, we could postulate that findings generalize to families in Mainland China. Indeed, within the cohesive family environment, there were more positive interactions between parents and children, which contributed to a higher quality of parent–child attachment and higher levels of child self-esteem. The higher quality of parent–child attachment and higher levels of child self-esteem appeared to protect children with ODD from further developing emotional and behavioral problems. The findings also validate the ancient Chinese proverb, "A harmonious family brings prosperity". Cohesion and adaptability within the family would facilitate parent–child attachment and child development, even among children with ODD. The findings indicated the urgent need

to understand the emotional and behavioral problems of children with ODD within the broader family contexts, instead of focusing solely on one family factor. In terms of clinical practice, the findings highlighted the significance of a positive family environment for the development of children with ODD.

As hypothesized, mother–child attachment, a dyadic level family factor, was associated closely with child development within the family context. Our study found that mother–child attachments mediated the relationship between family cohesion/adaptability and child depression. However, the mediating role of father–child attachments was not significant. Thus, mother–child attachment, unlike father–child attachment, was a significant mediator in the relationships between system level family factors and the individual outcomes of children with ODD [38]. This conclusion is consistent with the dominant hypothesis [24] and the concept of the traditional division of the family roles [63]. Recently, as a result of social and cultural shifts, more fathers have progressively accepted greater family duties. However, under the traditional gender division of labor, mothers are still the primary caretakers, responsible for the children's everyday lives and diverse socioemotional needs. This was particularly true for mothers of children with emotional and behavioral problems [48,63]. Fathers tend to take a secondary role in the family. Societal expectations and gender norms forced fathers to prioritize financial assistance. Due to this division of work, the mother–child attachment was more crucial to the development of the child than the father–child attachment. Additionally, this implicates that father–child and mother–child attachments were differentially related to child outcomes [64,65]. The father–child attachment was closely related to the social development of the child, while the mother–child attachment was mainly linked to the internal psychological outcomes of children, such as emotional problems [7]. These results all suggested that the mother–child attachment is a pivotal dyadic-level factor that linked with child emotional development, specifically in families with children identified with ODD. Thus, it is important that future research and home-based educational guidance for children with ODD should focus on family-related dyadic factors, such as mother–child attachment.

Results in the current study also indicated that child self-esteem mediated the spillover effect from mother–child attachment to the emotional and behavioral problems of children with ODD. This finding highlighted that child self-esteem, as an individual level factor, was an important pathway via which dyadic level factors exert function on child development. In fact, according to the sociometer hypothesis [66], self-esteem is a sociometer that is involved in the maintenance of interpersonal relations. Moreover, Leary (1990) proposed that individual self-esteem is associated with the evaluation of others given that the individual needs to be accepted in society. Children with ODD who experience lower levels of mother–child attachment might internalize negative perceptions of being rejected by their mothers, which might lead to lower self-esteem. Low self-esteem, in turn, can futher exacerbate emotional and behavioral problems in children [41,67]. Conversely, higher quality of mother–child attachment may contribute to a higher level of self-esteem in children, which can buffer against other emotional and behavioral problems. These findings point to the importance that child self-esteem played in the relationship between dyadic level factors (i.e., mother–child attachment) and child psychological outcomes. Importantly, it is worth noting that although children with ODD are more likely to exhibit emotional and behavioral problems, higher levels of self-esteem can improve the healthy development of children, and decrease the occurrence of emotional and behavioral problems. Taken together, these findings can help inform and improve services for both families with children with ODD and with emotional or behavioral problems.

4.1. Limitations and Future Prospects

Our findings should be interpreted in light of several limitations. First, our study predominantly focused on the hierarchy of family factors at different levels and their effects on problem behaviors in children with ODD, the mutual linkages are not further elaborated on in this study. Additionally, with a cross-sectional method, we could not

infer causal relationships or examine reciprocal relationships. However, the interplay of multilevel family factors and the emotional and behavioral problems of children with ODD might initiate transactional feedback loops. Longitudinal research should underscore the reciprocal relationships between multilevel family factors and child ODD symptoms. Second, the data collected in the present study were based on self-reports from parents, class master teachers, and children, which could have biased our results. Future studies should aim to reduce the bias caused by self-report methods and prioritize multi-informant ratings to better capture the heterogeneity of family dynamics. A further limitation is that we did not eliminate the influence of the different survey methods utilized in Grades 1–2 and Grades 3–5. To properly reflect the developmental outcomes of young children, future research should embrace more objective approaches. Fourth, the current study only examined parent–child attachment at the dyadic level and child self-esteem at the individual factor. Observing both parent–child relationships and marital relationships on the dyadic level and both the child and parent factors on the individual level may offer a new and integrated perspective to explore the association. Another concern is that caution is needed when generalizing the results of our study across cultures or age groups. As was previously stated, the core family values of Chinese culture are distinct from those of Western civilizations [68]. Consequently, the specific links discovered between multilevel family factors and emotional and behavioral problems in children with ODD must be confirmed in Western countries.

4.2. Implications

Despite these limitations, the present study substantiated and enriched the multilevel family factors model [12,38] by considering mother–child and father–child attachments and child self-esteem concurrently. Findings in the current study contributed to our understanding of how multilevel family factors relate to the emotional and behavioral problems of children with ODD. For researchers and practitioners working with families that have children with ODD, attuning to the family environment (family cohesion and adaptability), parent–child attachment (particularly mother–child attachment) may help decrease the severity of child emotional and behavioral problems. Furthermore, child self-esteem, as a vital self-protective factor, should be emphasized as a mechanism that can help prevent emotional and behavioral problems in children with ODD.

5. Conclusions

The current study examined the associations between multilevel family factors (i.e., family cohesion/ adaptability at a system level, mother–child and father–child attachment at a dyadic level, and child self-esteem at an individual level) and emotional and behavioral problems among children with ODD in China. This study contributes to the research on the development of children with ODD who have comorbid emotional and behavioral problems through an examination of a theory-based model proposed by Lin et al. (2022) [12]. The results revealed that a system level factor (family cohesion/adaptability) was associated with child emotional and behavior problems indirectly through factors at the dyadic level (mother–child attachment) and the individual level (child self-esteem) in sequence. Mother–child, but not father–child, attachments, mediated the linkage between family cohesion/adaptability and the emotional problems of children with ODD. Moreover, child self-esteem mediated the association between mother–child attachment and child emotional and behavioral problems. These results underscored the significance of understanding the emotional and behavioral problems of children with ODD within the framework of the family, and more particularly, within the context of the multiple levels of family relationships. The research highlighted the need for practitioners to carefully consider the features of the systemic family and the unique relationship between multilevel family factors and child outcomes.

Author Contributions: Conceptualization, X.L. and S.P.H.; methodology, Q.Z.; software, W.D. and T.H.; validation, J.M., Q.Z. and X.L.; formal analysis, T.H. and J.M.; investigation, T.H. and W.D.; resources, X.L.; data curation, T.H. and W.D.; writing—original draft preparation, T.H. and J.M.; writing—review and editing, T.H., U.A. and J.M.; visualization, T.H. and J.M.; supervision, X.L. and S.P.H.; project administration, X.L.; funding acquisition, X.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by The [National Nature Science Foundation of China] grant number [31800935, 32071072].

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of Beijing Normal University (protocol code 202003310034 and date of approval 31 March 2020).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed.; American Psychiatric Association: Washington, DC, USA, 2013.
2. Ezpeleta, L.; Penelo, E.; Navarro, J.B.; de la Osa, N.; Trepat, E. Co-developmental trajectories of defiant/headstrong, irritability, and prosocial emotions from preschool age to early adolescence. *Child Psychiatry Hum. Dev.* **2021**, *53*, 908–918. [CrossRef] [PubMed]
3. Nock, M.K.; Kazdin, A.E.; Hiripi, E.; Kessler, R.C. Lifetime prevalence, correlates, and persistence of oppositional defiant disorder: Results from the National Comorbidity Survey Replication. *J. Child Psychol. Psychiatry* **2007**, *48*, 703–713. [CrossRef] [PubMed]
4. Smith, T.E.; Lee, C.A.; Martel, M.M.; Axelrad, M.E. ODD symptom network during preschool. *J. Abnorm. Child Psychol.* **2017**, *45*, 743–748. [CrossRef] [PubMed]
5. Bernhard, A.; Mayer, J.S.; Fann, N.; Freitag, C.M. Cortisol response to acute psychosocial stress in ADHD compared to conduct disorder and major depressive disorder: A systematic review. *Neurosci. Biobehav. Rev.* **2021**, *127*, 899–916. [CrossRef] [PubMed]
6. Wang, J.; Yang, Y.; Tang, Y.; Wu, M.; Jiang, S.; Zou, H. Longitudinal links among parent-child attachment, emotion parenting, and problem behaviors of preadolescents. *Child. Youth Serv. Rev.* **2021**, *121*, 105797. [CrossRef]
7. Yan, J.; Schoppe-Sullivan, S.J.; Feng, X. Trajectories of mother-child and father-child relationships across middle childhood and associations with depressive symptoms. *Dev. Psychopathol.* **2019**, *31*, 1381–1393. [CrossRef] [PubMed]
8. Li, L.; Lin, X.; Hinshaw, S.P.; Du, H.; Qin, S.; Fang, X. Longitudinal associations between oppositional defiant symptoms and interpersonal relationships among Chinese children. *J. Abnorm. Child Psychol.* **2017**, *46*, 1267–1281. [CrossRef] [PubMed]
9. Tseng, W.L.; Kawabata, Y.; Gau, S.S.F. Social adjustment among Taiwanese children with symptoms of ADHD, ODD, and ADHD comorbid with ODD. *Child Psychiatry Hum. Dev.* **2011**, *42*, 134–151. [CrossRef] [PubMed]
10. He, T.; Li, L.; Gu, D.; Tan, Y.; Chen, H.; Wang, Y.; Lin, X. Parental depression and conduct problems among Chinese migrant children with oppositional defiant disorder symptoms: Testing moderated mediation model. *Curr. Psychol.* **2021**. [CrossRef]
11. Lavigne, J.V.; Gouze, K.R.; Hopkins, J.; Bryant, F.B.; Lebailly, S.A. A multi-domain model of risk factors for ODD symptoms in a community sample of 4-year-olds. *J. Abnorm. Child Psychol.* **2012**, *40*, 741–757. [CrossRef] [PubMed]
12. Lin, X.; He, T.; Melissa, A.H.; Chi, P.; Hinshaw, S. A Review of Multiple Family Factors Associated with Oppositional Defiant Disorder. *Int. J. Environ. Res. Public Health* **2022**, *19*, 10866. [CrossRef]
13. Rey, J.M.; Walter, G.; Plapp, J.M.; Denshire, E. Family environment in attention deficit hyperactivity, oppositional defiant and conduct disorders. *Aust. N. Z. J. Psychiatry* **2015**, *34*, 453–457. [CrossRef] [PubMed]
14. Olson, D.H. Circumplex model of marital and family systems. *J. Fam. Ther.* **2000**, *22*, 144–167. [CrossRef]
15. Crane, D.R.; Ngai, S.W.; Larson, J.H.; Hafen, M. The influence of family functioning and parent-adolescent acculturation on North American Chinese adolescent outcomes. *Fam. Relat.* **2005**, *54*, 400–410. [CrossRef]
16. Miller, I.W.; Ryan, C.E.; Keitner, G.I.; Bishop, D.S.; Epstein, N.B. The McMaster approach to families: Theory, assessment, treatment and research. *J. Fam. Ther.* **2000**, *22*, 168–189. [CrossRef]
17. Deater-Deckard, K.; Atzaba-Poria, N.; Pike, A. Mother- and father-child mutuality in Anglo and Indian British families: A link with lower externalizing behavior problems. *J. Abnorm. Child Psychol.* **2004**, *32*, 609–620. [CrossRef]
18. Rinaldi, C.M.; Howe, N. Mothers' and fathers' parenting styles and associations with toddlers' externalizing, internalizing, and adaptive behaviors. *Early Child. Res. Q.* **2012**, *27*, 266–273. [CrossRef]
19. Bowlby, J. Attachment and loss: Retrospect and prospect. *Am. J. Orthopsychiatry* **1982**, *52*, 664–768. [CrossRef] [PubMed]

20. Branstetter, S.A.; Fuman, W. Buffering effect of parental monitoring knowledge and parent-adolescent relationships on consequences of adolescent substance use. *J. Child Fam. Stud.* **2013**, *22*, 192–198. [CrossRef] [PubMed]
21. Spruit, A.; Goos, L.; Weenink, N.; Rodenburg, R.; Niemeyer, H.; Stams, G.J.; Colonnesi, C. The relation between attachment and depression in children and adolescents: A multilevel meta-analysis. *Clin. Child Fam. Psychol. Rev.* **2020**, *23*, 54–69. [CrossRef] [PubMed]
22. Ainsworth, M.D.S. Attachments beyond infancy. *Am. Psychol.* **1989**, *44*, 709–716. [CrossRef] [PubMed]
23. Pan, Y.; Zhang, D.; Liu, Y.; Ran, G.; Teng, Z. Different effects of paternal and maternal attachment on psychological health among Chinese secondary school students. *J. Child Fam. Stud.* **2016**, *25*, 2998–3008. [CrossRef]
24. Suess, G.J.; Grossmann, K.E.; Sroufe, L.A. Effects of Infant Attachment to Mother and Father on Quality of Adaptation in Preschool: From Dyadic to Individual Organisation of Self. *Int. J. Behav. Dev.* **1992**, *15*, 43–65. [CrossRef]
25. Murphy, S.E.; Boyd-Soisson, E.; Jacobvitz, D.B.; Hazen, N.L. Dyadic and Triadic Family Interactions as Simultaneous Predictors of Children's Externalizing Behaviors. *Fam. Relat.* **2017**, *66*, 346–359. [CrossRef]
26. Howes, C.; Ritchie, S. Attachment organizations in children with difficult life circumstances. *Dev. Psychopathol.* **1999**, *11*, 251–268. [CrossRef] [PubMed]
27. Lunkenheimer, E.; Hamby, C.M.; Lobo, F.M.; Cole, P.M.; Olson, S.L. The role of dynamic, dyadic parent-child processes in parental socialization of emotion. *Dev. Psychol.* **2020**, *56*, 566–577. [CrossRef] [PubMed]
28. Lam, C.B.; McHale, S.M.; Crouter, A.C. Parent-child shared time from middle childhood to late adolescence: Developmental course and adjustment correlates. *Child Dev.* **2012**, *83*, 2089–2103. [CrossRef] [PubMed]
29. Branje, S.J.; Hale, W.W.; Frijns, T.; Meeus, W.H. Longitudinal associations between perceived parent-child relationship quality and depressive symptoms in adolescence. *J. Abnorm. Child Psychol.* **2010**, *38*, 751–763. [CrossRef]
30. Carter, J.S.; Smith, S.; Bostick, S.; Grant, K.E. Mediating effects of parent-child relationships and body image in the prediction of internalizing symptoms in urban youth. *J. Youth Adolesc.* **2014**, *43*, 554–567. [CrossRef] [PubMed]
31. Botero, J.C.R.; Medina, C.M.A.; Rizzo, A.A.; Aristizabal, A.C.G.; Zuluaga, E.H. Relationship between social cognition and executive functions in children with oppositional defiant disorder. *Rev. Iberoam. De Diagn. Y Eval. Psicol.* **2016**, *2*, 49–58. [CrossRef]
32. O'Kearney, R.; Salmon, K.; Liwag, M.; Fortune, C.; Dawel, A. Emotional abilities in children with oppositional defiant disorder (ODD): Impairments in perspective–taking and understanding mixed emotions are associated with high callous–unemotional traits. *Child Psychiatry Hum. Dev.* **2017**, *48*, 346–357. [CrossRef]
33. Metalsky, G.I., Jr.; Joiner, T.E.; Hardin, T.S.; Abramson, L.Y. Depressive reactions to failure in a naturalistic setting: A test of the hopelessness and self-esteem theories of depression. *J. Abnorm. Psychol.* **1993**, *102*, 101–109. [CrossRef] [PubMed]
34. Rosenberg, M. *Society and the Adolescent Self-Image*; Princeton University Press: Princeton, NJ, USA, 1965; Volume 11, pp. 326–343.
35. Leeuwis, F.H.; Koot, H.M.; Creemers, D.H.; Van Lier, P.A. Implicit and explicit self-esteem discrepancies, victimization and the development of late childhood internalizing problems. *J. Abnorm. Child Psychol.* **2014**, *43*, 909–919. [CrossRef]
36. Lin, X.; Li, L.; Li, Y.; Wang, Z.; Chen, Q.; Fang, X. How paternal and maternal psychological control affect on internalizing and externalizing problems of children with ODD symptoms. *Psychol. Dev. Educ.* **2014**, *30*, 635–645. (In Chinese)
37. Magnusson, D.; Stattin, H. *Person-Context Interaction Theories*; Handbook of Child Psychology; Wiley: New York, NY, USA, 1998; pp. 685–759.
38. Lin, X.; Li, L.; Heath, M.A.; Chi, P.; Xu, S.; Fang, X. Multiple levels of family factors and oppositional defiant disorder symptoms among Chinese children. *Family Process* **2018**, *57*, 195–210. [CrossRef]
39. Hopkins, J.; Lavigne, J.V.; Gouze, K.R.; LeBailly, S.A.; Bryant, F.B. Multi-domain models of risk factors for depression and anxiety symptoms in preschoolers: Evidence for common and specific factors. *J. Abnorm. Child Psychol.* **2013**, *41*, 705–722. [CrossRef] [PubMed]
40. Liu, L.; Zhao, L. The effect of family functioning on anger: The mediating role of self-esteem. *J. Shanxi Univ. (Philos. Soc. Sci. Chin.)* **2018**, *41*, 139–144.
41. Hu, J.; Ai, H. Self-esteem mediates the effect of the parent-adolescent relationship on depression. *J. Health Psychol.* **2014**, *21*, 897–904. [CrossRef]
42. Kim, J.; Cicchetti, D. A longitudinal study of child maltreatment, mother-child relationship quality and maladjustment: The role of self-esteem and social competence. *J. Abnorm. Child Psychol.* **2004**, *32*, 341–354. [CrossRef]
43. Yeung, J.W.K.; Tsang, E.Y.H.; Chen, H.-F. Parental socialization and development of Chinese youths: A multivariate and comparative approach. *Int. J. Environ. Res. Public Health* **2019**, *16*, 1730. [CrossRef]
44. Chang, L.; Schwartz, D.; Dodge, K.A.; McBride-Chang, C. Harsh parenting in relation to child emotion regulation and aggression. *J. Fam. Psychol.* **2003**, *17*, 598–606. [CrossRef] [PubMed]
45. Fan, M. Effects of the "one-child" policy and the number of children in families on the mental health of children in China. *Rev. De Cercet. Şi Interv. Soc.* **2016**, *52*, 105–129.
46. Wang, W. Research on the sexual division of labor. *J. Chongqing Univ. (Soc. Sci. Ed. Chin.)* **2016**, *5*, 135–143.
47. Chen, X.; Chen, X.; Zhao, S.; Way, N.; Yoshikawa, H.; Zhang, G.; Deng, H.; Cao, R.; Chen, H.; Li, D. Autonomy- and connectedness-oriented behaviors of toddlers and mothers at different historical times in urban china. *Dev. Psychol.* **2021**, *57*, 1254–1260. [CrossRef]
48. Li, X. Fathers' Involvement in Chinese Societies: Increasing Presence, Uneven Progress. *Child Dev. Perspect.* **2020**, *14*, 150–156. [CrossRef]

49. Chen, F.; Zhu, S.; Bi, C. The development of self-esteem and the role of agency and communion: A longitudinal study among Chinese. *J. Child Fam. Stud.* **2018**, *27*, 816–824. [CrossRef]
50. National Health and Family Planning Commission of the PRC. *China Family Development Report 2015*; China Population Publishing House: Beijing, China, 2015.
51. Chen, L.Y.; Luo, X.R.; Wei, Z.; Guan, B.Q. Parenting styles, parenting locus of control and family function of children with oppositional defiant disorder. *J. Clin. Psychol.* **2011**, *19*, 209–211. (In Chinese)
52. Armsden, G.C.; Greenberg, M.T. The inventory of parent and peer attachment: Individual differences and their relationship to psychological well-being in adolescence. *J. Youth Adolesc.* **1987**, *16*, 427–451. [CrossRef]
53. Jin, C.C.; Zeng, R. The trait of attachment and the effect of attachment on social adjustment of middle school students: Parents intimacy as a moderator. *Psychol. Dev. Educ.* **2010**, *26*, 577–583. (In Chinese) [CrossRef]
54. Zhu, C.; Li, Y.; Li, Z.; Ding, W.; Wang, X.; Li, W.; Xie, R. The longitudinal relationship between filial piety and prosocial behavior of children: The chain mediating effect of self-esteem and peer attachment. *Curr. Psychol.* **2022**. [CrossRef]
55. Fendrich, M.; Weissman, M.M.; Warner, V. Screening for depressive disorder in children and adolescents: Validating the center for epidemiologic studies depression scale for children. *Am. J. Epidemiol.* **1990**, *131*, 538–551. [CrossRef]
56. Wong, M.; Power, T.G. Childhood depressive symptoms during the transition to primary school in Hong Kong: Comparison of child and maternal reports. *Child. Youth Serv. Rev.* **2019**, *100*, 183–190. [CrossRef]
57. Ladd, G.W.; Profilet, S.M. The child behavior scale: A teacher-report measure of young children's aggressive, withdrawn, and prosocial behaviors. *Dev. Psychol.* **1996**, *32*, 1008–1024. [CrossRef]
58. Tu, X.; Lv, Y.; Li, X.; Fang, X.; Zhao, G.; Lin, X.; Hong, Y.; Zhang, L.; Stanton, B. School performance and school behaviour of children affected by acquired immune deficiency syndrome (AIDS) in China. *Vulnerable Child. Youth Stud.* **2009**, *4*, 199–209. [CrossRef] [PubMed]
59. Muthén, L.K.; Muthén, B.O. *Mplus: Statistical Analyses with Latent Variables. User's Guide, 3*; Muthén & Muthén: Los Angeles, CA, USA, 1998.
60. Kline, R.B. *Principles and Practice of Structural Equation Modeling*, 3rd ed.; Guilford Press: New York, NY, USA, 2015.
61. Enders, C.K. *Applied Missing Data Analysis*; Guilford Press: New York, NY, USA, 2010.
62. Dekovic, M.; Janssens, J.M.A.M.; As, N.M.C. Family predictors of antisocial behavior in adolescence. *Family Process* **2004**, *42*, 223–235. [CrossRef]
63. Hou, F.; Wu, X.C.; Zou, S.Q.; Liu, Y.; Huang, B.B. The association between parental involvement and adolescent's prosocial behavior: The mediating role of parent-child attachment. *Psychol. Dev. Educ.* **2018**, *34*, 417–425. (In Chinese) [CrossRef]
64. Brown, G.L.; McBride, B.A.; Shin, N.; Bost, K.K. Parenting predictors of father-child attachment security: Interactive effects of father involvement and fathering quality. *Fathering* **2007**, *5*, 197–219. [CrossRef]
65. Liu, Y.L. An examination of three models of the relationships between parental attachments and adolescents' social functioning and depressive symptoms. *J. Youth Adolesc.* **2008**, *37*, 941–952. [CrossRef]
66. Leary, M.R.; Tambor, E.S.; Terdal, S.K.; Downs, D.L. Self-esteem as an interpersonal monitor: The sociometer hypothesis. *J. Personal. Soc. Psychol.* **1999**, *68*, 270–274. [CrossRef]
67. Brown, G.L.; Mangelsdorf, S.C.; Neff, C.; Schoppe-Sullivan, S.J.; Frosch, C.A. Young children's self-concepts: Associations with child temperament, mothers' and fathers' parenting, and triadic family interaction. *Merrill-Palmer Q.* **2009**, *55*, 184–216. [CrossRef]
68. Wang, M.; Xing, X.; Zhao, J. Intergenerational transmission of corporal punishment in china: The moderating role of marital satisfaction and gender. *J. Abnorm. Child Psychol.* **2014**, *42*, 1263–1274. [CrossRef] [PubMed]

behavioral sciences

MDPI

Article

Longitudinal Relation between Family Socio-Economic Status and Problem Behaviors in Chinese Children: The Roles of Sense of Coherence and Maternal Warmth

Bibo Mo [1], Rui Fu [2], Xiaoshi Liu [3], Gangmin Xu [4], Junsheng Liu [4] and Dan Li [1,*]

[1] Department of Psychology, Shanghai Normal University, Shanghai 200030, China
[2] Center for Violence Prevention at Children's Hospital of Philadelphia, Philadelphia, PA 19146, USA
[3] Department of Psychology, Yangzhou University, Yangzhou 225002, China
[4] School of Psychology and Cognitive Science, East China Normal University, Shanghai 200333, China
* Correspondence: lidan501@163.com

Abstract: Literature has well-documented the relation of family socio-economic status (SES) to children's problem behaviors, yet the complex mechanisms underlying the relation are not well understood. Therefore, the primary goal of this one-year longitudinal study was to explore the mediating role of children's sense of coherence and the moderating role of perceived maternal warmth in the association between family SES and externalizing and internalizing problems in Chinese children. The sample consisted of 913 children (493 boys; M_{age} = 11.50 years, SD = 1.04) in fourth to sixth grades in an urban area in mainland China. Data were obtained from multiple sources, including child self-reports, parental reports, and teacher ratings. The results indicated that children's sense of coherence mediated the association between family SES and internalizing problem behaviors, but not externalizing problem behaviors. This mediating role was also moderated by maternal warmth and specifically, family SES was negatively associated with internalizing problem behaviors via the sense of coherence for children who perceived high maternal warmth. Generally, these results highlighted the possible roles of a sense of coherence and maternal warmth in the longitudinal implications of family SES for Chinese children's internalizing problems.

Keywords: family socioeconomic status (SES); externalizing problems; internalizing problems; sense of coherence; maternal warmth

Citation: Mo, B.; Fu, R.; Liu, X.; Xu, G.; Liu, J.; Li, D. Longitudinal Relation between Family Socio-Economic Status and Problem Behaviors in Chinese Children: The Roles of Sense of Coherence and Maternal Warmth. *Behav. Sci.* **2023**, *13*, 291. https://doi.org/10.3390/bs13040291

Academic Editor: Gengfeng Niu

Received: 10 February 2023
Revised: 18 March 2023
Accepted: 21 March 2023
Published: 29 March 2023

1. Introduction

Research on children's and adolescents' social development has been largely focused on problem behaviors, including externalizing and internalizing problem behaviors [1–3]. It is shown that externalizing problem behaviors, such as aggressive, hyperactive, and disruptive behaviors, positively predict peer rejection and low academic performance [4,5]. Similarly, it has also been found that internalizing problem behaviors (e.g., anxiety, depression) positively predict sleep problems and peer victimization [6,7]. According to the social causation theory [8,9], the shortage of material resources in the family is likely to expose children to stress, which in turn leads to subsequent problem behaviors, suggesting economic difficulties as a stressor impacting child development. This proposition has been supported by several longitudinal studies [10,11] that family socioeconomic disadvantage leads to long-term problem behavior.

However, our understanding of the relationship between socioeconomic status (SES) and problem behaviors has been limited to individual-oriented, Western societies, leaving this issue largely understudied in group-oriented societies, such as China. A few studies examining the mechanisms underlying the association between family SES and academic achievement in China have suggested the roles of family process factors in mediating and moderating the association [12]. Yet little research has examined the underlying mechanism

in the relation between SES and other adjustment domains, especially problem behaviors that contribute to the comorbidities of adjustment difficulties [13]. As such, additional work is needed more specifically on factors that help to explain or modify the relation between family SES and problem behaviors in Chinese children.

Previous studies have demonstrated that a strong sense of coherence as a positive personal characteristic [14] jointly with maternal warmth as an optimal contextual factor [15] buffer individuals against maladjustment development. However, their roles in protecting children residing in families with limited resources from problems in Chinese children remain understudied. To address the gaps, the present study aimed to explore the relations between family SES and externalizing and internalizing problem behaviors and the role of a sense of coherence and maternal warmth in mediating and moderating the relations in Chinese children.

1.1. Family SES and Children's Problem Behaviors in the Chinese Context

Problem behaviors, including both internalizing and externalizing problem behaviors, are prevalent among Chinese children [16]. Internalizing problem behaviors are defined as a problematic syndrome that includes depression, anxiety, as well as withdrawal behavior, and so forth [17]. Externalizing problem behaviors refer to a group of behaviors that reflect the negative reactions of children to the external environment, including aggressive, hyperactive, and disruptive behaviors [18,19]. In the Chinese context where prosociality and behavioral appropriateness are emphasized [20], externalizing behavior problems are perceived by others as indicating low self-control, selfish or anti-collective and have thus been robustly associated with socioemotional and school maladjustment, such as low academic achievement and life dissatisfaction [21–23]. At the same time, children in China have been found to display high levels of affect disturbances and other internalizing problems [16], which strongly contribute to child maladjustment in the Chinese context [24,25]. Given the increased attention on problem behaviors, particularly internalizing problems, from professionals and the public in recent years [26], it is necessary to investigate stressors that are associated with such behaviors and potential factors that buffer the associations among Chinese children.

SES is a measurement index reflecting a person's status or prestige relative to others [27]. Generally speaking, family SES encompasses parental education, family income, and occupational status [8,28]. Specifically, parental education refers to skills and abilities necessary for individuals to be productive members of society (human capital), family income represents a family's ability to purchase material resources (financial capital), and occupational status reflects one's social standing in the occupational hierarchy and social network resources (social capital) [8,29].

As posited in Bronfenbrenner's ecological systems theory [30], family SES is an important factor in the microsystem, the most immediate environment in which children live. It determines a family's level of access to and control over economic and social resources that contribute to children's well-being [31]. This theoretical argument has been endorsed in many empirical studies which demonstrate the critical implications of family SES for children's educational achievement, and physical and psychological health [9,13]. These implications seem to be related to adequate resources such as nutrition, access to good health care, and cognitively stimulating materials and experiences, which facilitate the development of children's well-being [8].

Compared to Western studies in which the role of family SES in predicting problem behaviors has been widely endorsed [32,33], this predicting role of family SES has been less studied in China as the majority has focused on its prediction of Chinese children's academic achievement [34]. Considering that the importance of socioemotional well-being has been increasingly recognized in contemporary China [35,36], it is warranted to better understand the association between family SES and children's internalizing problems. Furthermore, using a longitudinal approach would allow us to explore the role of family SES in contributing to the change in internalizing problems.

1.2. The Mediating Role of Sense of Coherence

Sense of coherence refers to "a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence" ([37] p.19). Antonovsky [37] pointed out the three components of sense of coherence, encompassing comprehensibility (the extent to which an individual perceives the stimuli from internal and external environments to be structured, predictable, and interpretable); manageability (the extent to which an individual use resources to address or react to stimuli); and meaningfulness (the extent to which an individual considers the stimuli worth investing their time and efforts to address). It is viewed as a dispositional orientation that helps individuals sustain and promote their physical and mental health [37,38]. According to the Salutogenic model, generalized resistance resources foster an individual's ability to effectively respond to stress which in turn enhances an individual's sense of coherence [37,39]. In other words, when chronic generalized resistance resources are integrated into an individual's life situation, these resistance resources are considered the primary determinants of the strength of the individual's sense of coherence level [40].

As a type of chronic, generalized resistance resources, family SES, is strongly associated with family coping resources. These resources not only denote the materials and strategies within the family that the person can rely on to manage stressful events, but also provide the foundation for the three components (i.e., comprehensibility, manageability, and meaningfulness) of sense of coherence [40,41]. Individuals with higher levels of sense of coherence tend to view stressful events as predictable, explainable, and meaningful [38]. This positive orientation when coping with life stressors is evidenced to lead to effective coping [42,43] and positive, future-focused emotions [44]. These positive coping responses are likely to be associated with fewer problem behaviors, such as substance use, depression, and anxiety [45,46]. Taken together, family SES may indirectly contribute to children's problem behaviors via a sense of coherence, which may play a mediating role in the underlying influencing mechanism. However, this speculation has not been addressed in the literature.

As posited in the Salutogenic model, the contribution of a sense of coherence to promoting children's overall adjustment is viewed as universal [37,47] and empirical findings in many Western societies (e.g., Australia, Belgium, Brazil; [2]) have lent support to this postulation [46,48]. However, compared to Western research, studies on the role of the sense of coherence in group-oriented, non-Western societies, namely, China, are still lacking. In Chinese culture, the need for individuals to develop the ability to suppress emotions and impulses is highly emphasized, and over-expression of impulsive behaviors is viewed as a sign of immaturity [49]. Self-control plays a pivotal role in Chinese children's development of social competence, which is manifested in curbing one's anger or aggressive impulses in face of conflicts [49,50]. Moreover, self-control is regarded as a dimension of manageability, one core component of sense of coherence [51]. Children with a high sense of coherence are self-controlled which helps them monitor and modulate their negative emotional reactivity and demonstrate other effective coping responses [43]. In addition, children with a high sense of coherence tend to have a pervasive feeling of self-confidence which is increasingly valued in contemporary China, particularly in urban areas with increased competitiveness [52,53].

The social change in competitive urban China has manifested in changes in values that facilitate the development of cooperation and interdependence to those that facilitate the development of individual autonomy and independence [49]. Given the changes in cultural values, it is critical to examine the role of sense of coherence in predicting Chinese children's adjustment. Furthermore, as China's economy continues to grow, household income inequality has widened and been accompanied by financial distress in low SES families [54,55]. It is clear that family financial stress is positively associated with problem behaviors in China [56]. Therefore, the possible mediating role of sense of coherence in linking family SES and Chinese children's adjustment is worth examining. It is possible that high family SES would be associated with increased levels of sense of coherence which

is in turn related to fewer problem behaviors, as an important indicator of adjustment in Chinese children.

1.3. The Moderating Role of Maternal Warmth

Although the literature has documented that family SES is, in general, positively associated with sense of coherence and children's positive development [57], not all children with abundant resources exhibit high levels of sense of coherence and adjustment. There is some research indicating that the impact of family SES on children may be enhanced or weakened by contextual factors (e.g., living regions; [58]). As suggested in the resource-potentiating model [59,60], positive conditions may help enhance individuals' resources and promote adaptive development whereas adverse conditions may suppress adaptive development. According to this model, high maternal warmth may elevate the advantages of higher family SES as revealed in a stronger sense of coherence and/or fewer problem behaviors yet such advantages are likely less or not pronounced when maternal warmth is low. From a different perspective, as argued in the stress model [61], unfavorable social conditions may be an exacerbating factor, making children particularly vulnerable to risk and associated behavioral problems. On the contrary, positive conditions may function to buffer against the impact of stress on children. Specifically, in low SES families where there are limited financial resources, high maternal warmth may create a supportive familial climate for children [62,63] and provide them with consistently meaningful and coherent life experiences that are conducive to the development of the sense of coherence [64]. As such, these supportive provisions may enable the child to view stressful situations as comprehensible and manageable and to respond to the situations constructively, for example, turning to family for help rather than acting out or internalizing negative emotions.

Considering the possible role of maternal warmth in moderating the associations between family SES and sense of coherence and problem behaviors, the pathway of family SES to problem behaviors via the sense of coherence is likely to vary by the levels of maternal warmth. Specifically, this mediation effect may be weaker for children who experienced low levels of maternal warmth than for those who experienced high levels of maternal warmth. An orderly and supportive rather than chaotic family atmosphere, characterizing high levels of maternal warmth provide children with constructive modeling behaviors when coping with stressful events in the family that help them feel more in control and less anxious when facing difficulties in academic subjects or peer relationships [65,66]. Also, maternal warmth may represent a social and emotional resource that affords children to feel secure and confident when exploring their physical and social environments [67]. A strong sense of security and confidence is conducive to the growth of consistent emotional connectedness in social relationships which is evidenced in an enhanced level of sense of coherence [41,65,68]. In addition, high maternal warmth may enhance the functional meaning of sense of coherence as a mediator that links family SES and problem behaviors. That is, when mothers are affective, caring and responsive, high family SES is likely to provide children with more instrumental (e.g., rewarding the child for completing a tough school assignment) and emotional support (e.g., making the child feel valued and loved) that makes the mediating role of their sense of coherence more pronounced. In comparison, this mediating effect of a sense of coherence might be lessened in children with low levels of maternal warmth because the advantages of high family SES might be thus limited to materialistic, instrumental provisions. In other words, the mediating process of children's sense of coherence in linking family SES and problem behaviors over time may depend on the levels of their perceived maternal warmth.

1.4. The Present Study

As suggested in Preacher (2015) [69] and Fitzmaurice et al. (2011) [70], the longitudinal moderated mediation technique is conducive to assessing whether an indirect effect over time is conditional on the values of a moderating variable. Further, this technique allows causal inferences about the mediation process. This one-year longitudinal study aimed

to explore the role of sense of coherence in mediating the relations between family SES and Chinese children's problem behaviors (i.e., externalizing and internalizing problems) and the moderating effects of maternal warmth on the associations between family SES and sense of coherence and problem behaviors over time, while controlling for the initial levels of sense of coherence and problem behaviors. As illustrated in the conceptual model in Figure 1, we examined the following hypotheses: (1) T1 family SES would negatively predict T2 problem behaviors; (2) T2 sense of coherence would mediate the association between T1 family SES and T2 problem behaviors; (3) T1 maternal warmth would moderate the associations between T1 family SES and T2 sense of coherence; (4) T1 maternal warmth would moderate the relationship between T1 family SES and T2 problem behaviors; and (5) T1 maternal warmth would moderate the mediating effect of T2 sense of coherence underlying the association between T1 family SES and T2 problem behaviors. Additionally, given the relatively short duration between T1 and T2 and prior findings of the stability of the sense of coherence [71], we hypothesized that there would be no difference in the sense of coherence across time.

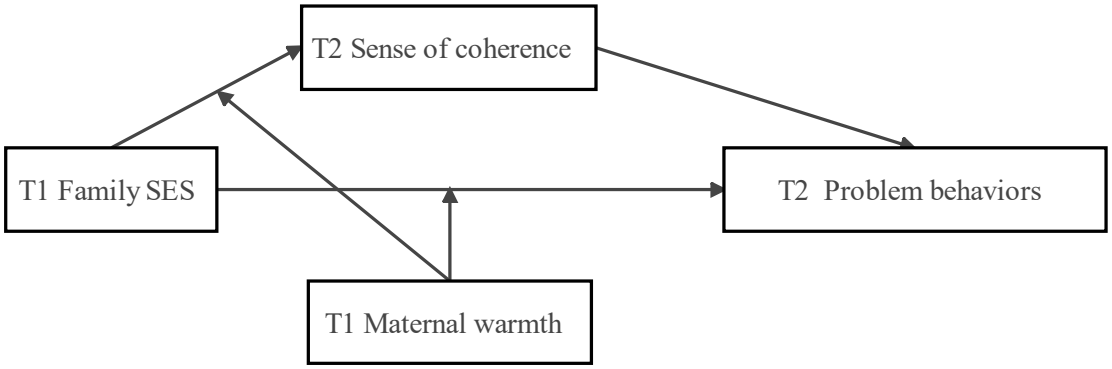

Figure 1. The Moderated Mediation Model. Note. T1 = Time 1; T2 = Time 2.

2. Methods

2.1. Participants

Participants in the study included 913 4th to 6th grade children (493 boys; M_{age} = 11.50 years, SD = 1.04) from four randomly selected regular public schools in Shanghai, China. There were 17.01% of the children from low SES families with an average yearly family income being approximately 48,000 yuan (6941 USD). Of the mothers and fathers, 12.5% and 6.9% had an elementary school, 33.2%, and 33.2% had a junior high school, 18.2% and 24.3% had a senior high school degree, and 36.2% and 35.6% had a college degree or higher education. Of the children, 65.84% were only children, and the others had one or more siblings. A year later (Time 2), 673 students participated in the follow-up study. There were no significant differences between students who participated in the follow-up study and those who did not, in Time 1 sense of coherence, F (1, 857) = 1.18, p = 0.28, on Time 1 externalizing problem behaviors, F (1, 899) = 0.05, p = 0.82, and on Time 1 internalizing problem behaviors, F (1, 899) = 0.45, p = 0.50.

2.2. Measures

2.2.1. Family SES

Given that the assessment of occupational status is often highly subjective [27], there is no consensus on the classification of occupations in China as people of the same occupation have large gaps in income and education levels [72]. Therefore, only parental education level and family income were used as indicators of SES [73,74]. Parents' self-reported monthly income was used (e.g., wages, bonuses) as an indicator of family income, which was divided into eight categories, below 500 yuan (74.7 USD), 500–1000 yuan (74.7–149.4 USD), 1000–2000 yuan (149.4–298.8 USD), 2000–3000 yuan (298.8–448.2 USD), 3000–5000 yuan (448.2–747 USD), 5000–10,000 yuan (747–1494 USD), 10,000–20,000 yuan

(1494–2988 USD), and above 20,000 yuan (2988 USD). The monthly incomes of both parents were summed up to represent family income. Parental education ratings for both parents were coded using a 4-point scale indicating "1 = elementary school and below", "2 = junior high school", "3 = high school or technical secondary school", and "4 = college and above". Following the recommended approach by Kraus and colleagues [75,76], an index of family SES was formed by totaling the standardized scores for parental education and family income. (i.e., Family SES = $Z_{\text{paternal income}} + Z_{\text{maternal income}} + Z_{\text{paternal education}} + Z_{\text{maternal education}}$, with higher scores indicative of greater family SES. In this study, internal reliability of the measure (Cronbach's α) was 0.85.

2.2.2. Sense of Coherence

The adapted version of the Children's Sense of Coherence Scale [77] that consisted of 12 items was used and example items are "If I want something, I believe I can get it", and "(reverse coded) I think what I do every day is meaningless"). Students were asked to respond to each item, on a 4-point scale, ranging from 1 (never) to 4 (always). Confirmatory factor analysis showed good model fit at both time points, $\chi^2/df = 4.80$ and 4.34, RMSEAs = 0.07, SRMRs = 0.06, CFIs = 0.93, TLIs = 0.91, respectively. As suggested by Liu et al. [77] and Antonovsky [78], the average score of all items was computed, with higher scores suggesting higher levels of self-perceived sense of coherence. The internal reliabilities (Cronbach's α) were 0.75 and 0.79 at Times 1 and 2, respectively, in this study.

2.2.3. Problem Behaviors

The head teacher in each class was requested to complete a 5-item measure of externalizing problems (e.g., "Disruptive in class") and a 9-item measure of internalizing problems (e.g., "Anxious, worried"), adapted from the Teacher-Child Rating Scale (T–CRS; [79]). The teacher rated, on a 5-point scale, ranging from 1 (not at all) to 5 (very well), how well each of the items described the student. Consistent with the procedure used in previous studies [80], the teacher-rating scores were standardized within the class to adjust for the teacher's response style and to allow for appropriate comparisons. Previous studies have suggested that it is a reliable and valid measure in Chinese children [80,81]. The results of the confirmatory factor analysis suggested good-fitting models for externalizing problems at Times 1 and 2, $\chi^2/df = 4.61$ and 4.87, RMSEAs = 0.06 and 0.08, SRMRs = 0.02, CFIs = 0.99 and 0.98, TLIs = 0.98 and 0.96, respectively, and for internalizing problems at Times 1 and 2, $\chi^2/df = 4.73$ and 3.33, RMSEAs = 0.06, SRMRs = 0.04, CFIs = 0.94, TLIs = 0.92 and 0.91, respectively. In this study, the internal reliabilities were 0.81 and 0.79 for externalizing problems at Times 1 and 2, and 0.75 and 0.71 for internalizing problems at Times 1 and 2.

2.2.4. Maternal Warmth

Maternal warmth was assessed using an adapted Chinese version of the Child Rearing Practices Report (CRPR; [82]). Participating students were asked to rate four items (e.g., "When I feel uneasy or scared, my mother gives me comfort and understanding"), on a 5-point scale, ranging from 1 (not at all true) to 5 (always true). This measure has been shown to be reliable and valid in the Chinese context [83]. Factor confirmatory analysis showed that the one-factor model was acceptable ($\chi^2/df = 1.79$, RMSEA = 0.03, SRMR = 0.004, CFI = 0.999, TLI = 0.997). In this study, the internal reliability was 0.83.

2.3. Procedures

This study obtained data from multiple sources, including parental reports, child self-reports, and teacher ratings, in order to reduce common method biases [84]. Written assent was obtained from all participating children and written consent was obtained from their parents through the school. Self-report measures of sense of coherence and maternal warmth were administered during class time on a school day. Teachers were asked to complete a rating scale for each participant concerning his or her externalizing and

internalizing problems. Extensive explanations were provided to participants during data collection. The administration of all measures was carried out by a group of psychology teachers and graduate students in China. Data were collected in November 2013 (Time 1) and 2014 (Time 2). This study followed APA ethical guidelines and was approved by the institutional review board of the first author's university.

2.4. Statistical Analysis

Descriptive statistics and intercorrelations among the study variables were conducted using SPSS (version 22.0). Then, moderated mediating modeling was conducted in Mplus (version 8.3). Little's MCAR test [85] was significant, $\chi^2(139) = 191.26$, $p = 0.002$. However, the χ^2/df was 1.38 (i.e., less than the suggested cutoff value of 2; [86]), indicating that the pattern of missing data is not substantially different from the random pattern [87]. Therefore, we employed the full information maximum likelihood (FIML; [88]) to handle missing data. The model fit was evaluated by the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). Acceptable and good fit was indicated by RMSEA values below 0.08 and 0.05 and CFI values greater than 0.90 and 0.95, respectively [89,90].

3. Results

3.1. Descriptive Data

Means and standard deviations for and intercorrelations among the study variables are presented in Table 1. Results of repeated measures ANOVA showed no difference in sense of coherence across time, $F(1, 632) = 0.02$, Wilks' $\lambda = 1$, $p = 0.89$. T1 family SES, T1 maternal warmth, and T1 and T2 sense of coherence were positively intercorrelated. Also, there were concurrent and longitudinal negative correlations between the sense of coherence and, externalizing problem behaviors and internalizing problem behaviors.

Table 1. Descriptive Statistics for Study Variables.

Variables	1	2	3	4	5	6	7	8	9	10
1 Gender	-									
2 Age	−0.006	-								
3 T1 Family SES	−0.048	−0.267 ***	-							
4 T1 Maternal warmth	−0.068 *	−0.083 *	0.185 ***	-						
5 T1 Sense of coherence	−0.101 **	−0.084 *	0.209 ***	0.431 ***	-					
6 T2 Sense of coherence	−0.082 *	−0.141 ***	0.303 ***	0.370 ***	0.476 ***	-				
7 T1 Externalizing problem behaviors	0.374 ***	−0.018	−0.026	−0.081 *	−0.184 ***	−0.123 **	-			
8. T2 Externalizing problem behaviors	0.341 ***	0.006	−0.037	−0.044	−0.136 **	−0.110 **	0.516 ***	-		
9. T1 Internalizing problem behaviors	−0.125 ***	0.009	−0.037	−0.041	−0.150 ***	−0.105 **	−0.056 †	−0.187 ***	-	
10. T2 Internalizing problem behaviors	−0.056	0.039	−0.043	−0.075 †	−0.147 ***	−0.159 ***	−0.046	0.056	0.225 ***	-
M	-	11.499	0.000	4.049	3.076	3.089	0.000	0.007	0.000	−0.006
SD	-	1.037	1.775	0.968	0.505	0.538	0.985	0.990	0.985	0.970

Note. T1 = Time 1; T2 = Time 2. Gender was dummy-coded (treating girls as the reference group). † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.2. The Mediating Effect of Sense of Coherence

Following the suggestions of Hayes and colleagues [91,92], we estimated indirect effects in mediation analyses using the bias-corrected bootstrapping method with 2000 bootstrap samples. This method produces bootstrapped confidence intervals, with mediation occurring when the indirect effect is significant and its 95% bias-corrected confidence interval does not contain zero [93,94]. The mediation model was good fitting, $\chi^2/df = 2.59$, RMSEA = 0.05, SRMR = 0.03, CFI = 0.97, TLI = 0.91. The results in Table 2 showed that the direct and total effects of T1 family SES on T2 externalizing and internalizing problems were nonsignificant, controlling for child gender and age, and T1 externalizing and internalizing problems. There was a significant indirect effect of T1 family SES on T2 internalizing problems via T2 sense of coherence, whereas the indirect effect of T1 family SES on T2 externalizing problems via T2 sense of coherence was nonsignificant, suggesting the mediating role of T2 sense of coherence in the pathway of T1 family SES and T2 internalizing problems.

Table 2. Mediated Role of Sense of Coherence on Longitudinal Relation Between Family SES and Problem Behaviors.

Outcome Predictor	B	β	SE	95% CI	*t* Value
T2 Sense of coherence					
T1 Sense of coherence	0.48	0.44	0.04	[0.362, 0.516]	11.11 ***
T1 Family SES (a)	0.06	0.19	0.04	[0.11, 0.265]	4.79 ***
T2 Externalizing problem behaviors					
Gender	0.32	0.16	0.04	[0.085, 0.230]	0.01
Age	0.00	0.00	0.04	[−0.074, 0.071]	0.00
T1 Externalizing problem behaviors	0.43	0.43	0.05	[0.338, 0.514]	9.40 ***
T2 Sense of coherence (b)	−0.02	−0.01	0.04	[−0.091, 0.075]	−0.22
T1 Family SES-T2 Sense of coherence (a *b)	−0.00	−0.00	0.01	[−0.018, 0.015]	−0.21
T1 Family SES (c-)	−0.03	−0.05	0.04	[−0.131, 0.026]	−1.31
Total effect (c)	−0.03	−0.05	0.04	[−0.073, 0.012]	−1.41
T2 Internalizing problem behaviors					
Gender	−0.09	−0.05	0.04	[−0.132, 0.031]	−1.14
Age	0.03	0.04	0.04	[−0.051, 0.119]	0.82
T1 Internalizing problem behaviors	0.22	0.22	0.04	[0.126, 0.298]	4.98 ***
T2 Sense of coherence (b)	−0.20	−0.11	0.05	[−0.203, −0.023]	−2.42 *
T1 Family SES-T2 Sense of coherence (a *b)	−0.01	−0.02	0.01	[−0.044, −0.006]	−2.19 *
T1 Family SES (c')	0.00	0.00	0.05	[−0.092, 0.09]	0.01
Total effect (c)	−0.01	−0.02	0.05	[−0.06, 0.036]	−0.46

Note. T1 = Time 1; T2 = Time 2. CI = confidence interval. The coefficients, a, b, and c', represent direct effects; The coefficient a *b represents an indirect effect. B for a *b represents the standardized coefficient of an indirect effect. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.3. The Moderating Effect of Maternal Warmth

Because the mediation of T2 sense of coherence between T1 family SES and T2 internalizing problems was significant, the moderated effect of T1 maternal warmth on this mediation was examined, controlling for child gender and age. The moderated mediation model suggested good model fit, $\chi^2/df = 1.33$, RMSEA = 0.03, SRMR = 0.01, CFI = 0.99, TLI = 0.98. Controlling for T1 internalizing problems, T1 sense of coherence, and child gender and age, T1 maternal warmth moderated the mediating effect of T2 sense of coherence on the association between T1 family SES and T2 internalizing behavior problems, $\beta = -0.01$, $SE = 0.005$, $t = -2.09$, $p = 0.037$, 95% CI = (−0.021, −0.002).

In addition, the interaction of T1 maternal warmth and family SES on T2 sense of coherence was significant, $\beta = 0.07$, $SE = 0.02$, $t = 3.12$, $p = 0.002$, yet this interaction on internalizing problems was not significant, $\beta = 0.03$, $SE = 0.03$, $t = 1.06$, $p = 0.29$. Further simple slope effects were examined on T1 family SES at high and low values (1 *SD* above and 1 *SD* below the mean) of maternal warmth. As shown in Figure 2, for children with high T1 maternal warmth, T1 family SES was significantly and positively associated with

T2 sense of coherence, β = 0.15, *SE* = 0.03, *t* = 4.62, *p* < 0.001, whereas this association was nonsignificant for children with low T1 maternal warmth, β = 0.02, *SE* = 0.03, *t* = 0.46, *p* = 0.65. Moreover, when T1 maternal warmth was high, T1 family SES was negatively associated with T2 internalizing problem behaviors via T2 sense of coherence, β = −0.02, *SE* = 0.01, *t* = −2.29, *p* = 0.022, 95% CI = (−0.037, −0.005), whereas this mediating effect of T2 sense of coherence was not significant when T1 maternal warmth was low, β = −0.002, *SE* = 0.004, *t* = −0.42, *p* = 0.672, 95% CI = (−0.011, 0.006).

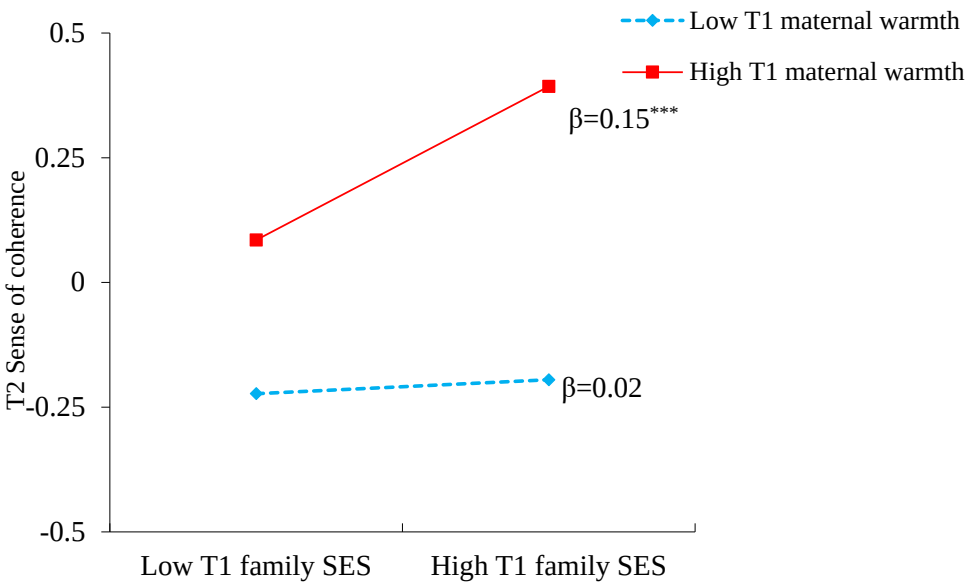

Figure 2. Simple Slope for Interaction Between Family SES and Maternal Warmth in Predicting Sense of Coherence. *Note.* T1 = Time 1; T2 = Time 2. *** *p* < 0.001.

4. Discussions

Research on the relation between family SES and developmental outcomes in Chinese children has mainly focused on the outcome of academic achievement [12,95] while the relation between family SES and adjustment in other domains remain less studied. Considering that the importance of individual socioemotional well-being has been increasingly recognized in contemporary China [35,36], As such, additional research is needed to better understand the implications of family SES for child outcomes such as externalizing and internalizing problems that contribute to the comorbidities of behavioral difficulties. Moreover, factors that may help explain and alter family SES disparities in youth outcomes are not well understood. The present study sought to fill the gaps by examining the roles of a sense of coherence and maternal warmth in explaining the association between family SES and problem behaviors among Chinese children. Results provided supporting evidence that children's sense of coherence served to mediate the association between family SES and internalizing problems over time and that this mediating role was particularly pronounced in children with high maternal warmth.

4.1. The Mediating Role of Sense of Coherence

Contrary to Hypothesis 1, family SES was not significantly associated with externalizing and internalizing problem behaviors over time. This may suggest that the longitudinal relation between family SES and problem behaviors may be curvilinear rather than linear, as suggested in recent meta-analytic work [32]. That is, children from high and low SES backgrounds may show comparable levels of problem behaviors, possibly attributed to different pathways of family SES leading to similar behavioral problems [96]. Nevertheless, these arguments should be examined using multi-wave (at least three-time points) longitudinal data in order to obtain a better understanding of the developmental patterns of the impact of family SES. Furthermore, the present study found little change in sense of

coherence over time, which is consistent with previous research [71]. This may be due to a sense of coherence that is assumed to be a stable character orientation [97].

The indirect effect of a sense of coherence was significant in linking family SES and children's internalizing problems later on. This finding partially supported Hypothesis 2 and lends support to Korous and colleagues' [98] call for more studies that identify specific pathways that elucidate the impact of family SES on child development. According to the Salutogenic model [37], family SES is a major generalized resistance resource that provides consistent, load-balanced life experiences to children [40,99]. These positive and rich experiences are likely to foster the child's ability to effectively cope with stressful events, which is central to one's sense of coherence. Having a strong sense of coherence enables individuals to perceive daily life experiences, in general, to be manageable, to derive meaning from difficult events, and to cope with these events positively [37,46], which in turn lower the likelihood of internalizing frustration, anxiety, and other negative emotions. This result extends prior findings [40,41] in suggesting sense of coherence as a mediator underlying the association between family SES and later adjustment outcomes in Chinese children.

Moreover, this positive role of a sense of coherence suggests that this orientation is highly relevant for and conducive to self-regulation and self-confidence, two cultural values that are strongly valued in contemporary urban China [20,37]. On the other hand, sense of coherence did not mediate the longitudinal association between family SES and Chinese children's externalizing problems. It may be that externalizing problems, such as aggressive behavior, is strictly prohibited in China in which maintaining social harmony is one primary socialization goal [20,60]. Therefore, social and contextual factors such as peer rejection may be more powerful in explaining the association between family SES and externalizing problems than individuals' behavioral dispositions, such as a sense of coherence. Nevertheless, this argument is highly speculative and future studies need to validate the current finding.

4.2. The Moderating Role of Maternal Warmth

As expected in Hypothesis 3, family SES was positively associated with a later sense of coherence more strongly for children with high maternal warmth as compared to those with low maternal warmth. This finding indicated the important role of maternal warmth in promoting the advantages of high family SES, lending support to the resource-potentiating model [59] which posits that favorable social conditions facilitate the adaptive development of individuals who already have the advantage. As an index of positive parenting, maternal warmth provides children with emotional closeness and optimal mother-child interaction, which are the core contextual factors in the development of children's sense of coherence [40,100,101]. The result further indicated that family SES and maternal warmth, each as a generalized resistance resource, individually and jointly contribute to promoting a sense of coherence. It is necessary for future researchers to pay attention to the possible interactive effects of other generalized resistance resources (e.g., self-efficacy and peer support) on the sense of coherence [40,46,102]. On the other hand, the current finding did not support Hypothesis 4. This may be attributed to the relationships between family SES and problem behaviors being non-linear [32]. In other words, the direction of the association between family SES and problem behaviors may fluctuate. Researchers have found that while low family SES may not provide adequate resources for children to curb problem behaviors [8,28], children from affluent families may also reactively engage in high levels of problem behaviors because they are subjected to pressure stemming from high parental expectations [103,104]. Therefore, the moderating role of maternal warmth may depend on the nonlinear contribution of family SES to problem behaviors, which cannot be examined in the present, two-wave longitudinal design. In addition, the nonsignificant role of maternal warmth as a moderator may suggest that the relationship between family SES and child adjustment, linear or nonlinear, is best explained by some combination

of individual and contextual factors [33] rather than individual factors solely (sense of coherence in the current study). Future studies should continue exploring this issue.

More importantly, maternal warmth was found to moderate the mediating effect of sense of coherence on the longitudinal association between family SES and internalizing problems. Specifically, the mediating role of a sense of coherence was significant for children with high maternal warmth but not for others with low maternal warmth. High levels of perceived maternal warmth foster a strong parent-child emotional connection as a type of social-emotional resource that is pivotal for the steady growth of meaningfulness, comprehensibility, and manageability [37,97]. In other words, those children who live in a family environment abundant with attentiveness and respect are likely to feel in control of their lives and consider most school tasks and participation in social activities as meaningful and worthy of investing their efforts in, suggesting that high maternal warmth may strengthen the contribution of the sense of coherence as a mediator. In contrast, low maternal warmth appears to weaken the mediating function of the sense of coherence for children's internalizing problems. This is in support of the resource-potentiating model [59,60] that high levels of maternal warmth and children's sense of coherence serve as positive conditions that increase an individual's resources and promote their adaptive development, as manifested in reduced internalizing problems. The current finding provides insights into how to promote Chinese children's sense of coherence by cultivating mothers' affection and responsiveness toward their children.

5. Limitations and Future Directions

Several limitations of this study should be noted. First, the present longitudinal study had collected only two waves of data, which does not allow us to examine intra-individual patterns of change in sense of coherence and its mediating function over time. Therefore, longitudinal studies with more repeated measures are warranted to obtain a better understanding of the role of the development of a sense of coherence in explaining the pathway from family SES to changes in externalizing and internalizing problems.

Second, self-report data were used and their validity may be threatened by social desirability bias that prompts respondents to answer questions that are viewed favorably by others. Other methods of data collection, such as teacher observation or ratings, should be considered to provide information on a particular behavior in depth and from different perspectives.

Third, children's subjective SES was not measured in this study. This represents how children perceive their family's socioeconomic standing relative to others, which is not necessarily comparable to objective SES and a stronger predictor of psychological well-being [29,105]. Therefore, the association between subjective SES and children's problem behaviors and the role of a sense of coherence as a mechanism underlying the association might be different from the present findings.

Fourth, this study only focused on maternal warmth and it is needed to examine the role of other aspects of maternal parenting (e.g., control) in the association of family SES and problem behaviors. Moreover, a number of studies have suggested that paternal warmth has a pervasive and enduring impact on children's problem behaviors [106]. Therefore, future research should consider the role of paternal warmth in predicting the longitudinal association between family SES, sense of coherence, and problem behaviors in Chinese children.

Fifth, students' problem behaviors were reported by the head teacher in the class. Despite teachers being considered reliable informants of children's problem behaviors, it would be interesting to include reports from peers and parents because problem behaviors occur outside the classroom and in other settings.

Finally, the present study was conducted in a highly urbanized region in China where self-oriented values such as independence and personal uniqueness and social skills such as initiative-taking and self-confidence are highly encouraged [52,107]. On the contrary, rural regions in China have been undergoing less rapid urbanization, and self-confidence and other social skills are less emphasized. Therefore, the functional meaning of the sense of coherence might differ in the two regions. Also, extending the present study to rural

children would help researchers and educators identify a possible, common individual (e.g., sense of coherence) and contextual (e.g., maternal warmth) protective resources against problems in both urban and rural children. Moreover, it would be interesting to validate the present findings in more recent samples drawn from urban Chinese children given this study was conducted approximately a decade ago.

Despite these limitations, the present study has some theoretical and practical implications. From a theoretical perspective, in alignment with the Salutogenic model [37,78], the present study extends the literature in suggesting that a sense of coherence is an important mediator in the longitudinal pathways linking family SES to later child adjustment in contemporary China. Moreover, this mediating function of the sense of coherence varied by levels of maternal warmth, suggesting that the mechanism underlying the relation between family SES and child adjustment is contextualized. From a practical perspective, the findings inform mental health interventions of the need of improving the sense of coherence. For example, intervention studies have shown the effectiveness of regular participation in sports and healthy eating in building a strong sense of coherence [108]. Educators and clinicians may use the sense of coherence measures to screen for youth who may benefit from supportive interventions to strengthen their mental health [109]. Parent involvement is a critical component of such interventions in which ways to strengthen parent-child bonding at home to further promote children's sense of coherence need to be incorporated.

6. Conclusions

Overall, this study examined the mediating role of sense of coherence and the moderating role of maternal warmth in the longitudinal relation between family SES and children's problem behaviors. The results suggested that children's sense of coherence was the mechanism between family SES and internalizing problem behaviors, but not externalizing problem behaviors. This mediating role was also moderated by maternal warmth and specifically, family SES was negatively associated with internalizing problem behaviors via the sense of coherence for children who perceived high maternal warmth. This study provided evidence of the roles of sense of coherence and maternal warmth in reducing children's internalizing problem behaviors.

The results indicated that children's sense of coherence mediated the association between family SES and internalizing problem behaviors, but not externalizing problem behaviors. This mediating role was also moderated by maternal warmth and specifically, family SES was negatively associated with internalizing problem behaviors via the sense of coherence for children who perceived high maternal warmth. Generally, these results highlighted the possible roles of a sense of coherence and maternal warmth in the longitudinal implications of family SES for Chinese children's internalizing problems.

Author Contributions: B.M. conceived of the present study and data analysis, and drafted the manuscript; R.F. and X.L. were involved in manuscript preparation and interpretation of the data; G.X. was involved in primary data analysis; J.L. and D.L. were involved in the initial design of the study, coordinated the research and were completely responsible for data collection. All authors have read and agreed to the published version of the manuscript.

Funding: The research study was supported by Key Innovation Program of Shanghai Municipal Education Commission (2019-01-07-00-02-E00005) and Shanghai Philosophy and Social Science Planning Project (2019BSH016).

Institutional Review Board Statement: All procedures performed in studies involving human participants were in accordance with the APA ethical institutional standards. This article does not contain any studies with animals performed by authors. This study was approved by the institutional review board of the Shanghai Normal University [2020] No. 42,2020.9.29.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are available through the authors at reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Gardner, F.; Montgomery, P.; Knerr, W. Transporting Evidence-Based Parenting Programs for Child Problem Behavior (Age 3–10) Between Countries: Systematic Review and Meta-Analysis. *J. Clin. Child Adolesc. Psychol.* **2016**, *45*, 749–762. [CrossRef] [PubMed]
2. Missler, M.A.; van Straten, A.; Denissen, J.J.A.; Donker, T.; de Weerth, C.; Beijers, R. The first 125 years of parenthood: A latent trait-state occasion model of the longitudinal association between maternal distress and child internalizing and externalizing problems. *Dev. Psychol.* **2021**, *57*, 1124–1135. [CrossRef] [PubMed]
3. Ugarte, E.; Liu, S.; Hastings, P.D. Parasympathetic activity, emotion socialization, and internalizing and externalizing problems in children: Longitudinal associations between and within families. *Dev. Psychol.* **2021**, *57*, 1525–1539. [CrossRef] [PubMed]
4. Janssens, A.; Noortgate, W.V.D.; Goossens, L.; Verschueren, K.; Colpin, H.; De Laet, S.; Claes, S.; Van Leeuwen, K. Externalizing Problem Behavior in Adolescence: Dopaminergic Genes in Interaction with Peer Acceptance and Rejection. *J. Youth Adolesc.* **2015**, *44*, 1441–1456. [CrossRef] [PubMed]
5. Lam, C.B.; Chung, K.K.H. Associations of sleep problems with externalizing behaviors and preacademic performance: The moderating role of family socioeconomic status. *Infant Child Dev.* **2017**, *26*, e2026. [CrossRef]
6. Boutin, S.; Roy, V.; St-Pierre, R.A.; Déry, M.; Lemelin, J.-P.; Martin-Storey, A.; Poirier, M.; Toupin, J.; Verlaan, P.; Temcheff, C.E. The longitudinal association between externalizing and internalizing problems: An exploration of the dual failure model. *Dev. Psychol.* **2020**, *56*, 1372–1384. [CrossRef]
7. Conway, A.; Miller, A.L.; Modrek, A. Testing Reciprocal Links Between Trouble Getting to Sleep and Internalizing Behavior Problems, and Bedtime Resistance and Externalizing Behavior Problems in Toddlers. *Child Psychiatry Hum. Dev.* **2017**, *48*, 678–689. [CrossRef]
8. Bradley, R.H.; Corwyn, R.F. Socioeconomic status and child development. *Annu. Rev. Psychol.* **2002**, *53*, 371–399. [CrossRef]
9. Conger, R.D.; Donnellan, M.B. An interactionist perspective on the socioeconomic context of human development. *Annu. Rev. Psychol.* **2007**, *58*, 175–199. [CrossRef]
10. Garratt, E.A.; Chandola, T.; Purdam, K.; Wood, A.M. Income and Social Rank Influence UK Children's Behavioral Problems: A Longitudinal Analysis. *Child Dev.* **2017**, *88*, 1302–1320. [CrossRef]
11. Hosokawa, R.; Katsura, T. A longitudinal study of socioeconomic status, family processes, and child adjustment from preschool until early elementary school: The role of social competence. *Child Adolesc. Psychiatry Ment. Health* **2017**, *11*, 62. [CrossRef] [PubMed]
12. Deng, X.; Luo, X.; Wu, Y. The mediating effect of parental involvement between family socioeconomic status and academic performance: Meta-analysis structural equation modeling. *Adv. Psychol. Sci.* **2016**, *24*, 1844–1853. [CrossRef]
13. Highlander, A.R.; Jones, D.J. Integrating Objective and Subjective Social Class to Advance Our Understanding of Externalizing Problem Behavior in Children and Adolescents: A Conceptual Review and Model. *Clin. Child Fam. Psychol. Rev.* **2022**, *25*, 300–315. [CrossRef]
14. Konaszewski, K.; Kolemba, M.; Niesiobędzka, M. Resilience, sense of coherence and self-efficacy as predictors of stress coping style among university students. *Curr. Psychol.* **2021**, *40*, 4052–4062. [CrossRef]
15. Luengo, K.B.P.L.; Pastorelli, C.; Thartori, E.; Lunetti, C.; Di Giunta, L.; Bacchini, D.; Lansford, J.E. Longitudinal relations among maternal self-efficacy, maternal warmth, and early adolescents' prosocial behavior. *Parent. Sci. Pract.* **2021**, *21*, 24–46. [CrossRef]
16. Huang, X.; Zhang, Y.; Yu, G. Prevalence of mental health problems among primary school students in Chinese mainland from 2010 to 2020: A meta-analysis. *Adv. Psychol. Sci.* **2022**, *30*, 953–964. [CrossRef]
17. Wasserman, A.M.; Wimmer, J.; Hill-Kapturczak, N.; Karns-Wright, T.E.; Mathias, C.W.; Dougherty, D.M. The Development of Externalizing and Internalizing Behaviors Among Youth with or Without a Family History of Substance Use Disorder: The Indirect Effects of Early-Life Stress and Impulsivity. *Child Psychiatry Hum. Dev.* **2021**, *52*, 978–993. [CrossRef]
18. Campbell, S.B.; Shaw, D.S.; Gilliom, M. Early externalizing behavior problems: Toddlers and preschoolers at risk for later maladjustment. *Dev. Psychopathol.* **2000**, *12*, 467–488. [CrossRef]
19. Li, D.; Zong, L.; Liu, J. The Relationship between Externalizing Behavior Problem and Collective Moral Emotion and Responsibility: The Moderate Effects of Class Climate. *Acta Psychol. Sin.* **2013**, *45*, 1015–1025. [CrossRef]
20. Chen, X.; French, D.C. Children's Social Competence in Cultural Context. *Annu. Rev. Psychol.* **2008**, *59*, 591–616. [CrossRef]
21. Xie, Q.; Zheng, H.; Jiang, G.; Ren, Z.; Fan, Y.; Liu, J.; Zhang, W. The reciprocal relationships between head teachers' negotiation management behavior and teacher-student relationship and primary school students' externalizing problem behaviors from grades four to six: A cross-lagged study. *Acta Psychol. Sin.* **2021**, *53*, 1120–1132. [CrossRef]
22. Zhang, W.; Zhang, L.; Chen, L.; Ji, L.; Deater, D.K. Developmental changes in longitudinal associations between academic achievement and psychopathological symptoms from late childhood to middle adolescence. *J. Child Psychol. Psychiatry* **2019**, *60*, 178–188. [CrossRef] [PubMed]
23. Zhu, X.; Shek, D.T.L. Problem Behavior and Life Satisfaction in Early Adolescence: Longitudinal Findings in a Chinese Context. *J. Happiness Stud.* **2021**, *22*, 2889–2914. [CrossRef]
24. Liu, J.; Bullock, A.; Coplan, R.J.; Chen, X.; Li, D.; Zhou, Y. Developmental cascade models linking peer victimization, depression, and academic achievement in Chinese children. *Br. J. Dev. Psychol.* **2018**, *36*, 47–63. [CrossRef] [PubMed]
25. Liu, J.; Glenn, A.L.; Cui, N.; Raine, A. Longitudinal bidirectional association between sleep and behavior problems at age 6 and 11 years. *Sleep Med.* **2021**, *83*, 290–298. [CrossRef]

26. Danneel, S.; Nelemans, S.; Spithoven, A.; Bastin, M.; Bijttebier, P.; Colpin, H.; Noortgate, W.V.D.; Van Leeuwen, K.; Verschueren, K.; Goossens, L. Internalizing Problems in Adolescence: Linking Loneliness, Social Anxiety Symptoms, and Depressive Symptoms Over Time. *J. Abnorm. Child Psychol.* **2019**, *47*, 1691–1705. [CrossRef]
27. Matthews, K.A.; Gallo, L.C. Psychological Perspectives on Pathways Linking Socioeconomic Status and Physical Health. *Annu. Rev. Psychol.* **2011**, *62*, 501–530. [CrossRef]
28. Conger, R.D.; Conger, K.J.; Martin, M. Socioeconomic Status, Family Processes, and Individual Development. *J. Marriage Fam.* **2010**, *72*, 685–704. [CrossRef]
29. Manstead, A.S.R. The psychology of social class: How socioeconomic status impacts thought, feelings, and behaviour. *Br. J. Soc. Psychol.* **2018**, *57*, 267–291. [CrossRef]
30. Bronfenbrenner, U. *The Ecology of Human Development: Experiments by Nature and Design*; Harvard University Press: Cambridge, MA, USA, 1979.
31. Bronfenbrenner, U. Ecology of the family as a context for human development: Research perspectives. *Dev. Psychol.* **1986**, *22*, 723–742. [CrossRef]
32. Korous, K.M.; Causadias, J.M.; Bradley, R.H.; Luthar, S.S. Unpacking the link between socioeconomic status and behavior problems: A second-order meta-analysis. *Dev. Psychopathol.* **2018**, *30*, 1889–1906. [CrossRef] [PubMed]
33. Letourneau, N.L.; Duffett-Leger, L.; Levac, L.; Watson, B.; Young-Morris, C. Socioeconomic Status and Child Development. *J. Emot. Behav. Disord.* **2013**, *21*, 211–224. [CrossRef]
34. Wang, J.; Chen, C.; Gong, X. The impact of family socioeconomic status and parenting styles on children's academic trajectories: A longitudinal study comparing migrant and urban children in China. *New Dir. Child Adolesc. Dev.* **2021**, *2021*, 81–102. [CrossRef] [PubMed]
35. Chen, X.; Chen, H. *Children's Social Functioning and Adjustment in the Changing Chinese Society*; Sage: London, UK, 2010; pp. 209–226.
36. Jin, D.; Bi, Y.; Yan, M. Possible Relationship Between Sense of Coherence and Adolescents' School Adaptation Through Empathy and Parenting: A Moderated Mediation Model. *J. Early Adolesc.* **2021**, *41*, 840–864. [CrossRef]
37. Antonovsky, A. *Unraveling the Mystery of Health: How People Manage Stress and Stay Well*; Jossey-Bass: San Francisco, CA, USA, 1987.
38. Länsimies, H.; Pietilä, A.-M.; Hietasola-Husu, S.; Kangasniemi, M. A systematic review of adolescents' sense of coherence and health. *Scand. J. Caring Sci.* **2017**, *31*, 651–661. [CrossRef]
39. Antonovsky, A. *Health, Stress, and Coping*; Jossey-Bass: San Francisco, CA, USA, 1979.
40. Idan, O.; Eriksson, M.; Al-Yagon, M. Generalized resistance resources in the salutogenic model of health. In *The Handbook of Salutogenesis*, 2nd ed.; Mittelmark, M.B., Bauer, G.F., Vaandrager, L.J., Pelikan, M., Sagy, S., Eriksson, M., Lindström, B.C., Magistretti, M., Eds.; Springer International Publishing: Gewerbestrasse, Switzerland, 2022; pp. 93–106.
41. Sagy, S.; Antonovsky, H. The Development of the Sense of Coherence: A Retrospective Study of Early Life Experiences in the Family. *Int. J. Aging Hum. Dev.* **2000**, *51*, 155–166. [CrossRef]
42. Eriksson, M.; Contu, P. The sense of coherence: Measurement issues. In *The Handbook of Salutogenesis*, 2nd ed.; Mittelmark, M.B., Bauer, G.F., Vaandrager, L., Pelikan, J.M., Sagy, S., Eriksson, M., Lindström, B., Magistretti, C.M., Eds.; Springer International Publishing: Gewerbestrasse, Switzerland, 2022; pp. 79–91.
43. Eriksson, M.; Mittelmark, M.B. The sense of coherence and its measurement. In *Handbook of Salutogenesis*; Mittelmark, M.B., Sagy, S., Eriksson, M., Bauer, G.F., Pelikan, J.M., Lindström, B., Espnes, G.A., Eds.; Springer: Gewerbestrasse, Switzerland, 2017; pp. 97–106.
44. Zhu, M.; Cai, D.; Wu, Y.; Zhang, X.; Margraf, J. The Impact of social support on optimistic tendency of college students: The mediating effects of sense of coherence and resilience. *J. Psychol. Sci.* **2016**, *39*, 371–376. [CrossRef]
45. Grevenstein, D.; Bluemke, M.; Kroeninger-Jungaberle, H. Incremental validity of sense of coherence, neuroticism, extraversion, and general self-efficacy: Longitudinal prediction of substance use frequency and mental health. *Health Qual. Life Outcomes* **2016**, *14*, 9. [CrossRef]
46. Mittelmark, M.B.; Bauer, G.F.; Vaandrager, L.; Pelikan, J.M.; Sagy, S.; Eriksson, M.; Lindström, B.; Magistretti, C.M. *The Handbook of Salutogenesis*, 2nd ed.; Springer International Publishing: Gewerbestrasse, Switzerland, 2022.
47. Braun-Lewensohn, O.; Sagy, S. Salutogenesis and culture: Personal and community sense of coherence among adolescents belonging to three different cultural groups. *Int. Rev. Psychiatry* **2011**, *23*, 533–541. [CrossRef]
48. Eriksson, M.; Lindström, B. Validity of Antonovsky's sense of coherence scale: A systematic review. *J. Epidemiol. Community Health* **2005**, *59*, 460–466. [CrossRef]
49. Chen, X.; Cen, G.; Li, D.; He, Y. Social Functioning and Adjustment in Chinese Children: The Imprint of Historical Time. *Child Dev.* **2005**, *76*, 182–195. [CrossRef] [PubMed]
50. Nilsson, K.W.; Starrin, B.; Simonsson, B.; Leppert, J. Alcohol-related problems among adolescents and the role of a sense of coherence. *Int. J. Soc. Welf.* **2007**, *16*, 159–167. [CrossRef]
51. Veronese, G.; Dhaouadi, Y.; Afana, A. Rethinking sense of coherence: Perceptions of comprehensibility, manageability, and meaningfulness in a group of Palestinian health care providers operating in the West Bank and Israel. *Transcult. Psychiatry* **2021**, *58*, 38–51. [CrossRef] [PubMed]
52. Liu, X.; Fu, R.; Li, D.; Liu, J.; Chen, X. Self- and Group-Orientations and Adjustment in Urban and Rural Chinese Children. *J. Cross-Cultural Psychol.* **2018**, *49*, 1440–1456. [CrossRef]

53. Yang, F.; Chen, X.; Wang, L. Shyness-Sensitivity and Social, School, and Psychological Adjustment in Urban Chinese Children: A Four-Wave Longitudinal Study. *Child Dev.* **2015**, *86*, 1848–1864. [CrossRef] [PubMed]
54. Hu, X.; Li, J.; Lu, X.; Guo, Y. The psychological study of social class: Social cognitive perspective. *J. Psychol. Sci.* **2014**, *37*, 1509–1517. [CrossRef]
55. Li, S.; Xu, Q.; Xia, R. Relationship Between SES and Academic Achievement of Junior High School Students in China: The Mediating Effect of Self-Concept. *Front. Psychol.* **2020**, *10*, 2513. [CrossRef]
56. Shek, D.T.L. Economic Stress, Emotional Quality of Life, and Problem Behavior in Chinese Adolescents with and without Economic Disadvantage. *Soc. Indic. Res.* **2005**, *71*, 363–383. [CrossRef]
57. Tsuno, Y.S.; Yamazaki, Y. A comparative study of Sense of Coherence (SOC) and related psychosocial factors among urban versus rural residents in Japan. *Pers. Individ. Differ.* **2007**, *43*, 449–461. [CrossRef]
58. Liu, Q.; Zhou, N.; Cao, H.; Hong, X. Family socioeconomic status and Chinese young children' social competence: Parenting processes as mediators and contextualizing factors as moderators. *Child. Youth Serv. Rev.* **2020**, *118*, 105356. [CrossRef]
59. Kupersmidt, J.B.; Griesler, P.C.; DeRosier, M.E.; Patterson, C.J.; Davis, P.W. Childhood Aggression and Peer Relations in the Context of Family and Neighborhood Factors. *Child Dev.* **1995**, *66*, 360–375. [CrossRef] [PubMed]
60. Yang, F.; Chen, X.; Wang, L. Relations between Aggression and Adjustment in Chinese Children: Moderating Effects of Academic Achievement. *J. Clin. Child Adolesc. Psychol.* **2014**, *43*, 656–669. [CrossRef] [PubMed]
61. Cohen, S.; Wills, T.A. Stress, social support, and the buffering hypothesis. *Psychol. Bull.* **1985**, *98*, 310–357. [CrossRef] [PubMed]
62. O'Brien, J.R.; Loi, E.C.; Byrne, M.L.; Zalewski, M.; Casement, M.D. The link between positive and negative parenting behaviors and child inflammation: A systematic review. *Child Psychiatry Hum. Dev.* **2021**, *54*, 51–65. [CrossRef]
63. Pauli, R.; Tino, P.; Rogers, J.C.; Baker, R.; Clanton, R.; Birch, P.; Brown, A.; Daniel, G.; Ferreira, L.; Grisley, L.; et al. Positive and negative parenting in conduct disorder with high versus low levels of callous–unemotional traits. *Dev. Psychopathol.* **2021**, *33*, 980–991. [CrossRef]
64. Super, S.; Wagemakers, M.A.E.; Picavet, H.S.J.; Verkooijen, K.T.; Koelen, M.A. Strengthening sense of coherence: Opportunities for theory building in health promotion. *Health Promot. Int.* **2016**, *31*, 869–878. [CrossRef]
65. Ma, Y.; Chen, X.; Nunez, A.; Yan, M.; Zhang, B.; Zhao, F. Influences of parenting on adolescents' empathy through the intervening effects of self-integrity and sense of coherence. *Child. Youth Serv. Rev.* **2020**, *116*, 105246. [CrossRef]
66. Rohner, R.P.; Khaleque, A.; Cournoyer, D.E. Parental Acceptance-Rejection: Theory, Methods, Cross-Cultural Evidence, and Implications. *Ethos* **2005**, *33*, 299–334. [CrossRef]
67. Chen, X.; Liu, M.; Li, D. Parental warmth, control, and indulgence and their relations to adjustment in Chinese children: A longitudinal study. *J. Fam. Psychol.* **2000**, *14*, 401–419. [CrossRef]
68. Xu, F.; Cui, W.; Xing, T.; Parkinson, M. Family Socioeconomic Status and Adolescent Depressive Symptoms in a Chinese Low– and Middle—Income Sample: The Indirect Effects of Maternal Care and Adolescent Sense of Coherence. *Front. Psychol.* **2019**, *10*, 819. [CrossRef]
69. Preacher, K.J. Advances in Mediation Analysis: A Survey and Synthesis of New Developments. *Annu. Rev. Psychol.* **2015**, *66*, 825–852. [CrossRef] [PubMed]
70. Fitzmaurice, G.M.; Laird, N.M.; Ware, J.H. *Applied Longitudinal Analysis*, 2nd ed.; Wiley: Hoboken, NJ, USA, 2012.
71. Feldt, T.; Leskinen, E.; Kinnunen, U.; Ruoppila, I. The stability of sense of coherence: Comparing two age groups in a 5-year follow-up study. *Pers. Individ. Differ.* **2003**, *35*, 1151–1165. [CrossRef]
72. Li, C. Prestige stratification in the contemporary China: Occupational prestige measures and socio-economic index. *Sociol. Stud.* **2005**, *20*, 74–102. [CrossRef]
73. Kraus, M.W.; Keltner, D. Signs of Socioeconomic Status: A Thin-Slicing Approach. *Psychol. Sci.* **2009**, *20*, 99–106. [CrossRef] [PubMed]
74. Piff, P.K.; Kraus, M.W.; Côté, S.; Cheng, B.H.; Keltner, D. Having less, giving more: The influence of social class on prosocial behavior. *J. Pers. Soc. Psychol.* **2010**, *99*, 771–784. [CrossRef] [PubMed]
75. Kraus, M.W.; Piff, P.K.; Keltner, D. Social class, sense of control, and social explanation. *J. Pers. Soc. Psychol.* **2009**, *97*, 992–1004. [CrossRef]
76. Stellar, J.E.; Manzo, V.M.; Kraus, M.W.; Keltner, D. Class and compassion: Socioeconomic factors predict responses to suffering. *Emotion* **2012**, *12*, 449–459. [CrossRef] [PubMed]
77. Liu, J.; Zhou, Y.; Sang, B. Psychometric analysis of children sense of coherence scale in Chinese cultural context. *Psychol. Dev. Educ.* **2010**, *26*, 87–93. [CrossRef]
78. Antonovsky, A. The structure and properties of the Sense of Coherence scale. *Soc. Sci. Med.* **1993**, *36*, 725–733. [CrossRef]
79. Hightower, A.D.; Work, W.C.; Cowen, E.L.; Lotyczewski, B.S.; Spinell, A.P.; Guare, J.C.; Rohrbeck, C. The Teacher-Child Rating Scale: A Brief Objective Measure of Elementary Children's School Problem Behaviors and Competencies. *Sch. Psychol. Rev.* **1986**, *15*, 393–409. [CrossRef]
80. Liu, J.; Chen, X.; Coplan, R.J.; Ding, X.; Zarbatany, L.; Ellis, W. Shyness and Unsociability and Their Relations with Adjustment in Chinese and Canadian Children. *J. Cross-Cultural Psychol.* **2015**, *46*, 371–386. [CrossRef]
81. Chen, X.; Yang, F.; Wang, L. Relations between Shyness-Sensitivity and Internalizing Problems in Chinese Children: Moderating Effects of Academic Achievement. *J. Abnorm. Child Psychol.* **2013**, *41*, 825–836. [CrossRef]
82. Block, J.H. *The Child-Rearing Practices Report (CRPR): A Set of Q Items for the Description of Parental Socialization Attitudes and Values*; Unpublished manuscript, Institute of Human Development, University of California: Berkeley, CA, USA, 1981.

83. Chen, X.; Dong, Q.; Zhou, H. Authoritative and Authoritarian Parenting Practices and Social and School Performance in Chinese Children. *Int. J. Behav. Dev.* **1997**, *21*, 855–873. [CrossRef]
84. Podsakoff, P.M.; MacKenzie, S.B.; Lee, J.-Y.; Podsakoff, N.F. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **2003**, *88*, 879–903. [CrossRef] [PubMed]
85. Little, R.J.A. A Test of Missing Completely at Random for Multivariate Data with Missing Values. *J. Am. Stat. Assoc.* **1988**, *83*, 1198–1202. [CrossRef]
86. Ulman, J.B. Structural equation modeling. In *Using Multivariate Statistics*, 6th ed.; Tabachnick, B.G., Fidell, L.S., Eds.; Pearson Education: London, UK, 2013; pp. 681–785.
87. Bollen, K.A. *Structural Equations with Latent Variables*; Wiley: New York, NY, USA, 1989.
88. Graham, J.W. Missing Data Analysis: Making It Work in the Real World. *Annu. Rev. Psychol.* **2009**, *60*, 549–576. [CrossRef]
89. Hu, L.T.; Bentler, P.M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Model.* **1999**, *6*, 1–55. [CrossRef]
90. Kline, R.B. *Principles and Practice of Structural Equation Modeling*, 2nd ed.; The Guilford: New York, NY, USA, 2005.
91. Hayes, A.F. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*, 2nd ed.; The Guilford Press: New York, NY, USA, 2018.
92. Hayes, A.F.; Preacher, K.J.; Myers, T.A. Mediation and the estimation of indirect effects in political communication research. In *The Sourcebook for Political Communication Research*; Bucy, E.P., Holbert, R.L., Eds.; Routledge: Oxford, UK, 2011; pp. 434–465.
93. Preacher, K.J.; Rucker, D.D.; Hayes, A.F. Addressing Moderated Mediation Hypotheses: Theory, Methods, and Prescriptions. *Multivar. Behav. Res.* **2007**, *42*, 185–227. [CrossRef]
94. Williams, J.; MacKinnon, D.P. Resampling and Distribution of the Product Methods for Testing Indirect Effects in Complex Models. *Struct. Equ. Model. A Multidiscip. J.* **2008**, *15*, 23–51. [CrossRef]
95. Liu, J.; Peng, P.; Luo, L. The Relation Between Family Socioeconomic Status and Academic Achievement in China: A Meta-analysis. *Educ. Psychol. Rev.* **2020**, *32*, 49–76. [CrossRef]
96. Luthar, S.S.; Kumar, N.L. How can you help children thrive in a world focused on success? In *Wealth Zof Wisdom: 50 Questions Wealthy Families Ask and Answers from the World's Top Family Wealth Experts*; McCullough, T., Whitaker, K., Eds.; Wiley: Hoboken, NJ, USA, 2018; pp. 149–155.
97. Sagy, S.; Antonovsky, A.; Adler, I. Explaining life satisfaction in later life: The sense of coherence model and activity theory. *Behav. Health Aging* **1990**, *1*, 11–25.
98. Korous, K.M.; Causadias, J.M.; Bradley, R.H.; Luthar, S.S.; Levy, R. A Systematic Overview of Meta-Analyses on Socioeconomic Status, Cognitive Ability, and Achievement: The Need to Focus on Specific Pathways. *Psychol. Rep.* **2022**, *125*, 55–97. [CrossRef] [PubMed]
99. Volanen, S.-M.; Lahelma, E.; Silventoinen, K.; Suominen, S. Factors contributing to sense of coherence among men and women. *Eur. J. Public Health* **2004**, *14*, 322–330. [CrossRef] [PubMed]
100. García-Moya, I.; Moreno, C.; Jiménez-Iglesias, A. Understanding the joint effects of family and other developmental contexts on the sense of coherence (SOC): A person-focused analysis using the Classification Tree. *J. Adolesc.* **2013**, *36*, 913–923. [CrossRef]
101. García-Moya, I.; Rivera, F.; Moreno, C.; Lindström, B.; Jiménez-Iglesias, A. Analysis of the importance of family in the development of sense of coherence during adolescence. *Scand. J. Public Health* **2012**, *40*, 333–339. [CrossRef] [PubMed]
102. Xu, F.; Wang, M.; Zhang, Q.; Xing, T.; Cui, W. The Association Between Maternal Control and Sense of Coherence in Chinese Adolescents: Self-Efficacy as a Mediator and Stressful Life Events as a Moderator. *J. Happiness Stud.* **2021**, *22*, 2721–2738. [CrossRef]
103. Ansary, N.S.; Luthar, S.S. Distress and academic achievement among adolescents of affluence: A study of externalizing and internalizing problem behaviors and school performance. *Dev. Psychopathol.* **2009**, *21*, 319–341. [CrossRef]
104. Luthar, S.S.; Goldstein, A.S. Substance use and related behaviors among suburban late adolescents: The importance of perceived parent containment. *Dev. Psychopathol.* **2008**, *20*, 591–614. [CrossRef]
105. Adler, N.E.; Epel, E.S.; Castellazzo, G.; Ickovics, J.R. Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy, White women. *Health Psychol.* **2000**, *19*, 586–592. [CrossRef]
106. Robillard, C.L.; Balakrishnan, C.; Craig, S.G.; Turner, B.J. A Two-Way Street? Reciprocal Associations Between Parental Warmth and Hostility with Substance Use Among Justice-Involved Adolescents. *J. Youth Adolesc.* **2022**, *51*, 1442–1456. [CrossRef]
107. Chen, X. Exploring the implications of social change for human development: Perspectives, issues and future directions. *Int. J. Psychol.* **2015**, *50*, 56–59. [CrossRef] [PubMed]
108. Moyers, S.A.; Hagger, M.S. Physical activity and sense of coherence: A meta-analysis. *Int. Rev. Sport Exerc. Psychol.* **2020**, 1–29. [CrossRef]
109. Carlén, K.; Suominen, S.; Lindmark, U.; Saarinen, M.M.; Aromaa, M.; Rautava, P.; Sillanpää, M. Sense of coherence predicts adolescent mental health. *J. Affect. Disord.* **2020**, *274*, 1206–1210. [CrossRef] [PubMed]

behavioral sciences

MDPI

Article

Early Emotional Experiences and Prosocial Behavior among Chinese Adolescents: The Roles of Psychological *Suzhi* and Subjective Socioeconomic Status

Xiaoyi Liu [1,2,3,†], Gege Cao [1,2,3,†], Li Zhang [1,2,3], Yang Chen [1,2,3], Sige Liu [1,2,3], Yan Shi [1,2,3], Yunpeng Liu [1,2,3], Yulin Li [4] and Huazhan Yin [1,2,3,*]

[1] Department of Psychology, School of Education Science, Hunan Normal University, Changsha 410081, China
[2] Cognition and Human Behavior Key Laboratory of Hunan Province, Hunan Normal University, Changsha 410081, China
[3] Center for Mind & Brain Science, Hunan Normal University, Changsha 410081, China
[4] School of Business Administration, Hunan University of Finance and Economics, Changsha 410205, China
* Correspondence: yhz1979@sina.com
† These authors contributed equally to this work.

Abstract: Prosocial behavior plays a vital role in adolescents' well-being and social functioning, with the recall of early emotional experiences being a major influence. Positive experiences such as early memories of warmth and safeness (EMWS) contribute to prosocial interpersonal characteristics, whereas adverse experiences such as child psychological abuse and neglect (CPAN) lead to social withdrawal or behavioral problems. The direct effects of EMWS and CPAN on prosocial behavior were investigated in this study, along with the mediation effect of psychological *suzhi* and the moderation effect of subjective socioeconomic status (SSS). A sample of 948 adolescents (M_{age} = 14.05 years, *SD* = 1.68 years; 43.6% females) was randomly recruited to complete self-report questionnaires. Correlation results indicated that EMWS promoted prosocial behavior, whereas CPAN was negatively associated with prosocial behavior. Path analyses confirmed the mediating role of psychological *suzhi* on the effects of EMWS and CPAN on prosocial behavior. SSS was shown to moderate the effects of EMWS on prosocial behavior and CPAN on psychological *suzhi*. Compared to lower SSS, higher SSS would reinforce the positive impact of EMWS on prosocial behavior and exacerbate the negative impact of CPAN on psychological *suzhi*. The current study provided new insight into understanding the underlying mechanisms of prosocial behavior from the perspective of early emotional experiences.

Keywords: early memories of warmth and safeness (EMWS); child psychological abuse and neglect (CPAN); prosocial behavior; psychological *suzhi*; subjective socioeconomic status (SSS)

Citation: Liu, X.; Cao, G.; Zhang, L.; Chen, Y.; Liu, S.; Shi, Y.; Liu, Y.; Li, Y.; Yin, H. Early Emotional Experiences and Prosocial Behavior among Chinese Adolescents: The Roles of Psychological *Suzhi* and Subjective Socioeconomic Status. *Behav. Sci.* **2023**, *13*, 283. https://doi.org/10.3390/bs13040283

Academic Editors: Xuechen Ding and Wan Ding

Received: 9 January 2023
Revised: 12 March 2023
Accepted: 13 March 2023
Published: 24 March 2023

1. Introduction

Adolescence is a critical period characterized by heightened physical and psychological development. Transitions during the teenage years mainly focus on physical maturation and cognitive development, as well as social interactions [1,2]. Prosocial behavior, defined as voluntary, cooperative actions or tendencies that result in benefits for another individual or group, is considered a major aspect of adolescents' social functioning [3] and is linked with a wide range of positive outcomes in adolescence [4,5].

The recall of early emotional experiences is presumed to be a major influencing factor on adolescents' prosocial behavior [6]. According to the evolutionary theory of socialization, human beings are evolved to be sensitive and responsive to their early childhood environments and consequently generate certain behavioral patterns that correspond to their experiences. Individuals with positive rearing experiences are often securely attached and willing to foster mutually beneficial social interactions, whereas individuals with negative experiences are likely to be insecurely attached, becoming more aggressive and

less cooperative [7]. Based on previous research, positive experiences obtained from early childhood, such as parental warmth, will promote adolescents' prosocial behavior [8]. In contrast, early-life adversities, such as abuse and neglect, are negatively associated with prosocial tendencies [9]. Ample evidence has proved the effect of early positive experiences and negative experiences on prosocial behavior [10–14]. However, comparisons between—and combinations with—the two factors influencing prosocial behavior are under-explored. Among positive factors, early memories of warmth and safeness (EMWS), which emphasize the recall of one's inner pleasant feelings, emotions, and experiences obtained from caregivers in early childhood [15], are a key predictor of individuals' social development [16]. Numerous studies have revealed the relationship between EMWS and psychopathology [15], eating pathology [17], loneliness [18], and social safeness [16]. However, there is a dearth of research on how EMWS would affect prosocial behavior. As for negative factors, child psychological abuse and neglect (CPAN), characterized as the most prevalent and the least well-studied form of child maltreatment, also need to be further investigated [19]. In comparison with other forms of maltreatment (e.g., physical abuse), CPAN is presumed to have a comparatively high prevalence rate and has a detrimental effect on children's future well-being [19,20]. Therefore, the present study aims to focus on the effects of these two variables (EMWS and CPAN) on adolescent prosocial behavior, as well as the potential mechanisms underlying the relationships.

1.1. EMWS and Prosocial Behavior

Based on the internal working models (IWMs) in attachment theory [21], the attachment relationships between infants and caretakers can be internalized by children and affect their cognitive and emotional processing (e.g., memory), which would further form a prototype for their later social interactions with other people [22]. In other words, the willingness to help others could be a consequence of having benefited from early positive memories [13,23]. Much empirical research has demonstrated that EMWS can predict positive social development [15,18]. For instance, cross-sectional findings using Portuguese samples have found that EMWS are associated with lower levels of loneliness and increased social quality of life [18]. Early affiliative memories, such as warmth, safeness, and acceptance, have been shown to promote engagement in caregiving [24,25] and cooperative behaviors [15,26]. Moreover, a recent study conducted on Portuguese adolescents by Simões has also indicated that early positive emotional memories are directly associated with current feelings of social safeness and belonging [16]. In summary, the present study hypothesizes that EMWS are positively correlated with prosocial behavior in Chinese adolescents (H1).

1.2. CPAN and Prosocial Behavior

CPAN has been a serious social concern [27] and has aroused public attention as a global health issue. Specifically, psychological abuse refers to caretakers' continuously repetitive and inappropriate behavior toward children that conveys to individuals a sense of being unwanted or unloved [28]. While neglect is the caregiver's negligence in providing and meeting the child's basic essentials, including material essentials (e.g., food, education, hygiene) and emotional essentials (e.g., communication and protection). Children suffering from psychological abuse and neglect are often discouraged and frightened [20], and feel a lack of warmth and concern from caregivers [29]. According to previous studies, individuals with CPAN experiences in early life usually show a sense of insecurity and distrust towards others [30] and, consequently, feel an unwillingness to help others [8]. Consistent evidence has indicated that CPAN from early childhood would undermine positive social behaviors, such as less involvement in volunteering activities [31], increasing engagement in aggressive behaviors [23], and increased risk for externalizing and internalizing problems [32]. Furthermore, as the most frequent form of maltreatment suffered by children and adolescents, it has been increasingly acknowledged that CPAN could be a stronger predictor of subsequent impairments in individuals' development compared to the harm of physical abuse or other forms of maltreatment, and the significant harm

not only exists in childhood but also extends into adolescence [33]. Taken together, the present study hypothesizes that CPAN is negatively correlated with prosocial behavior in adolescents (H2).

1.3. The Mediation Effect of Psychological Suzhi

Early emotional experiences might influence prosocial behavior through many potential mechanisms such as empathy [34] and trust [14]. Here, we focus on psychological *suzhi*, a concept that is introduced by Chinese scholars in the background of China's quality-oriented education system [35]. The term *suzhi* comes out of the education reform policy announced by the Chinese government (http://www.moe.gov.cn (accessed on 1 August 2002)). In Chinese culture, *suzhi* often refers to the quality of an individual or a group and their associated character. Psychological *suzhi* is conceptualized as a stable, fundamental, and implicit psychological quality that shapes individuals' development, adaptation, and creative activities [36]. It has shown wide application since the publication of an international authoritative reference book—the *Handbook of Positive Psychology in Schools* [37]. Based on theoretical and empirical research over the last thirty years, Chinese scholars have proposed that psychological *suzhi* consists of three sub-scales: cognitive quality, individuality, and adaptability. Among these three sub-dimensions, cognitive quality, as the most fundamental component, refers to individuals' cognitive reflections of objects. Individuality is the reflection of individuals' behaviors toward things and is considered a core component. Simultaneously, adaptability refers to individuals' ability to experience consistency by adjusting themselves or transforming the environment during their socialization process [38]. Though it originated in China, the connotations of its elements are similar to some traditional concepts of positive psychology in Western culture (e.g., the emphasis on an individual's psychological development and adaptation to the environment) [35].

Based on the relationship model between psychological *suzhi* and mental health, psychological *suzhi* is a stable mental quality being cultivated under the common impacts of inherited genes and the social-cultural environment [39]. As a significant construct that is highly emphasized within Chinese psychology, psychological *suzhi* has been widely applied to studies among Chinese children and adolescents [35,38]. It reflects an individual's mental health condition on the internal level and affects external behavior under the effect of environmental factors, such as childhood experiences [33,40] and parenting styles [41]. Both external protective factors (e.g., EMWS) and risk factors (e.g., CPAN) could shape individuals' behavior through the mediating effect of psychological *suzhi*. Specifically, early memories of warmth, love and affection are positively related to adolescents' mental health [1] and psychological well-being [16] and are negatively associated with depressive symptoms [15,25,42,43]. On the other hand, psychological *suzhi*, as a positive mental trait, can facilitate individuals' positive adaptation to the social environment [37]. Therefore, the present study hypothesizes that psychological *suzhi* mediates the association between EMWS and prosocial behavior in adolescents (H3). In contrast, adverse experiences such as CPAN would undermine the psychological and social well-being of the child [7,44]. Individuals subjected to abuse and neglect in their early years are more prone to suffer from serious mental health problems, become less cooperative, less empathetic, and show more social withdrawal behaviors than other children [7]. Therefore, the present study hypothesizes that psychological *suzhi* mediates the association between CPAN with prosocial behavior (H4).

1.4. The Moderation Effect of Subjective Socioeconomic Status (SSS)

Under the evolutionary theory of socialization, socioeconomic context plays an integral part in an individual's social development. Warm and sensitive rearing practices are presumed to cultivate individuals' prosocial disposition, and these are often supported by abundant social and economic resources [7]. On the contrary, childhood abuse and neglect are more likely to increase the risk of problem behaviors under the stress of limited

resources or poverty [45]. Socioeconomic status (SES), a multidimensional concept that has been paid particular attention to by scholars in recent years, is shaped by both material resources of social life (e.g., wealth, education, and work) and one's perception of his or her socioeconomic status rank [46].

Research in this field has revealed the indispensable role that SES played in parenting, psychological health, and social behaviors. For instance, parents in higher SES families are more inclined to adopt warm and supportive rearing styles and encourage their children to actively engage in various social activities [47,48]. The combination of high SES and warm parenting styles would provide positive external environments for children's psychological development [49]. Conversely, low SES would act as a risk factor that negatively affects children's psychological and behavioral development [50].

Adolescence is a critical period experiencing the transition from childhood social status (mainly determined by family SES) to adulthood social status (mainly reflected by subjective SES). As parental influence decreases and personal autonomy increases, adolescents tend to assess SES based on their subjective perceptions of social stratification [51]. Subjective socioeconomic status, which is also called SSS, refers to individuals' subjective view of their socioeconomic status [52]. According to Wolff [50] and Piff [53], SSS is considered to be a more sensitive indicator of individuals' socioeconomic position, and a better predictor of one's behavior compared with SES. Thus, the present study hypothesizes that SSS moderates the effects of EMWS on prosocial behavior and psychological *suzhi* (H5), as well as the effects of CPAN on prosocial behavior and psychological *suzhi* (H6).

1.5. The Current Study

The purpose of the present study is to investigate the associations between the recall of early emotional experiences and prosocial behavior as well as their underlying mechanisms. To address this issue, EMWS was adopted as the positive factor to examine the recollection of an individual's early pleasant experiences, emotions, and feelings, while CPAN was considered as the negative measure to reflect one's early unfavorable experiences and emotions. Taking into account that EMWS and CPAN are not exactly two converse dimensions of early emotional experiences, the present study explored two separate moderated mediation models (Figure 1), including the roles of EMWS or CPAN, psychological *suzhi*, and SSS, as well as prosocial behavior. Psychological *suzhi* and SSS were investigated as potential mediating and moderating variables. In summary, the current study was designed to test six hypotheses:

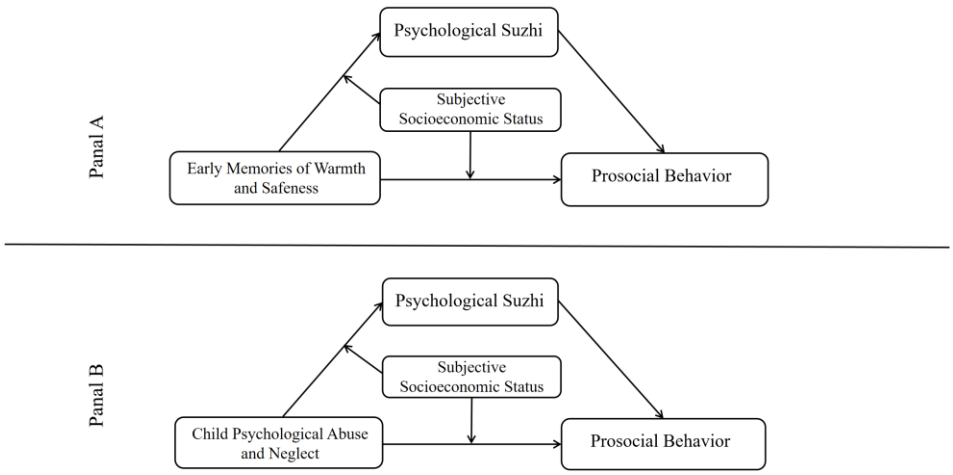

Figure 1. The moderated mediation models.

H1: *EMWS positively correlates with adolescents' prosocial behavior.*

H2: *CPAN negatively correlates with adolescents' prosocial behavior.*

H3: *Psychological suzhi mediates the relationship between EMWS and prosocial behavior.*

H4: *Psychological suzhi mediates the relationship between CPAN and prosocial behavior.*

H5: *SSS moderates the effect of EMWS on prosocial behavior and the effect of EMWS on psychological suzhi.*

H6: *SSS moderates the effect of CPAN on prosocial behavior and the effect of CPAN on psychological suzhi.*

2. Materials and Methods

2.1. Participants and Procedure

A total of 1078 participants were recruited from two junior and senior middle schools in Changsha and Yueyang city, Hunan Province, China, following the principle of convenience sampling. A total of 948 participants (M_{age} = 14.05 years, SD = 1.68 years; 43.6% females) were included in the final valid sample, with an effective recovery rate of 87.94%. Among them, 61.7% were junior middle school students (grades seven to nine), and 38.3% were senior middle school students (grades ten to twelve). The Research Ethics Committee of the Hunan Normal University of China approved this study, and it was carried out in compliance with the standards of the Declaration of Helsinki. All participating adolescents, parents, and school teachers submitted their written consent. Before the survey started, adolescents were required to read the instructions carefully. After making clear the test purpose and the way to answer, each of them finished a self-report questionnaire in 20 to 30 min independently under the guidance of experienced researchers. Data recruitment and analyses were completed by experienced postgraduate students.

2.2. Measures

2.2.1. Prosocial Behavior

Adolescents' prosocial behavior was measured by the Prosocial Tendencies Measure in the Chinese version (PTM) [54,55]. The measurement was initially proposed by Carlo and Randall [54] and consists of 26 items. In this study, we evaluated six types of prosocial tendencies: anonymous (5 items), emotional (4 items), dire (3 items), compliant (2 items), public (4 items), and altruism (4 items). Each item is rated by a 5-point Likert scale ranging from 1 "does not fit me at all" to 5 "fits me greatly". Confirmatory factor analyses were also conducted (CFAs) to examine this measurement and display good model fit indices: χ^2/df = 4.04, CFI = 0.92, TLI = 0.91, SRMR = 0.05, and RMSEA = 0.05. PTM in this research demonstrated good internal reliability (α = 0.90).

2.2.2. Early Memories of Warmth and Safeness (EMWS)

Adolescents' EMWS were measured using the Chinese version of the Early Memories of Warmth and Safeness Scale (EMWSS). The measurement was initially proposed by Richter [15]. Consisting of 21 items, each item (e.g., "I felt that I lived in a secure and safe environment"; "I felt that I was cherished by my family members") of EMWS is rated by a 5-point Likert scale ranging from 0 "never" to 4 "very often". Self-reports were collected to measure the recall of early positive emotional experiences such as warmth, safeness, and care in childhood. The CFA displays good model fit indices: χ^2/df = 4.35, CFI = 0.96, TLI = 0.95, SRMR = 0.03, and RMSEA = 0.06. EMWSS in this study demonstrated adequate internal reliability (α = 0.94).

2.2.3. Child Psychological Abuse and Neglect (CPAN)

Adolescents' CPAN was recorded by Child Psychological Abuse and Neglect Scale in the Chinese version with 31 items [56]. There were 2 sub-scales included in the measurement: psychological abuse (14 items, including belittling, threatening, and intermeddling) and neglect (17 items, including physical, emotional, and educational neglect). Each item is rated by a 5-point Likert scale ranging from 0 "never" to 4 "always". Both the CFA of psy-

chological abuse (χ^2/df = 4.16, CFI = 0.95, TLI = 0.94, SRMR = 0.03, and RMSEA = 0.06) and the CFA of neglect (χ^2/df = 2.91, CFI = 0.94, TLI = 0.93, SRMR = 0.03, and RMSEA = 0.05) supported well-fitted model indices. CPAN in this research demonstrated good internal reliability (α = 0.93).

2.2.4. Psychological *Suzhi*

The Psychological *suzhi* Scale for Adolescents (the simplified version) was adopted to measure Psychological *suzhi*. This version is the latest and most valid to apply to adolescents in China [41]. It includes 24 items and is composed of 3 subscales: cognitive quality (8 items), individuality quality (8 items), and adaptability quality (8 items). Each item is rated using a 5-point Likert scale (ranging from 1 "fully disagree" to 5 "fully agree"). The CFA displays good model fit indices: χ^2/df = 2.51, CFI = 0.96, TLI = 0.95, SRMR = 0.03, and RMSEA = 0.04. In this research, good reliability was found for both the total psychological *suzhi* (α = 0.96) and the three sub-scales (α = 0.90, 0.86, and 0.73).

2.2.5. Subjective Socioeconomic Status (SSS)

A Sociodemographic Questionnaire from the MacArthur Scale [57] was adopted to measure SSS. The measurement is assessed with a visual analog scale, which presents a picture of a 10-rung social ladder. Participants were required to compare themselves to their acquaintances (such as friends, family members, and coworkers) and determine where they stood on the ladder. The bottom rung (No. 1) indicates the lowest SSS and income situations. People who place themselves on this ladder usually have no access to good living conditions or decent jobs. On the contrary, the top rung (No. 10) indicates the highest SSS and income situations. People who place themselves on this ladder often possess good living conditions and well-paid jobs. This measurement for SSS was similarly used in previously published studies [51,58,59].

2.3. Data Analysis

All the study variables for the entire sample were included in the descriptive analysis. The grade and gender differences were investigated by ANOVA and an independent sample *t*-test, respectively. To make sure that the measurement model of the sample data had a suitable fit, confirmatory factor analysis was conducted to achieve that result. Structural equation modeling (SEM) was then performed to investigate the association between EMWS and CPAN and prosocial behavior.

The model fit of the sample data was evaluated by several standard fit indicators, including the CFI, TLI, RMSEA with a 90% confidence interval, and SRMR. Values greater than 0.90 for the CFI/TLI and smaller than 0.08 for the RMSEA/SRMR denoted acceptable and good fit, respectively [60]. LMS analysis was carried out by Mplus 8.3 [61] to calculate the effects of the potential moderator (SSS) on the direct path from EMWS and CPAN to prosocial behavior as well as the mediation path from EMWS and CPAN to psychological *suzhi*.

3. Results

3.1. Common Method Biases

The common method biases of the two models were tested using the Harman single-factor method. Both the findings revealed that there were 14 factors with an eigenvalue larger than 1. For the first model, the variance of the first factor's interpretation was 21.735%. For the second model, the variance of the first factor's interpretation was 18.146%. All were below the critical criterion of 40% and showed that there were no significant common method biases in the data of the present study.

3.2. Descriptive and Correlational Analyses

The findings of ANOVA and the independent sample T-test results indicated non-significant gender and grade differences in all variables ($p > 0.05$). Pearson's correlation analysis revealed significant positive associations between EMWS (M = 55.02, SD = 17.64)

and psychological *suzhi* (M = 81.22, SD = 14.47) (r = 0.41, $p < 0.01$), EMWS and prosocial behavior (M = 93.94, SD = 14.83) (r = 0.33, $p < 0.01$), as well as psychological *suzhi* and prosocial behavior (r = 0.40, $p < 0.01$). On the contrary, negative correlations were found between CPAN (M = 30.92, SD = 19.61) and psychological *suzhi* ($r = -0.12$, $p < 0.01$), as well as CPAN and prosocial behavior ($r = -0.25$, $p < 0.01$). See Table 1 for details.

Table 1. Means, standard deviations, and correlations among all variables (N = 948).

Variables	*M*	*SD*	Correlations					
			1	**2**	**3**	**4**	**5**	**6**
1. EMWS	55.02	17.64	1					
2. CPAN	30.92	19.61	−0.50 **	1				
3. Psychological abuse	14.93	10.76	−0.46 **	0.90 **	1			
4. Neglect	15.98	10.77	−0.45 **	0.90 **	0.61 **	1		
5. Psychological *suzhi*	81.22	14.47	0.41 **	−0.25 **	−0.22 **	−0.32 **	1	
6. Prosocial behavior	93.94	14.83	0.33 **	−0.12 **	−0.09 **	−0.13 **	0.40 **	1

Notes: EMWS = Early Memories of Warmth and Safeness; CPAN = Child Psychological Abuse and Neglect; *M* = mean value; *SD* = standard deviation. ** $p < 0.01$.

3.3. EMWS, CPAN, and Prosocial Behaviors

In accordance with the procedures of the mediation analysis [62], simple regression models with latent variables were initially established to assess the direct predictive effects of EMWS and CPAN on prosocial behavior, respectively. The models demonstrated good fits to the data. χ_{EMWS}^2 = 1399.65, df = 552, CFI = 0.94, TLI = 0.93, RMSEA = 0.04, SRMR = 0.05, indicating a significant positive association between EMWS and prosocial behavior (β_{EMWS} = 0.39, $p < 0.001$). χ_{abuse}^2 = 1214.12, df = 516, CFI = 0.94, TLI = 0.93, RMSEA = 0.04, SRMR = 0.04; $\chi_{neglect}^2$ = 1172.29, df = 549, CFI = 0.93, TLI = 0.93, RMSEA = 0.04, SRMR = 0.04, indicating a significant negative association between psychological abuse, neglect, and prosocial behavior ($\beta_{abuse} = -0.076$, $p < 0.05$; $\beta_{neglect} = -0.131$, $p < 0.01$).

3.4. The Mediation Effect of Psychological Suzhi

Firstly, psychological *suzhi* was introduced as a mediation variable between EMWS and prosocial behavior to establish a simple mediation model, and the model fitted well (χ^2 = 2739.36, df = 1210, CFI = 0.92, TLI = 0.91, RMSEA = 0.04, SRMR = 0.05). As can be shown in Figure 2, the path coefficient between EMWS and prosocial behavior reduced (β = 0.25) but was still significant. Bootstrapping 95% CI = [0.092, 0.211], which excluded 0 from the range and confirmed a significant mediating effect of psychological *suzhi* in the association between EMWS and prosocial behavior.

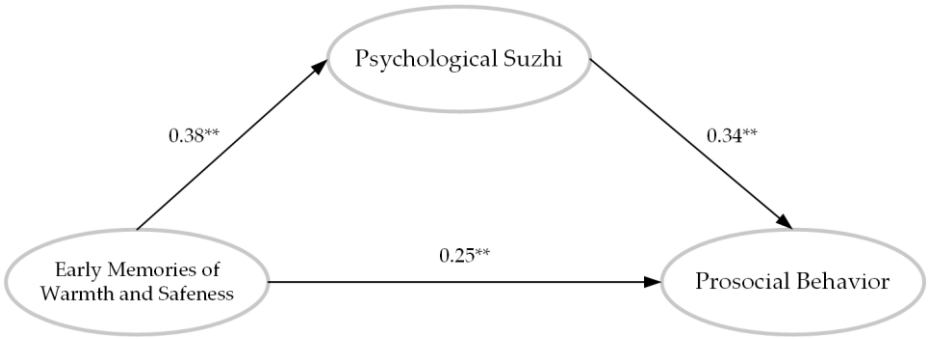

Figure 2. The mediation role of psychological *suzhi* in the relationship between EMWS and prosocial behavior. Notes. EMWS = early memories of warmth and safeness. ** $p < 0.01$.

Psychological *suzhi* was then introduced as a mediation variable between CPAN and prosocial behavior to establish two simple mediation models. The models fitted well (χ_{abuse}^2 = 2377.68, df = 1208, CFI = 0.92, TLI = 0.92, RMSEA = 0.03, SRMR = 0.04; $\chi_{neglect}^2$ = 2364.34, df = 1258, CFI = 0.92, TLI = 0.91, RMSEA = 0.03, SRMR = 0.04). As can

be shown in Figure 3, the path coefficients between psychological abuse and neglect with prosocial behavior reduced to insignificant levels ($\beta_{abuse} = -0.054$, $p = 0.175$; $\beta_{neglect} = -0.025$, $p = 0.542$). The bootstrapping method was then used to examine the indirect effect of the mediation variable, 95% CI_{abuse} = [−0.181, −0.008], $CI_{neglect}$ = [−0.214, −0.109], which excluded 0 from the range and confirmed the main mediation effect of psychological *suzhi* in the associations between CPAN and prosocial behavior.

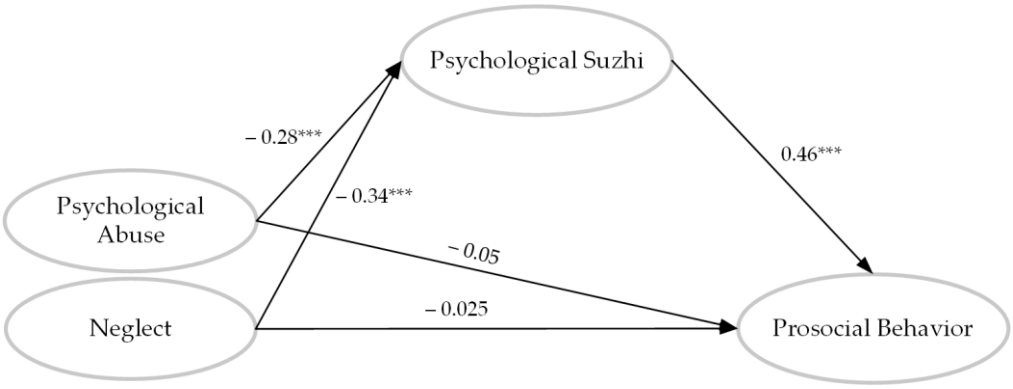

Figure 3. The mediation role of psychological *suzhi* in the relationship between psychological abuse and neglect with prosocial behavior. *** $p < 0.001$.

3.5. The Moderated Mediation Effect of SSS

The LMS analysis was performed to examine the moderation hypotheses [63], in line with the testing procedures of the moderated mediation analysis [62].

Firstly, the moderating role of SSS on the direct path (EMWS → prosocial behavior) and the mediation path (EMWS → psychological *suzhi*) were examined. For the direct path from EMWS to prosocial behavior, the model fitted well ($\chi^2 = 2929.11$, $df = 1260$, CFI = 0.90, TLI = 0.90, RMSEA = 0.04, SRMR = 0.05) and $LogL_{restricted} = -62840.14$. A potential interaction (SSS × EWMS) was introduced to construct a complete model, with findings indicating that $LogL_{full} = -62834.87$. Based on the calculative formula, LR = 10.55, $df = 1$, $p < 0.001$, which showed an acceptable model fit. Furthermore, the potential interaction effect was significant ($\beta = 0.10$, $p < 0.001$), suggesting that SSS could moderate the impact of EMWS on prosocial behavior in adolescence. For the mediation path from EMWS to psychological *suzhi*, the model fitted well ($\chi^2 = 2861.54$, $df = 1260$, CFI = 0.91, TLI = 0.90, RMSEA = 0.04, SRMR = 0.05) and $LogL_{restricted} = -62806.35$. The findings of the full model indicated that $LogL_{full} = -62805.87$. Based on the calculative formula, LR = 0.96, $df = 1$, $p < 0.5$, which showed a poor model fitting; the latent interaction between EMWS and SSS was insignificant ($\beta = 0.032$, $p = 0.33$), indicating that SSS did not play a moderating role in the association linking EMWS and psychological *suzhi*.

Secondly, taking into account the insignificant results of the direct paths in the mediation model, only the moderating role of SSS on the indirect paths from psychological abuse and neglect to psychological *suzhi* was examined. SSS was included as an independent variable to create moderation models in the simple regression model, and the models fitted well ($\chi_{abuse}^2 = 2476.47$, $df = 1258$, CFI = 0.92, TLI = 0.92, RMSEA = 0.03, SRMR= 0.04; $\chi_{neglect}^2 = 2483.56$, $df = 1309$, CFI = 0.92, TLI = 0.91, RMSEA = 0.03, SRMR= 0.04). $LogL_{restricted\_A} = -59451.08$, $df = 170$; $LogL_{restricted\_N} = -61659.88$, $df = 173$. Potential interactions (SSS × Abuse/Neglect) were introduced to construct a complete model, with findings indicating that $LogL_{restricted\_A} = -59447.84$, $df = 171$; $LogL_{restricted\_N} = -61655.95$, $df = 174$. Based on the calculative formula, $LR_A = 6.48$, $df_A = 1$, $p < 0.05$; $LR_N = 7.90$, $df_N = 1$, $p < 0.01$, which showed an acceptable model fit. The potential interaction effects were significant ($\beta_{abuse} = -0.09$, $p < 0.05$; $\beta_{neglect} = -0.10$, $p < 0.01$), suggesting that SSS could moderate the impact of CPAN on psychological *suzhi*.

To further examine the moderated mediation effect, simple slope analyses were performed on the interactions between EMWS, psychological abuse, and neglect with SSS.

Figure 4A showed that the positive effect of EMWS on prosocial behavior was more significant when SSS was high ($M + SD$), $\beta_{EMWS\_H} = 0.281$, $p < 0.001$; $\beta_{EMWS\_L} = 0.159$, $p < 0.001$, whereas the association was much weaker when SSS was low ($M—SD$). Figure 4B showed that the negative effects of psychological abuse and neglect on psychological *suzhi* were significant when SSS was high ($M + SD$), $\beta_{abuse\_H} = -0.08$, $p < 0.05$; $\beta_{neglect\_H} = -0.34$, $p < 0.001$, whereas the effects were insignificant when SSS was low ($M—SD$), $\beta_{abuse\_L} = -0.01$, $p = 0.90$; $\beta_{neglect\_L} = -0.08$, $p = 0.34$.

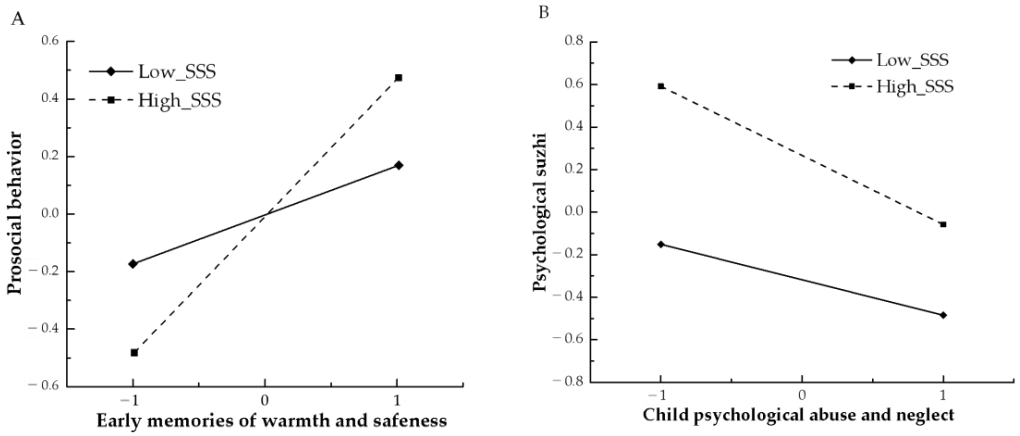

Figure 4. (**A**) SSS as a moderator in the effects of EMWS on prosocial behavior; (**B**) SSS as a moderator in the effects of CPAN on psychological *suzhi*.

4. Discussion

This research was designed to examine the impacts of EMWS and CPAN on prosocial behavior in adolescence, as well as the mediation effect of psychological *suzhi* and the moderation effect of SSS. The results indicated that EMWS promoted prosocial behavior, whereas CPAN was negatively associated with prosocial behavior. In addition, the tested models revealed that psychological *suzhi* mediated the effects of EMWS and CPAN on prosocial behavior. As for the moderating effect of SSS, the findings showed that SSS moderated the path between EMWS and prosocial behavior as well as the path between CPAN and psychological *suzhi*. The novel findings in this study promote a better understanding of the mechanisms of adolescents' prosocial behavior.

4.1. EMWS, CPAN and Adolescents' Prosocial Behavior

As expected, correlation analyses indicated that EMWS was significantly associated with prosocial behavior. The positive relationship between EMWS and prosocial behavior supported the H1, indicating that adolescents who recalled more warm and safe memories in early childhood tended to engage in more prosocial behaviors in adolescence. This is the first study to explore the association between EMWS and Chinese adolescents' prosocial behavior. The result extends previous research suggesting that early warmth and safe experiences or memories contribute to adolescents' social development, such as higher levels of social safeness [16] and social life quality [18]. Furthermore, from the perspective of Bowlby's attachment theory [21], a securely-attached person could easily recollect feelings of warmth and safeness [15,26]. These positive emotional memories seem to stimulate the soothing affiliation system that directs one's attention and energy to other human beings' sufferings, and thereby inspire more prosocial behaviors towards others [17,64,65].

The inverse relationship between CPAN and prosocial behavior supported the H2, indicating that adolescents who suffered from more psychological abuse and neglect in early childhood tended to engage in less prosocial behaviors in adolescence. It has been well established that CPAN is associated with higher levels of negative outcomes (e.g., more suicidal or anti-social behaviors) and lower levels of positive outcomes (e.g., low self-esteem and subjective well-being levels) [9,10,29,30]. The current finding is consistent with existing research demonstrating that adverse early-life experiences, such as CPAN, could be robust

risk factors that negatively affect adolescents' social interpersonal relationships [10,14]. Children with psychological abuse and neglect in their early lives are prone to perceive the world as uncaring and the relationships around them as untrustworthy [7], and are therefore less likely to establish secure attachment relationships with others, which could in turn damage their prosocial system and discourage them from exhibiting prosocial behaviors during adolescence [9,66].

4.2. The Mediation Effect of Psychological Suzhi

Mediation analysis results were in accordance with the H3 and the H4, indicating that psychological *suzhi*, acting as a novel mediation mechanism, revealed the relationships between early emotional experiences (both EMWS and CPAN) and prosocial behavior. Consistent with previous studies, early positive experiences (e.g., perceived parental warmth and secure parent–child attachment) would promote adolescents' prosocial behavior by improving their psychological *suzhi* levels [41,67]. Besides activating the prosocial system directly, EMWS also contributes to prosocial behavior by providing a rather solid and stable psychological basis (i.e., high levels of psychological *suzhi*) for individuals. Adolescents who recall more EMWS usually grow up in caring, harmonious, and supportive environments [26,64]. The positive atmosphere is conducive to the cultivation of individuals' mental resources (e.g., higher cognitive quality and adaptive ability), and contributes to the development of positive psychological traits [11,67,68]. Moreover, from the psychological and behavioral perspective, *suzhi* is closely correlated with individual behavior in Chinese society. One's prosocial behavior is the exterior representation and adaptive outcome of psychological *suzhi* [36]. Individuals with high psychological *suzhi* levels are often perceived to adapt themselves to new environments quickly and engage in more prosocial behaviors [41,66].

On the contrary, CPAN would reduce adolescents' participation in prosocial behaviors by undermining their psychological *suzhi* levels. This finding supports the stress process model, emphasizing that stressful life events could affect individuals' behavioral expressions through the loss of psychological resources (e.g., psychological sushi) [69]. Consistent with previous research, experiencing frequent childhood adversities (e.g., CPAN) could hinder adolescents' cognitive, personality, and social development, thereby weakening their psychological *suzhi* levels [70]. Consequently, individuals with low levels of psychological *suzhi* tend to show more psychological stress and conflict, leading to an increased incidence of mental health problems and reduced engagement in prosocial behaviors [71].

4.3. The Moderation Effect of SSS

Moderated mediation analysis in the proposed model showed that SSS moderated the effect of EMWS on prosocial behavior, which partly supported the H5. Specifically, the link between EMWS and prosocial behavior was more significant when SSS was high, while the link was weaker when SSS was low. This is in line with previous work that high SSS may contribute to positive psychological and behavioral outcomes in adolescence [51]. According to the evolutionary theory of socialization [7], individuals with high SSS usually grow up in environments in which resources are relatively abundant or predictable, therefore, they are more prone to cultivate psychological well-being and engage in more prosocial behaviors. Contrary to our expectations, the moderated mediation impact of SSS on the association between EMWS and psychological *suzhi* was insignificant, suggesting that whether the SSS was high or low, EMWS was steadily and positively linked to psychological *suzhi*. In other words, no matter what SSS adolescents possess compared to others, EMWS would contribute to their cultivation of high levels of psychological *suzhi*. As suggested in the ecological systems theory [72], the micro-system (e.g., family–child interactions) is the immediate environment that has the most influence on a child's development, which is often very personal and fundamental for fostering and supporting adolescents' psychological development [73]. Specific to this study, early

warmth and safeness experiences obtained from the micro-system might have a steady and stable influence on adolescents' cultivation of psychological *suzhi*.

The results also revealed that high SSS moderated the effect of CPAN on psychological *suzhi*, which partly supported the H6. However, contrary to previous work demonstrating that high SSS could serve as a protective factor against a range of mental health problems [74], this finding showed that the link between CPAN and psychological *suzhi* was more significant when SSS was high, while the link was insignificant when SSS was low. One possible explanation for this is that high SSS may also operate as a vulnerable factor that undermines an individual's psychological functioning in the presence of adversities [75]. Previous research similarly confirmed the deleterious consequences of high SES for children and adolescents in African Americans, such as worsened psychological well-being and increased depressive symptoms [75,76]. In the present study, high SSS adolescents may be more vulnerable when suffering from CPAN, whereas low SSS adolescents may have developed other resilience mechanisms, such as flourishing in adverse conditions [77]. The finding that SSS moderates the effect of CPAN on psychological *suzhi* may add to the existing literature and provide new insight.

4.4. Joint Discussion of the Two Models

To summarize, the recall of early emotional experiences, both positive and negative, was associated with adolescents' prosocial behavior through specific mediation and moderation mechanisms. On the one hand, in the EMWS model, early warmth and safeness experiences could promote adolescents' prosocial behavior through the mediating effect of psychological suzhi. The association between EMWS and psychological suzhi was relatively stable, suggesting that early positive emotional experiences play stable protective roles in individuals' psychological development. Higher SSS acted as a promotive factor that strengthened the association between EMWS and adolescents' prosocial behaviors. On the other hand, in the CPAN model, early psychological abuse and neglect experiences could undermine adolescents' prosocial behaviors by devastating their psychological *suzhi*. High SSS moderated the effect of CPAN on psychological *suzhi*, which verified the vulnerable role that high SSS played in adverse situations. The evolutionary theory of socialization proposed that the linkage between early rearing, social context, and psychological orientation fosters intertwining patterns in children's interpersonal behavior [7]. By combining the results of the two models together, the present study extended the previous research in this field and verified the theory by illustrating the associations between early childhood experiences (EMWS and CPAN) and adolescents' prosocial behavior, along with the mediating effect of psychological basis (i.e., psychological *suzhi*) and the moderating effect of socioeconomic context (i.e., SSS). In summary, the findings concluded that adolescents growing up in environments with positive emotional experiences and relatively abundant resources (both physical and psychological) would focus on more prosocial encounters with others. Whereas early negative emotional experiences, even with higher socioeconomic backgrounds, are more likely to trigger individuals' psychological problems (i.e., decreased levels of psychological *suzhi*) and consequently lead to less engagement in prosocial behaviors.

4.5. Implications and Limitations

The findings in the present study may reveal profound implications for both educational research and practice. First and foremost, this study highlights the protective role of EMWS and the destructive effect of CPAN during adolescents' psychological and social development. Hence, it is imperative for caregivers to meet children's emotional needs in a warm and supportive environment to cultivate their positive social interpersonal relationships in later life. In addition, given that psychological *suzhi* is a crucial mechanism mediating the associations between early childhood experiences and prosocial behavior, it would be necessary to cultivate individuals' psychological *suzhi* to mitigate the negative effects of external adversities. Furthermore, a particular focus should be placed on subjec-

tive perceptions of adolescents' socioeconomic status. The implicit negative impact of high SSS reminds us that individuals should develop resilience mechanisms, such as flourishing under adverse conditions, especially for adolescents growing up in high socioeconomic status families.

Several limitations in this research should be acknowledged when interpreting the results. Firstly, restricted by the research conditions, the current research was performed with cross-sectional adolescent sampling data, and the assessment was based on self-report measures. Longitudinal or experimental designs may be adopted by future studies to investigate the developmental trend of core variables and the causal relationships between these variables. Secondly, the EMWS and CPAN scales used in the present study requested participants to recollect childhood memories. Although retrospective recall data has been shown to be relatively stable and reliable, the current emotional state may influence the recollection and current feelings of interpersonal relationship qualities [78]. Moreover, early experiences such as support and physical abuse are also lacking comparison and discussion in the current study. Lastly, the recruiting is exclusively conducted in schools in central China, despite the fact that the social and economic development in China differs significantly across regions. Therefore, it is necessary to proceed with caution when applying the findings to larger samples and other areas.

5. Conclusions

In summary, the present study suggests that EMWS serves as a possible vehicle to promote prosocial behavior in adolescents by facilitating their psychological *suzhi*. Conversely, CPAN may be a factor that impedes the improvement of psychological *suzhi* and prosocial behavior. Additionally, high SSS reinforces the positive effect of EMWS on prosocial behavior and the negative effect of CPAN on psychological *suzhi*. The study highlights the importance of the recall of early emotional experiences on adolescents' psychological and social development and provides new insight into understanding the underlying mechanisms of prosocial behavior.

Author Contributions: Conceptualization, X.L. and G.C.; Methodology, X.L. and G.C.; Software, G.C.; Validation, G.C., X.L. and L.Z.; Formal Analysis, G.C.; Investigation, G.C.; Writing—Original Draft Preparation, X.L.; Writing—Review & Editing, X.L., Y.C., S.L., Y.S., Y.L. (Yunpeng Liu) and Y.L. (Yulin Li); Visualization, X.L.; Supervision, Y.C., L.Z. and H.Y.; Project Administration, H.Y.; and Funding Acquisition, H.Y. All authors have read and agreed to the published version of the manuscript.

Funding: This work was funded by the Research Foundation of Science and Technology Bureau of Changsha, Hunan Province, China [grant number: kq2202242].

Institutional Review Board Statement: The Research Ethics Committee of Hunan Normal University waived the ethics approval for this study.

Informed Consent Statement: Informed consent was obtained from all individual participants included in the study, and informed consent was obtained from legal guardians.

Data Availability Statement: The datasets that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Cunha, M.; Xavier, A.; Martinho, M.I.; Matos, M. Measuring positive emotional memories in adolescents: Psychometric properties and confirmatory factor analysis of the early memories of warmth and safeness scale. *Int. J. Psychol. Psychol. Ther.* **2014**, *14*, 245–259.
2. Wolfe, D.A.; Mash, E.J. *Behavioral and Emotional Disorders in Adolescents: Nature, Assessment, and Treatment*; Guilford Press: New York, NY, USA, 2006.
3. Eisenberg, N.; Eggum-Wilkens, N.D.; Spinrad, T.L. *The Development of Prosocial Behavior*; Oxford University Press: Melbourne, Australia, 2015.
4. Padilla-Walker, L.M.; Carlo, G. The study of prosocial behavior. In *Prosocial Development: A Multidimensional Approach*; Oxford University Press: Oxford, UK, 2014; pp. 3–16.

5. Van der Graaff, J.; Carlo, G.; Crocetti, E.; Koot, H.M.; Branje, S. Prosocial Behavior in Adolescence: Gender Differences in Development and Links with Empathy. *J. Youth Adolesc.* **2018**, *47*, 1086–1099. [CrossRef] [PubMed]
6. Williams, S.E.; Ford, J.H.; Kensinger, E.A. The power of negative and positive episodic memories. *Cogn. Affect. Behav. Neurosci.* **2022**, *22*, 869–903. [CrossRef]
7. Belsky, J.; Steinberg, L.; Draper, P. Childhood Experience, Interpersonal Development, and Reproductive Strategy: An Evolutionary Theory of Socialization. *Child Dev.* **1991**, *62*, 647–670. [CrossRef]
8. Padilla-Walker, L.M.; Nielson, M.G.; Day, R.D. The role of parental warmth and hostility on adolescents' prosocial behavior toward multiple targets. *J. Fam. Psychol.* **2016**, *30*, 331–340. [CrossRef]
9. Yu, G.; Li, S.; Zhao, F. Childhood maltreatment and prosocial behavior among Chinese adolescents: Roles of empathy and gratitude. *Child Abus. Negl.* **2020**, *101*, 104319. [CrossRef] [PubMed]
10. Liu, J.; Li, B.; Xu, M.; Luo, J.; Li, X. Effects of childhood maltreatment on prosocial behaviors among Chinese emerging adults: A mediated moderation model of psychological suzhi and gratitude. *Child. Youth Serv. Rev.* **2022**, *132*, 106334. [CrossRef]
11. Luo, H.; Liu, Q.; Yu, C.; Nie, Y. Parental warmth, gratitude, and prosocial behavior among chinese adolescents: The moderating effect of school climate. *Int. J. Environ. Res. Public Health* **2021**, *18*, 7033. [CrossRef]
12. Quan, S.; Li, M.; Yang, X.; Song, H.; Wang, Z. Perceived Parental Emotional Warmth and Prosocial Behaviors among Emerging Adults: Personal Belief in a Just World and Gratitude as Mediators. *J. Child Fam. Stud.* **2022**, *31*, 1019–1029. [CrossRef]
13. Shi, X.; Wang, B.; He, T.; Wu, L.; Zhang, J. Secure attachments predict prosocial behaviors: A moderated mediation study. *PsyCh J.* **2020**, *9*, 597–608. [CrossRef]
14. Wu, J.; Yuan, M.; Kou, Y. Disadvantaged early-life experience negatively predicts prosocial behavior: The roles of Honesty-Humility and dispositional trust among Chinese adolescents. *Personal. Individ. Differ.* **2020**, *152*, 109608. [CrossRef]
15. Richter, A.; Gilbert, P.; McEwan, K. Development of an early memories of warmth and safeness scale and its relationship to psychopathology. *Psychol. Psychother. Theory Res. Pract.* **2009**, *82*, 171–184. [CrossRef] [PubMed]
16. Marta-Simões, J.; Tylka, T.L.; Ferreira, C. Potential contributing roles of early affiliative memories, social safeness and body appreciation to adolescents' well-being. *J. Health Psychol.* **2022**, *27*, 445–455. [CrossRef] [PubMed]
17. Ferreira, C.; Silva, C.; Mendes, A.L.; Trindade, I.A. How do warmth, safeness and connectedness-related memories and experiences explain disordered eating? *Eat Weight Disord.* **2018**, *23*, 629–636. [CrossRef]
18. Ferreira, C.; Matos-Pina, I.; Cardoso, A.; Coimbra, M.; Oliveira, S. Can the lack of early memories of warmth and safeness explain loneliness and quality of life? A community sample study on young and middle-aged Portuguese adults. *Curr. Psychol.* **2021**. [CrossRef]
19. Hayashi, M. Child psychological/emotional abuse and neglect: A definitional conceptual framework. *J. Child Adolesc. Trauma* **2022**, *15*, 999–1010. [CrossRef]
20. Li, Q.; Wang, F.; Ye, J. Impact of psychological abuse on children and social skill development. *Aggress. Violent Behav.* **2021**, 101667. [CrossRef]
21. Bowlby, J. Attachment and Loss: Retrospect and Prospect. *Am. J. Orthopsychiatry* **1982**, *52*, 664–678. [CrossRef]
22. Bretherton, I.; Munholland, K. Internal Working Models in Attachment Relationships: Elaborating a Central Construct in Attachment Theory. In *Handbook of Attachment: Theory, Research and Clinical Application*; The Guilford Press: New York, NY, USA, 2008; pp. 102–127.
23. Wang, Y.; Li, D.; Sun, W.; Zhao, L.; Lai, X.; Zhou, Y. Parent-child attachment and prosocial behavior among junior high school students: Moderated mediation effect. *Acta Psychol. Sin.* **2017**, *49*, 663–679. [CrossRef]
24. Gilbert, P.; Cheung, M.S.P.; Grandfield, T.; Campey, F.; Irons, C. Recall of threat and submissiveness in childhood: Development of a new scale and its relationship with depression, social comparison and shame. *Clin. Psychol. Psychother.* **2003**, *10*, 108–115. [CrossRef]
25. Steindl, S.R.; Matos, M.; Creed, A.K. Early shame and safeness memories, and later depressive symptoms and safe affect: The mediating role of self-compassion. *Curr. Psychol.* **2021**, *40*, 761–771. [CrossRef]
26. Irons, C.; Gilbert, P.; Baldwin, M.W.; Baccus, J.R.; Palmer, M. Parental recall, attachment relating and self-attacking/self-reassurance: Their relationship with depression. *Br. J. Clin. Psychol.* **2006**, *45*, 297–308. [CrossRef]
27. Li, J.; Li, Z.; Lei, X.; Yang, J.; Yu, X.; Liu, H. Longitudinal Association between Child Psychological Abuse and Neglect and Academic Achievement in Chinese Primary School Children: A Moderated Mediation Model. *Front. Psychol.* **2022**, *13*, 870371. [CrossRef] [PubMed]
28. Haque, M.A.; Moniruzzaman, S.; Janson, S.; Rahman, A.K.M.F.; Mashreky, S.R.; Eriksson, U.B. Children's exposure to psychological abuse and neglect: A population-based study in rural Bangladesh. *Acta Paediatr. Int. J. Paediatr.* **2021**, *110*, 257–264. [CrossRef] [PubMed]
29. Kaplan, S.J.; Pelcovitz, D.; Labruna, V. Child and adolescent abuse and neglect research: A review of the past 10 years. Part I: Physical and emotional abuse and neglect. *J. Am. Acad. Child Adolesc. Psychiatry* **1999**, *38*, 1214–1222. [CrossRef] [PubMed]
30. Zhou, Y.-h. Childhood trauma and subjective well-being in postgraduates: The mediating of coping style. *Chin. J. Clin. Psychol.* **2016**, *24*, 509–513.
31. Chen, L.; Wang, Y.; Li, Y. Belief in a just world and trait gratitude mediate the effect of childhood psychological maltreatment on undergraduates cyberbullying attitude. *Chin. J. Clin. Psychol.* **2020**, *28*, 152–156.

32. Allen, E.K.; Desir, M.P.; Shenk, C.E. Child maltreatment and adolescent externalizing behavior: Examining the indirect and cross-lagged pathways of prosocial peer activities. *Child Abus. Negl.* **2021**, *111*, 104796. [CrossRef] [PubMed]
33. Biçakçi, M.Y.; Er, S.; Aral, N. An overview of child neglect and abuse: Types, causes, impact and prevention. *Stud. Ethno-Med.* **2016**, *10*, 221–228. [CrossRef]
34. Hoffman, M.L. Empathy and prosocial behavior. *Handb. Emot.* **2008**, *3*, 440–455.
35. Zhang, D.; Feng, Z.; Guo, C.; Chen, X.J. Problems on research of children psychological suzhi. *J. Southwest China Norm. Univ. (Humanit. Soc. Sci. Ed.)* **2000**, *26*, 56–62.
36. Zhang, D.J.; Wang, X. An analysis of the relationship between mental health and psychological suzhi: From the perspective of connotation and structure. *J. Southwest Univ.* **2012**, *38*, 69–74.
37. Furlong, M.J.; Gilman, R.; Huebner, E.S. *Handbook of Positive Psychology in Schools*; Routledge: New York, NY, USA, 2014.
38. Nie, Q.; Yang, C.; Teng, Z.; Furlong, M.J.; Pan, Y.; Guo, C.; Zhang, D. Longitudinal association between school climate and depressive symptoms: The mediating role of psychological suzhi. *Sch. Psychol.* **2020**, *35*, 267–276. [CrossRef] [PubMed]
39. Wang, X.; Zhang, X.; Zhang, D.J. The relationship between psychological Suzhi and mental health among Chinese college students. *J. Biosci. Med.* **2016**, *4*, 21–29. [CrossRef]
40. Wu, L.; Zhang, D.; Cheng, G.; Hu, T. Bullying and Social Anxiety in Chinese Children: Moderating Roles of Trait Resilience and Psychological Suzhi. *Child Abus. Negl.* **2018**, *76*, 204–215. [CrossRef] [PubMed]
41. Pan, Y.; Hu, Y.; Zhang, D.; Ran, G.; Li, B.; Liu, C.; Liu, G.; Luo, S.; Chen, W. Parental and peer attachment and adolescents' behaviors: The mediating role of psychological suzhi in a longitudinal study. *Child. Youth Serv. Rev.* **2017**, *83*, 218–225. [CrossRef]
42. Matos, M.; Duarte, J.; Pinto-Gouveia, J. The Origins of Fears of Compassion: Shame and Lack of Safeness Memories, Fears of Compassion and Psychopathology. *J. Psychol. Interdiscip. Appl.* **2017**, *151*, 804–819. [CrossRef]
43. Matos, M.; Pinto-Gouveia, J.; Duarte, C. Internalizing early memories of shame and lack of safeness and warmth: The mediating role of shame on depression. *Behav. Cogn. Psychother.* **2013**, *41*, 479–493. [CrossRef]
44. Glaser, D. Emotional abuse and neglect (psychological maltreatment): A conceptual framework. *Child Abus. Negl.* **2002**, *26*, 697–714. [CrossRef] [PubMed]
45. Ellis, B.J.; Essex, M.J. Family environments, adrenarche, and sexual maturation: A longitudinal test of a life history model. *Child Dev.* **2007**, *78*, 1799–1817. [CrossRef]
46. Kraus, M.W.; Piff, P.K.; Mendoza-Denton, R.; Rheinschmidt, M.L.; Keltner, D. Social class, solipsism, and contextualism: How the rich are different from the poor. *Psychol. Rev.* **2012**, *119*, 546–572. [CrossRef]
47. Schmitt-Rodermund, E.; Vondracek, F.W. Breadth of Interests, Exploration, and Identity Development in Adolescence. *J. Vocat. Behav.* **1999**, *55*, 298–317. [CrossRef]
48. Yuan, Y.; Sun, X.; Chen, Q.; Liu, Z.; Xue, G. Family socioeconomic status and youth leadership potential: Serial mediating effects of parental rearing behaviors and youth self-esteem. *Curr. Psychol.* **2022**, *41*, 2034–2044. [CrossRef]
49. Mo, W.J.; Zhang, D.J.; Pan, Y.G.; Liu, G.Z. Family socioeconomic status and academic performance of migrant children: The chain mediating effects of parental emotional warmth and psychological Suzhi. *J. Southwest Univ.* **2018**, *40*, 57–63.
50. Wolff, L.S.; Subramanian, S.V.; Acevedo-Garcia, D.; Weber, D.; Kawachi, I. Compared to whom? Subjective social status, self-rated health, and referent group sensitivity in a diverse US sample. *Soc. Sci. Med.* **2010**, *70*, 2019–2028. [CrossRef]
51. Goodman, E.; Adler, N.E.; Kawachi, I.; Frazier, A.L.; Huang, B.; Colditz, G.A. Adolescents' perceptions of social status: Development and evaluation of a new indicator. *Pediatrics* **2001**, *108*, e31. [CrossRef] [PubMed]
52. Singh-Manoux, A.; Adler, N.E.; Marmot, M.G. Subjective social status: Its determinants and its association with measures of ill-health in the Whitehall II study. *Soc. Sci. Med.* **2003**, *56*, 1321–1333. [CrossRef]
53. Piff, P.K.; Kraus, M.W.; Côté, S.; Cheng, B.H.; Keltner, D. Having Less, Giving More: The Influence of Social Class on Prosocial Behavior. *J. Personal. Soc. Psychol.* **2010**, *99*, 771–784. [CrossRef] [PubMed]
54. Carlo, G.; Randall, B.A. The development of a measure of prosocial behaviors for late adolescents. *J. Youth Adolesc.* **2002**, *31*, 31–44. [CrossRef]
55. Kou, Y.; Hong, H.; Tan, C.; Li, L. Revisioning prosocial tendencies measure for adolescent. *Psychol. Dev. Educ.* **2007**, *23*, 112–117.
56. Deng, Y.; Pan, C.; Tang, Q.; Yuan, X.; Xiao, C. Preliminary development of Child psychological abuse and neglect scale. *Chin. J. Behav. Med. Brain Sci.* **2007**, *16*, 3.
57. Adler, N.E.; Epel, E.S.; Castellazzo, G.; Ickovics, J.R. Relationship of subjective and objective social status with psychological and physiological functioning: Preliminary data in healthy, White women. *Health Psychol.* **2000**, *19*, 586–592. [CrossRef]
58. Demakakos, P.; Nazroo, J.; Breeze, E.; Marmot, M. Socioeconomic status and health: The role of subjective social status. *Soc. Sci. Med.* **2008**, *67*, 330–340. [CrossRef] [PubMed]
59. Steen, P.B.; Poulsen, P.H.; Andersen, J.H.; Biering, K. Subjective social status is an important determinant of perceived stress among adolescents: A cross-sectional study. *BMC Public Health* **2020**, *20*, 396. [CrossRef] [PubMed]
60. Hu, L.T.; Bentler, P.M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Model.* **1999**, *6*, 1–55. [CrossRef]
61. Asparouhov, T.; Muthén, B. Bayesian estimation of single and multilevel models with latent variable interactions. *Struct. Equ. Model.* **2021**, *28*, 314–328. [CrossRef]
62. Wen, Z.; Ye, B. Analyses of mediating effects: The development of methods and models. *Adv. Psychol. Sci.* **2014**, *22*, 731. [CrossRef]

63. Klein, A.; Moosbrugger, H. Maximum likelihood estimation of latent interaction effects with the LMS method. *Psychometrika* **2000**, *65*, 457–474. [CrossRef]
64. Gilbert, P. Introducing compassion-focused therapy. *Adv. Psychiatr. Treat.* **2009**, *15*, 199–208. [CrossRef]
65. Oliveira, S.; Ferreira, C.; Mendes, A.L. Memórias precoces de calor e segurança e a psicopatologia alimentar: O papel do social safeness e da body appreciation. *Psychologica* **2016**, *2*, 45–60. [CrossRef]
66. Liu, G.; Zhang, D.; Pan, Y.; Ma, Y.; Lu, X. The Effect of Psychological Suzhi on Problem Behaviors in Chinese Adolescents: The Mediating Role of Subjective Social Status and Self-esteem. *Front. Psychol.* **2017**, *8*, 1490. [CrossRef]
67. Wu, L.; Zhang, D.; Cheng, G.; Hu, T.; Rost, D.H. Parental emotional warmth and psychological Suzhi as mediators between socioeconomic status and problem behaviours in Chinese children. *Child. Youth Serv. Rev.* **2015**, *59*, 132–138. [CrossRef]
68. Khaleque, A. Perceived Parental Warmth, and Children's Psychological Adjustment, and Personality Dispositions: A Meta-analysis. *J. Child Fam. Stud.* **2013**, *22*, 297–306. [CrossRef]
69. Pearlin, L.I.; Lieberman, M.A.; Menaghan, E.G.; Mullan, J.T. The stress process. *J. Health Soc. Behav.* **1981**, *22*, 337–356. [CrossRef] [PubMed]
70. Pan, Z.; Zhang, D. Relationship between stressful life events and sleep quality: The mediating and moderating role of psychological suzhi. *Sleep Med.* **2022**, *96*, 28–34. [CrossRef] [PubMed]
71. Chen, X.; Zhao, H.; Zhang, D. Forgiveness as a Mediator between Psychological Suzhi and Prosocial Behavior in Chinese Adolescents. *Behav. Sci.* **2022**, *12*, 330. [CrossRef]
72. Bronfenbrenner, U. *Ecological Systems Theory*; Jessica Kingsley Publishers: London, UK, 1992.
73. Guy-Evans, O. Bronfenbrenner's Ecological Systems Theory. Available online: https://www.simplypsychology.org/Bronfenbrenner.html (accessed on 9 September 2020).
74. Anderson, A.S.; Siciliano, R.E.; Henry, L.M.; Watson, K.H.; Gruhn, M.A.; Kuhn, T.M.; Ebert, J.; Vreeland, A.J.; Ciriegio, A.E.; Guthrie, C.; et al. Adverse childhood experiences, parenting, and socioeconomic status: Associations with internalizing and externalizing symptoms in adolescence. *Child Abus. Negl.* **2022**, *125*, 105493. [CrossRef]
75. Assari, S.; Preiser, B.; Lankarani, M.M.; Caldwell, C.H. Subjective Socioeconomic Status Moderates the Association between Discrimination and Depression in African American Youth. *Brain Sci.* **2018**, *8*, 71. [CrossRef]
76. Luthar, S.S.; Becker, B.E. Privileged but pressured? A study of affluent youth. *Child Dev.* **2002**, *73*, 1593–1610. [CrossRef] [PubMed]
77. Keyes, C.L.M. The black-white paradox in health: Flourishing in the face of social inequality and discrimination. *J. Personal.* **2009**, *77*, 1677–1706. [CrossRef]
78. Brewin, C.R.; Andrews, B.; Gotlib, I.H. Psychopathology and Early Experience: A Reappraisal of Retrospective Reports. *Psychol. Bull.* **1993**, *113*, 82–98. [CrossRef] [PubMed]

behavioral sciences

MDPI

Article

Shyness and Socio-Emotional Adjustment among Young Chinese Children: The Moderating Role of Screen Time

Jingjing Zhu [1], Alicia McVarnock [2], Laura Polakova [2], Shuhui Xiang [1], Yan Li [1,*] and Robert J. Coplan [2,*]

[1] Shanghai Institute of Early Childhood Education, Shanghai Normal University, No. 100 Guilin Rd., Shanghai 200234, China; zhujingjing@shnu.edu.cn (J.Z.); 1000510514@smail.shnu.edu.cn (S.X.)
[2] Department of Psychology, Carleton University, 1125 Colonel by Drive, Ottawa, ON K1S 5B6, Canada; aliciamcvarnock@cmail.carleton.ca (A.M.); laurapolakova@cmail.carleton.ca (L.P.)
* Correspondence: liyan@shnu.edu.cn (Y.L.); robertcoplan@cunet.carleton.ca (R.J.C.)

Abstract: The primary aim of the present study was to examine the potential moderating role of screen time in the links between shyness and indices of socio-emotional adjustment in young Chinese children. Participants were $N = 211$ children (112 boys, 99 girls) ages 43–66 months ($M = 58.84$ months, $SD = 5.32$) recruited from two public kindergartens in Shanghai, People's Republic of China. Mothers completed assessments of children's shyness and screen time, and both mothers and teachers completed measures of indices of children's socio-emotional functioning (prosocial, internalizing problems, learning problems). Among the results, shyness was positively associated with internalizing problems and negatively associated with prosocial behavior, whereas screen time was positively associated with internalizing problems. However, several significant shyness × screen time interaction effects were observed. The pattern of these results consistently revealed that at higher levels of screen time, links between shyness and indices of socio-emotional difficulties were exacerbated. Results are discussed in terms of the implications of shyness and screen time in early childhood.

Keywords: shyness; socio-emotional adjustment; screen time; young children; China

check for updates

Citation: Zhu, J.; McVarnock, A.; Polakova, L.; Xiang, S.; Li, Y.; Coplan, R.J. Shyness and Socio-Emotional Adjustment among Young Chinese Children: The Moderating Role of Screen Time. *Behav. Sci.* **2023**, *13*, 763. https://doi.org/10.3390/bs13090763

Academic Editor: Xiaochun Xie

Received: 30 July 2023
Revised: 11 September 2023
Accepted: 12 September 2023
Published: 14 September 2023

1. Introduction

Shyness is a temperamental trait characterized by wariness and self-consciousness in social contexts [1] and a well-established risk factor for childhood socio-emotional problems in both Western societies [2,3] and China [4]. However, outcomes related to shyness are known to be heterogeneous [5]. As such, researchers have sought to identify key factors that may determine which shy children are most (or least) at risk of poor socio-emotional functioning. For example, in early childhood, pragmatic language skills were found to attenuate associations between shyness and internalizing problems [6], whereas inhibitory control was found to exacerbate relations between shyness and peer difficulties [7].

Child development is also influenced by the environment [8]. One framework aiming to understand the ways in which temperament and environmental factors interact to predict socio-emotional development is the diathesis–stress model. This model posits that due to underlying diatheses, some children are particularly vulnerable to the negative impacts of environmental stressors [9]. For instance, children high in shyness are especially likely to experience negative outcomes when they are exposed to higher levels of parent neuroticism and overprotective parenting behaviors (e.g., micromanaging of activities) [10,11]. The diathesis–stress framework can be used to expand knowledge regarding why some young shy children adapt better than others to developmental stressors (e.g., transition to early education settings).

With the rise of technology, many children today are exposed to screens from a young age. For the present study, screen time was conceptualized as any engagement with screens, including smartphones, tablets, television, video games, computers, or wearable technology [12]. To optimize children's developmental trajectories, widely adopted guidelines

recommend a maximum of one hour of screen time daily from ages 2 to 5 years [12–15]. However, cross-cultural evidence suggests that a large majority of preschool-aged children exceed screen time guidelines [16,17], which can have negative socio-emotional and cognitive implications [18,19]. Importantly, young children learn best through face-to-face interactions with family, and time spent engaged with screens takes away from more active opportunities to develop socio-emotional and cognitive skills [12].

To date, researchers have yet to directly examine how adjustment outcomes related to shyness may vary according to screen time usage. However, the implications of excessive screen time may be especially dire for shy children, who, due to socio-evaluative fears and high social reactivity [1], already miss out on important opportunities to build socio-emotional skills through social interaction [20]. Accordingly, drawing upon a diathesis–stress framework, the primary aim of the present study was to examine the potential moderating role of screen time in the links between shyness and indices of socio-emotional adjustment in young Chinese children. Early childhood represents an important and unique developmental period to address this issue, as young children are engaged in the process of developing socio-emotional skills through interactions with peers [21], and parents typically have more control over their children's technology use. Moreover, early screen time practices may form lasting habits [22], which may help (or hinder) long-term development.

1.1. Overview of Shyness in Early Childhood

According to Asendorf's [23] approach–avoidance model of social withdrawal, shy individuals desire social interactions but are held back by social fears and socio-evaluative concerns. The construct of shyness shares considerable conceptual overlap with related terms, such as behavioral inhibition [24] and social reticence [25]. These terms all share a common theme related to fear and anxiety in social contexts. Shy young children are more likely to forgo opportunities to engage, choosing instead to watch their peers from a distance [25]. Affective, cognitive, and behavioral features of shyness also often mirror those of social anxiety. Although some scholars use the terms interchangeably, research suggests that shyness and social anxiety are distinct constructs [26]. Notwithstanding, childhood shyness remains a significant predictor of the later development of anxiety disorders, particularly social anxiety [27].

Shyness has been linked to a host of socio-emotional difficulties in early childhood. For example, young shy children exhibit deficits in social and communicative skills and are less prosocial than their more sociable agemates [20,28]. It has been suggested that these difficulties reflect, at least in part, deficits in performance rather than deficits in competence [29]. In this regard, young shy children's empathetic and prosocial tendencies might be overwhelmed by feelings of social fear and socio-evaluative concerns.

Most notably, shy children experience increased internalizing issues, such as loneliness, anxiety, and depression [3,20,30]. Shyness may become particularly problematic during the transition to kindergarten [31]. In kindergarten, children face new social and academic demands, as communication with unfamiliar others (e.g., teachers and peers) becomes more routine and expected. Withdrawing from peers at school may also interfere with the development of strong social skills, which are important for long-term well-being and academic success [32].

Young shy children are less likely to interact with peers or speak up in class [33], and such failure to participate in classroom activities can translate to poor academic adjustment [31]. Indeed, shy children are perceived by teachers as less academically competent [31,32]. Difficulty initiating social interactions can also prevent shy children from developing positive peer relationships. For example, shy young children tend to be viewed more negatively by their peers and experience higher rates of exclusion and victimization [3,34].

1.2. Shyness in Mainland China

It is now widely accepted that shyness can have different meanings and implications across different cultures, as cultural values and beliefs are inextricable from human development [35]. For example, in traditional Chinese culture, shyness was viewed as an indication of maturity and social competence that helped to maintain social cohesion in a collectivistic society [36]. In support of this notion, historical studies indicated that shyness in China was associated with positive outcomes, including peer-liking, leadership, and academic success [37]. However, over the last 25 years, there have been large-scale economic and social macro-level changes in China, with individualist factors becoming increasingly important in predicting well-being and success [38,39]. As a result, contemporary research indicates that shyness among Chinese children is now associated with a range of adjustment difficulties, including academic under-achievement, internalizing problems (e.g., loneliness, social anxiety, depression), and negative peer experiences (e.g., exclusion, victimization) [4]. Although most of these studies have focused on older children and adolescents, there have been a handful of recent studies demonstrating similar negative outcomes for shy young children in China [40–43].

As aforementioned, not all shy children experience adjustment difficulties, which has led to the exploration of risk and protective factors (see Coplan et al., 2020, for a recent review) [5]. A myriad of such factors has been previously examined among Chinese children, including receptive language [43], academic achievement [44], attachment style [45], and teacher–child relationships [42]. However, although there is growing interest in the impact of screen time on child development [19], this construct has not been considered with respect to its potential impact on shy children to date.

1.3. Screen Time and Shyness: A Diathesis–Stress Model

Children's use of screens has increased considerably with advancements in digital technology [46]. For example, by age 5 years, Chinese children spend over 3 h a day exposed to screens, with passive screen time (e.g., television, videos) making up two-thirds of overall exposure [16]. As a result, children are likely to spend less time in social scenarios (including child–parent and peer interactions), which can serve to reduce verbal opportunities and creative play [47].

Excessive screen exposure can impede healthy development in early childhood [46]. For example, studies in both North America and China suggest that young children engaging in high levels of passive screen time are more likely to experience problems with executive functioning and struggle to develop academic, language, and social skills [16,48]. Excessive screen time in childhood is also associated with increased internalizing and externalizing problems, as well as attention impairments [49–51]. This may be in part because increased screen exposure often translates to decreased interactions with caregivers and peers [52], which is how young children learn best [12]. As such, children engaging in excessive screen time may have fewer opportunities to develop socio-emotional skills. Moreover, young children engaging in high amounts of screen time may be more likely to overuse technology when they get older [22]. These implications may be particularly relevant for shy children in China.

The diathesis–stress model has been applied to the development of childhood shyness [53] and can be used to conceptualize the interplay between shyness and screen time in early childhood. In this context, shyness is denoted as an individual vulnerability (i.e., diathesis) and screen time as an environmental stressor. From this perspective, social fear and socio-evaluative concerns prevent shy children from engaging with teachers and peers during the transition to kindergarten and hinder the development and implementation of important socio-emotional and language skills [31]. Indeed, even outside of school, young shy children are less likely to engage in playdates and extracurricular peer activities [6,11]. Such restricted opportunities for social interactions may be especially common among shy Chinese children due to the substantive emphasis Chinese families place on academic achievement [44].

Young shy children in China who spend more time on screens (whether passive or active) may further isolate themselves from social engagement. Missed opportunities to interact with others (e.g., caregivers, siblings) and develop friendships may be especially detrimental for young shy children, who may already lack social and language skills [40–43]. As a result of these diathesis–stress processes, we speculated that links between shyness and socio-emotional maladjustment would be especially strong at higher levels of screen time. There is some support for this notion in older samples, as socially withdrawn adolescents who depend more on their smartphones have been shown to be particularly at risk for interpersonal difficulties [54]. Yet, to date, the impact of screen time on the links between early childhood shyness and indices of adjustment has not been investigated.

1.4. The Present Study

To address gaps in the literature, the goal of the present study was to examine links between shyness, screen time, and indices of socio-emotional functioning among young Chinese children. We were particularly interested in the potential moderating role of screen time in the relationship between shyness and adjustment. As aforementioned, previous research has identified links between shyness and maladjustment in three primary domains: (1) internalizing problems, (2) negative peer experiences, and (3) academic difficulties. Accordingly, in the present study, we included a range of outcome variables assessed by mothers and teachers, including indices of internalizing problems (i.e., parent-rated emotional symptoms, teacher-rated internalizing problems), aspects of peer experiences (i.e., maternal-rated prosocial behaviors and peer problems), and academic difficulties (i.e., teacher-rated learning problems). It was hypothesized that, overall, shyness would be positively associated with internalizing problems, negative peer experiences, and learning difficulties, as well as negatively associated with prosocial behavior. Further, in line with diathesis–stress processes, we speculated that links between shyness and socio-emotional functioning would be moderated by screen time, such that associations between shyness and negative outcomes (including reduced prosocial behavior) would be strongest at higher levels of screen time.

2. Materials and Methods

2.1. Participants and Procedure

Participants were N = 211 children (112 boys, 99 girls) ages 43–66 months (M = 58.84 months, SD = 5.32) recruited from eight classes in two public kindergartens in Shanghai, P.R. China. There were 25–30 children in each class. In China, children attend kindergarten for three years (e.g., junior class: age 3–4 years; middle class: age 4–5 years; senior class: age 5–6 years). All children were of Han ethnicity, which is the predominant ethnic group in China (nearly 97% of the population). A total of 14.8% of mothers and 13.8% of fathers completed high school, 21.9% of mothers and 21.4% of fathers had completed junior college, 47.5% of mothers and 37.2% of fathers had a bachelor's degree, and 15.8% of mothers and 27.6% of fathers had a postgraduate degree. Maternal and paternal scores were averaged to create an overall measure of parental education, with higher scores representing higher education.

The data were collected in February of 2019. The present study was reviewed and approved by the Ethics Review Board of Shanghai Normal University. In China, fathers still remain predominantly in breadwinning roles [55], and mothers assume the primary caregiving duties [56]. Accordingly, and following protocols from previous studies of child social withdrawal and screen time [57–59], we relied upon maternal (as opposed to paternal) reports and teacher ratings as sources of assessment in the present study. With the consent of the kindergarten director, recruitment information was communicated to the children's mothers by each classroom teacher. All children in the kindergarten, as well as their mothers and teachers, were invited to participate in the study. Mothers and teachers provided written informed consent through the corresponding kindergartens before completing the online questionnaires. The online questionnaire was forwarded to

children's mothers via the teachers. The participation rate was 98%. Teachers received a small honorarium (equivalent to approximately $50) after finishing the questionnaire. Mothers were not compensated. The results of the missing data analysis indicated a range of 0.5 to 7.1% missing for all study variables. Little's [60] test of missingness indicated that data did not significantly deviate from a missing completely at random pattern (χ^2 = 49.12, df = 39, p = 0.12).

2.2. Measures

2.2.1. Shyness

Mothers completed the Chinese version of the Child Social Preference Scale (CSPS) [41,61]. Of particular interest was the sub-scale assessing *shyness* (7 items, α = 0.87, e.g., "My child seems to want to play with other children, but is sometimes nervous"). Items were rated on a 5-point scale (1–5) from "not true at all" to "very true". Previous research with young children in China indicates good internal and test–retest reliability, along with criterion, concurrent, and predictive validity of the sub-scale [62].

2.2.2. Screen Time

Mothers reported their children's screen exposure (e.g., defined for them as "watching television, using a smartphone, computer, or other digital media device") in hours for each day of the previous week (Monday through Sunday). Given our conceptualization of screen time as a broad construct, scores were aggregated to create a single score of screen time [22,63].

2.2.3. Social–Emotional Adjustment

Mothers completed the Chinese version of the *Strengths and Difficulties Questionnaire* (SDQ) [64,65]. Of particular interest were subscales assessing *prosocial behavior* (5 items, α = 0.71, e.g., "Considerate of other people's feelings"), *emotional symptoms* (5 items, α = 0.69, e.g., "Many worries, often seem worried"), and *peer problems* (5 items, α = 0.39, e.g., "Picked on or bullied by other children") [66]. Items were rated on a 3-point scale from 1 (doesn't apply) to 5 (certainly applies). The Chinese version of the mother-rated SDQ has demonstrated satisfactory internal and test–retest reliability, as well as convergent validity among Chinese children [67].

Teachers completed the Chinese version of the Social Skills Teacher Rating System (SSTRS) [41,68]. Of particular interest was the subscale assessing *internalizing problems* (4 items, α = 0.84, e.g., "Feels anxious in a group"). Items were rated on a 3-point scale from 0 (never) to 2 (always). The SSTRS has been shown to be reliable and valid in young Chinese children [41]. Teachers also completed the *learning problems* subscale of the Chinese version of the Teacher Behavior Rating Scale (TBRS) [69]. This 4-item subscale assesses children's academic difficulties (α = 0.86, e.g., "Has difficulty in learning"). Items were rated on a 3-point scale from 0 (doesn't apply) to 2 (certainly applies).

2.3. Analytic Strategy

Data analyses were conducted using IBM SPSS (version 22.0). First, gender differences were examined using t-tests (boy = 0, girl = 1). Second, Hayes's PROCESS macro [70], with non-parametric bootstrapping with 5000 resamples, was used to examine the potential moderating effect of screen time on the association between shyness and social–emotional adjustment. Moderation was regarded when the 95% bias-corrected confidence interval (CI) of the interaction term (shyness $\times$ screen time) did not include zero [71]. To probe significant interactions, simple slope tests using methods suggested by Aiken and West (1991) [72] were conducted. The Johnson–Neyman (J–N) technique was then applied to estimate regions of significance for the adjusted effects of shyness on social–emotional adjustment variables as a function of screen time.

3. Results

3.1. Preliminary Analyses

Descriptive statistics and intercorrelations among study variables are displayed in Table 1. Boys experienced higher learning difficulties than girls (M_{boys} = 0.55, SD = 0.54; M_{girls} = 0.31, SD = 0.48; t = 3.28, $p < 0.001$). There were no gender differences in shyness (M_{boys} = 1.91, SD = 0.65; M_{girls} = 1.80, SD = 0.64; t = 1.13, p = 0.26), screen time (M_{boys} = 0.39, SD = 0.40; M_{girls} = 0.45, SD = 0.50; t = −0.90, p = 0.37), prosocial behavior (M_{boys} = 2.74, SD = 0.29; M_{girls} = 2.81, SD = 0.35; t = −1.50, p = 0.14), emotional symptoms (M_{boys} = 1.41, SD = 0.40; M_{girls} = 1.45, SD = 0.48; t = −0.66, p = 0.51), peer problems (M_{boys} = 1.37, SD = 0.27; M_{girls} = 1.34, SD = 0.32; t = 0.73, p = 0.47), or internalizing problems (M_{boys} = 0.14, SD = 0.35; M_{girls} = 0.10, SD = 0.30; t = 0.88, p = 0.38).

Table 1. Inter-correlations for all study variables (N = 208).

	1	2	3	4	5	6	7	8	9
1. parent education^{-M}	1								
2. age^{-M}	−0.12	1							
3. shyness^{-M}	0.14	−0.01	1						
4. screen time^{-M}	−0.15 *	0.05	0.05	1					
5. prosocial behavior^{-M}	−0.02	0.05	−0.17 *	0.01	1				
6. emotional symptoms^{-M}	−0.07	0.05	0.29 ***	0.15 *	−0.13	1			
7. peer problems^{-M}	−0.23 **	0.01	0.19 *	0.05	−0.33 ***	0.47 ***	1		
8. internalizing problems^{-T}	0.00	0.01	0.08	0.06	0.05	0.06	0.04	1	
9. learning problems^{-T}	−0.26 ***	−0.01	0.06	0.12	−0.05	0.11	0.22 **	0.42 ***	1
M	-	58.84	1.85	2.93	2.16	1.43	1.35	0.13	
SD	-	5.32	0.65	3.18	0.51	0.44	0.29	0.33	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. ^{M} maternal ratings, ^{T} teacher ratings.

Parent education was negatively associated with screen time, peer problems, and learning problems. Shyness was positively associated with emotional symptoms and peer problems and negatively associated with prosocial behavior. Screen time was positively associated with emotional symptoms. Accordingly, we controlled for parent education and child gender in subsequent analyses.

3.2. Shyness, Screen Time, and Social–Emotional Adjustment

Classroom intra-class correlations (ICC) were less than 0.04 and non-significant for all variables, indicating no classroom-based cluster effects. Models examining shyness × screen time interactions on socio-emotional adjustment were conducted separately for mother-rated prosocial behavior, mother-rated internalizing problems, teacher-rated internalizing problems, and learning problems while controlling for parent education and child gender. Results are displayed in Table 2. There were significant shyness × screen time interaction effects for peer, internalizing, and learning problems.

Following suggestions by Hayes and Matthes (2009) [73], we used the Johnson–Neyman (J–N) technique [74] to further probe to determine the cut-off values. All predictors were standardized for the analyses, then a "region of significance" was estimated for the simple slope of a predictor conditioned on the value of the continuous moderator. The cut-off point is where the "region of non-significance" changes to the "region of significance". This technique allowed us to estimate a region of significance for the simple slope of a predictor conditioned on the value of the continuous moderator. The results are presented visually in Figures 1–3.

Table 2. Effects of shyness, screen time (controlling for parent education and child gender) in relation to indices of social adjustment.

Predictor	B	SE	t-Value	95% CI	R^2	ΔR^2	ΔF
Prosocial behavior							
Shyness	−0.04	0.03	−1.58	[−0.10, 0.01]			
Screen time	0.09	0.03	−0.57	[−0.07, 0.04]	0.04	0.01	0.38
Shyness × screen time	0.02	0.03	0.62	[−0.03, 0.07]			
Emotional symptoms							
Shyness	0.15	0.03	4.47 ***	[0.08, 0.21]			
Screen time	0.06	0.04	1.73	[−0.01, 0.13]	0.16	0.13	2.38
Shyness × screen time	0.05	0.03	1.52	[−0.02, 0.11]			
Peer problems							
Shyness	0.07	0.03	2.92 **	[0.02, 0.11]			
Screen time	−0.01	0.02	−0.37	[−0.06, 0.04]	0.11	0.08	3.90
Shyness × screen time	0.04	0.02	1.91 $^{+}$	[0.00, 0.09]			
Internalizing problems							
Shyness	0.01	0.02	0.22	[−0.04, 0.05]			
Screen time	0.03	0.03	1.27	[−0.02, 0.08]	0.07	0.04	6.53
Shyness × screen time	0.06	0.02	2.50 *	[0.01, 0.11]			
Learning problems							
Shyness	0.02	0.04	0.41	[−0.06, 0.09]			
Screen time	0.03	0.04	0.62	[−0.06, 0.11]	0.14	0.11	5.16
Shyness × screen time	0.09	0.04	2.22 *	[0.01, 0.17]			

CI, confidence interval. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

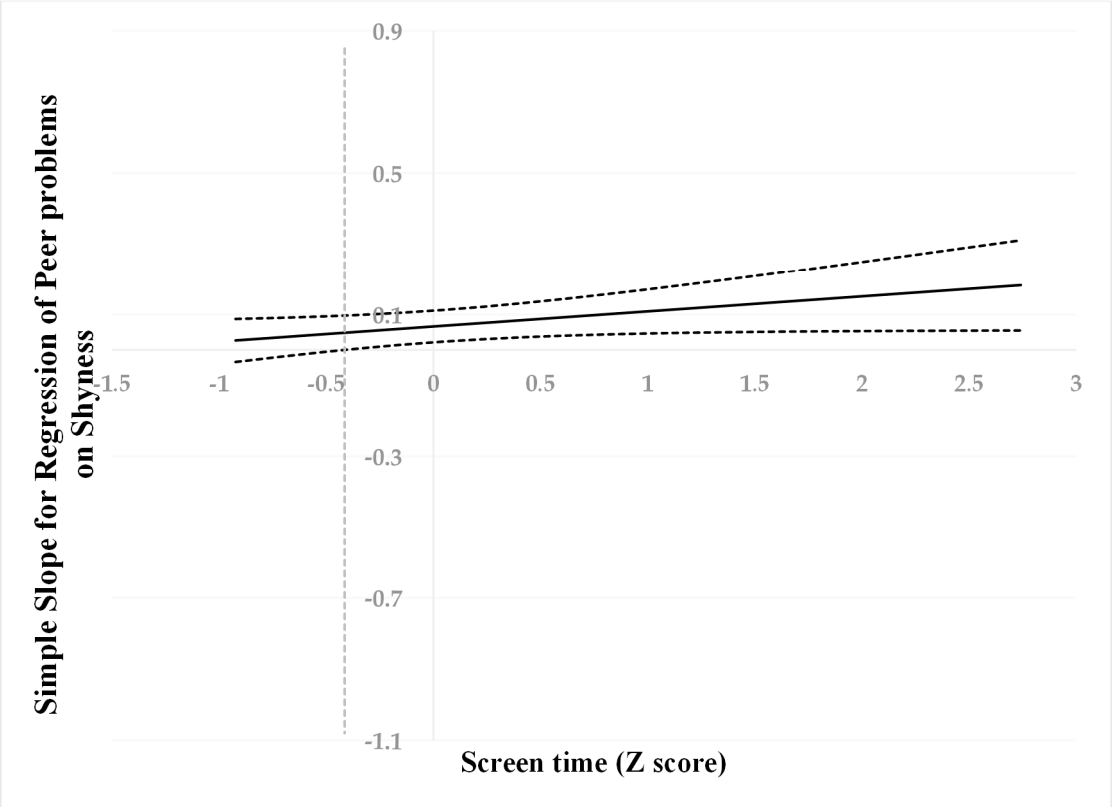

Figure 1. Johnson–Neyman regions of significance and confidence bands for mother-rated shyness along with screen time in relation to peer problems. Solid diagonal line represents the regression coefficient for shyness along screen time. The dashed vertical line is −0.42.

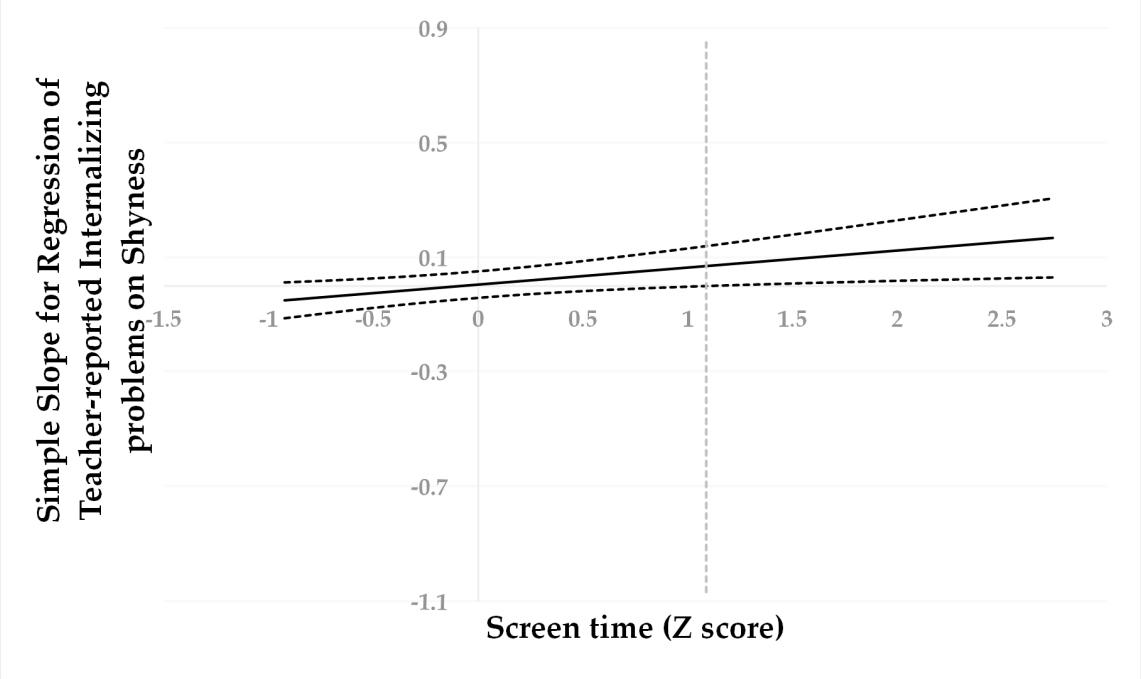

Figure 2. Johnson–Neyman regions of significance and confidence bands for mother-rated shyness along with screen time in relation to internalizing problems. Solid diagonal line represents the regression coefficient for shyness along screen time. The dashed vertical line is 1.09.

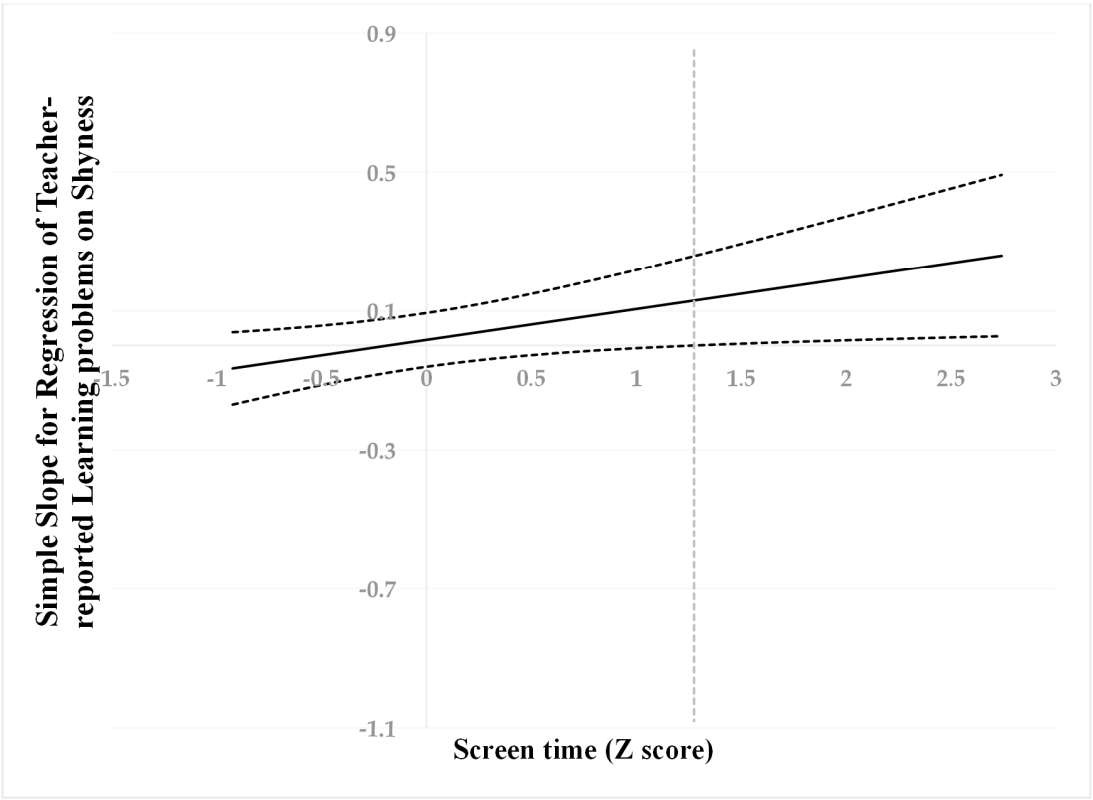

Figure 3. Johnson–Neyman regions of significance and confidence bands for mother-rated shyness along with screen time in relation to learning problems. Solid diagonal line represents the regression coefficient for shyness along screen time. The dashed vertical line is 1.28.

When screen time was higher than −0.42 SD, shyness was positively associated with peer problems (Figure 1). However, when screen time was lower than −0.42 SD, shyness was no longer associated with peer problems. When screen time was higher than 1.09 SD, shyness was positively associated with internalizing problems (Figure 2). However, when screen time was lower than 1.09 SD, shyness was no longer associated with internalizing problems. When screen time was higher than 1.28 SD, shyness was positively associated with learning problems (Figure 3). However, when screen time was lower than 1.28 SD, shyness was no longer associated with learning problems.

4. Discussion

The goal of this study was to assess links between shyness, screen time, and indices of socio-emotional functioning among young children in mainland China. Overall, results indicated that both shyness and screen time were linearly related to indices of socio-emotional difficulties. However, several significant shyness × screen time interaction effects were observed. Consistent with postulations of the stress–diathesis model pertaining to shyness [53], the pattern of these results consistently revealed that at higher levels of screen time, links between shyness and indices of socio-emotional difficulties were exacerbated.

4.1. Shyness and Screen Time in China

Overall, results from bivariate correlations indicated that shyness was positively associated with emotional symptoms and peer problems and negatively associated with prosocial behavior. These findings add to the growing number of recent studies linking early childhood shyness in China with internalizing issues (parent-rated) and poor peer experiences [40–43,62]. Such findings also reinforce the notion that because of changing social norms in China, as is the case in the West, childhood shyness is now a maladaptive trait and carries a risk for negative adjustment outcomes [35,38].

In line with previous evidence suggesting that screen time is on the rise among children in China [16], children in the present study engaged in almost three times the recommended guidelines for screen time. Excessive screen exposure has been linked to a range of negative socio-emotional outcomes, as well as cognitive and academic difficulties, among young Chinese children [49,75]. However, with the exception of a significant (albeit modest) positive association with maternal-rated emotional symptoms, screen time was not linearly related to socio-emotional difficulties. One explanation for the discrepancy between past and present findings relates to differences in how children engage with screens. For example, Hu et al. [16] found that although passive screen time (e.g., television) undermined social, cognitive, and academic capabilities in a sample of Chinese 5-year-olds, active screen time (e.g., educational apps) enhanced science and language performance and was unrelated to social capabilities. Other research suggests that when content is educational and age-appropriate, even watching television can incur socio-emotional and academic benefits for young children [76]. Thus, the link between screen exposure and early childhood adjustment may not be straightforward. We did not differentiate between active and passive forms of screen time (or consider differences in screen content), making this an important area for future research.

Notwithstanding, screen time was found to significantly moderate associations between shyness and adjustment difficulties across several domains (i.e., learning problems, peer problems, internalizing problems). The pattern of interaction effects was similar across all outcomes: as expected, higher levels of screen time heightened associations between shyness and adjustment problems. These findings add to the empirical support for diathesis–stress effects related to shyness [53], suggesting that children higher in shyness are more vulnerable to the effects of screen exposure. Some research suggests that excessive screen exposure during the early years can limit opportunities for peer interaction, which may, in turn, lead to socio-emotional difficulties. For example, Putnick et al. [77] recently found that increased screen time predicted deficits in communication and social skills over time, not directly but indirectly, through decreased peer play. As such, engaging in

too much screen time may be particularly problematic for shy children, as it carries the risk of further exacerbating social withdrawal and interfering with the development and implementation of social skills. Perhaps not surprisingly, then, low screen time attenuated the positive association between shyness and peer problems in this study. Findings suggest that limiting screen time may protect against (at least some of) the negative implications of shyness in early childhood.

Although shyness was not directly related to learning difficulties, the combined effect of high shyness and high screen time on learning is noteworthy. Shyness has been previously linked to academic difficulties and reduced vocabulary in early childhood [7,32]. Some evidence suggests that Chinese parents often use technological devices for educational purposes [75], which has the potential to bolster young children's learning [76]. Still, learning through in-person interactions is critical during the early childhood years [78]. If engaging with screens replaces opportunities for interacting with others face-to-face, such screen exposure may further limit shy young children's opportunities to develop strong verbal abilities. As such, shy children may struggle to engage in classroom activities.

It should be noted that although shyness was associated with learning difficulties and internalizing problems only at high levels of screen time, shyness was linked to peer problems even when screen exposure was moderate. Although young shy children face a wide range of challenges (including in the academic and emotional domains), these secondary issues are likely rooted in more primary problems related to interpersonal difficulties. For instance, during kindergarten in China, there is a strong focus on socio-emotional learning [79]. As such, young children in China experience pressure to interact socially at school, and failure to engage with teachers and peers may translate to learning problems and poor academic achievement [32,33]. At the same time, shy children may feel lonely and sad because they struggle to interact with peers (despite their desire to engage) during a time when forming friendships is imperative [80,81].

Finally, although screen time was found to moderate links between shyness and certain indicators of socio-emotional functioning (i.e., parent-rated peer problems and teacher-rated internalizing issues), such effects did not emerge for other similar constructs (i.e., parent-rated prosocial behavior and emotional problems). Such discrepancies may be explained (at least in part) by shared method variance. For example, parent-rated shyness was more strongly related to parent-rated emotional problems than to teacher-rated internalizing problems. For prosocial behavior and peer problems, explanations are less clear. Peer problems were assessed using a wide range of constructs, including withdrawn behaviors, friendships, peer-liking, victimization, and dependent relationships with adults. It is thus possible that at least one of these domains differed meaningfully from prosocial behavior. The expansiveness of the peer problems measure may also help explain why even average levels of screen time were linked with peer difficulties. Nevertheless, additional research is required to better understand the present findings.

4.2. Implications

Our findings add to the growing research highlighting the negative implications of shyness in young Chinese children [41–43]. Indeed, researchers are now developing and evaluating early intervention programs for young shy children in China designed to promote positive peer interactions and reduce social wariness and anxiety [40]. Our findings also provide the first evidence to suggest that increased screen exposure may exacerbate these negative outcomes among shy young children. These results have potentially important implications for shy young children in China. For example, parents of socially withdrawn children are more likely to be overprotective, keeping their children close and limiting free exploration of novel environments [11]. Although parents' intention here may be to protect their children from feelings of social distress, our findings suggest that it is important to facilitate, encourage, and support peer interactions among shy young children. Recall that screen time exceeded recommended guidelines by almost three times [16]. Rather than allowing shy children to retreat to a virtual world, parents and educators

should scaffold and support shy Chinese children's social interactions to reduce social anxiety and support skill development [40]. Early childhood represents an important and unique developmental period to intervene, as (1) screen time during the early childhood years sets the foundation for lasting habits [22], and (2) parents typically have more control over their children's technology use. In adolescence, monitoring screen time becomes more difficult [54].

4.3. Limitations, Future Directions, and Conclusions

This study addresses a gap in the literature by exploring the links between shyness, screen time, and adjustment among young Chinese children. Notwithstanding, some limitations should be considered in the interpretation of our results, with an eye toward future research directions. First, as noted previously, we did not differentiate between passive and active forms of screen time. However, previous research suggests that at younger ages, screen time more often involves passive activities, such as television and videos [16]. Too much screen time may be especially problematic for shy young children. For example, there is a recent indication that passive technology use may be a particularly negative experience for shy adolescents [82]. Given that researchers have yet to examine how different forms of screen time interact with early childhood shyness to predict adjustment, additional studies may explore whether passive and active forms of screen time have different effects on shyness in young children. In particular, interactive video chatting guided by caring adults may be more beneficial due to social presence [12].

In addition, the present study did not specify screen-related behaviors. For example, specific types of screen behaviors, such as binge-watching (consuming media in rapid succession) and media multitasking (simultaneous use of multiple media platforms, devices, or engagement with a technology-based activity while engaging in a non-technology-based task), appear to be associated with a range of negative consequences, including insomnia, damage to social relationships, academic under-performance, and a sedentary lifestyle [83–86]. Thus, future research should explore whether similar findings exist for different screen-related behaviors explored in the context of shyness and socio-emotional development among young children.

An additional limitation relates to the screen time measure that was used (i.e., maternal reported screen time over the last week). Previous research suggests that parents misjudge their preschoolers' technology use retrospectively [87]. To combat recall issues, future research may examine children's screen exposure using experience sampling or daily diary methodologies. In addition, there is a rising trend in China toward using technology for educational purposes in the classroom [88]. Children may also be exposed to screens when they are in the care of other adults. Thus, parents (and especially only one parent) may not be fully aware of their children's screen exposure. As such, studies should consider multiple reporter methods, such as teacher, maternal, and paternal reports.

Relatedly, the maternal-rated measure of child behavior problems (SDQ) evidenced poor internal reliability, particularly for the peer problems subscale. Because the SDQ is symptom-based and subscales assess a broad range of behavioral indicators, internal reliabilities for some of the substances do tend to be lower [89]. Future research should include additional parental rating scales of child behavior problems, such as the Child Behavior Checklist (CBC) [90].

Finally, assessing measures at a single time point does not allow us to make conclusions regarding the directions of effects. We must be mindful when interpreting results in the context of previous developmental research, as underlying developmental processes and mechanisms cannot be determined. For example, we have suggested that screen time use exacerbates the associations between shyness and adjustment difficulties. However, it is also possible that shy children who are experiencing greater adjustment difficulties retreat more often to screen time use as an escape from these stressors. Future longitudinal studies are required to better elucidate these effects over time.

Notwithstanding these limitations, results from this study add to our understanding of the role of screen time in the socio-emotional functioning of young shy children. In particular, findings suggest that parents should continue to promote and encourage "face-to-face" peer interactions for young shy children.

Author Contributions: Conceptualization, Y.L.; methodology, J.Z.; software, J.Z.; validation, Y.L., J.Z. and R.J.C.; formal analysis, J.Z.; investigation, J.Z.; resources, Y.L.; data curation, Y.L.; writing—original draft preparation, J.Z.; writing—review and editing, A.M., L.P., S.X. and R.J.C.; visualization, Y.L.; supervision, Y.L.; project administration, Y.L.; funding acquisition, J.Z. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Foundation for National Social Science Fund of China (Grant No. 21CSH048) awarded to Jingjing Zhu.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Shanghai Normal University (Ethical and Approval No. 2020056).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors without undue reservation.

Acknowledgments: We are really grateful to the participating children, parents, and teachers.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Henderson, L.; Gilbert, P.; Zimbardo, P. Shyness, social anxiety, and social phobia. In *Social Anxiety*, 3rd ed.; Hofmann, S.G., DiBartolo, P., Eds.; Academic Press: Cambridge, MA, USA, 2014; pp. 95–115.
2. Eggum, N.D.; Eisenberg, N.; Reiser, M.; Spinrad, T.L.; Valiente, C.; Sallquist, J.; Michalik, N.M.; Liew, J. Relations over time among children's shyness, emotionality, and internalizing problems. *Soc. Dev.* **2012**, *21*, 109–129. [CrossRef] [PubMed]
3. Kopala-Sibley, D.C.; Klein, D.N. Distinguishing types of social withdrawal in children: Internalizing and externalizing outcomes of conflicted shyness versus social disinterest across childhood. *J. Res. Pers.* **2017**, *67*, 27–35. [CrossRef]
4. Zhang, X.; Lau, C.; Yang, Y. Shyness and social–emotional development among Chinese children: A systematic review and meta-analysis. *Infant Child Dev.* **2021**, *30*, e2265. [CrossRef]
5. Coplan, R.J.; Baldwin, D.; Wood, K.R. Shy but getting by: Protective factors in the links between childhood shyness and indices of socio-emotional functioning. In *Adaptive Shyness: Multiple Perspectives on Behavior and Development*; Schmidt, L.A., Poole, K.L., Eds.; Springer: Berlin, Germany, 2020; pp. 63–87.
6. Coplan, R.J.; Weeks, M. Shy and soft-spoken: Shyness, pragmatic language, and socio-emotional adjustment in early childhood. *Infant Child Dev.* **2009**, *18*, 238–254. [CrossRef]
7. Sette, A.; Hipson, W.E.; Zava, F.; Baumgartner, E.; Coplan, R.J. Linking shyness with social and school adjustment in early childhood. The moderating role of inhibitory control. *Early Educ. Dev.* **2018**, *29*, 675–690. [CrossRef]
8. Bronfrenbrenner, U. *The Experimental Ecology of Human Development*; Harvard University Press: Cambridge, MA, USA, 1979.
9. Broerman, R. Diathesis-Stress Model. In *Encyclopedia of Personality and Individual Differences*; Zeigler-Hill, V., Shackelford, T., Eds.; Springer: Berlin, Germany, 2017.
10. Burstein, M.; Ginsburg, G.S.; Tein, J.-Y. Parental anxiety and child symptomatology: An examination of additive and interactive effects of parent psychopathology. *J. Abnorm. Child Psychol.* **2010**, *38*, 897–909. [CrossRef] [PubMed]
11. Rubin, K.H.; Burgess, K. Parents of aggressive and withdrawn children. In *Handbook of Parenting*; Bornstein, M.H., Ed.; Lawrence Erlbaum Associates: Mahwah, NJ, USA, 2002; pp. 383–418.
12. Canadian Paediatric Society. Screen Time and Preschool Children: Promoting Health and Development in a Digital World. Available online: https://cps.ca/en/documents/position/screen-time-and-preschool-children (accessed on 24 November 2022).
13. American Academy of Pediatrics. Media and young minds. *Pediatrics* **2016**, *138*, e20162591. [CrossRef]
14. Australian Government. Physical Activity and Exercise Guidelines for All Australians. Australian Government: Department of Health and Aged Care. Available online: https://www.health.gov.au/topics/physical-activity-and-exercise/physical-activity-and-exercise-guidelines-for-all-australians (accessed on 7 May 2021).
15. World Health Organization. *Guidelines on Physical Activity, Sedentary Behaviour and Sleep for Children under 5 Years of Age*; World Health Organization: Geneva, Switzerland, 2019.
16. Hu, B.Y.; Johnson, G.K.; Teo, T.; Wu, Z. Relationship between screen time and Chinese children's cognitive and social development. *J. Res. Child. Educ.* **2020**, *34*, 183–207. [CrossRef]

17. Madigan, S.; McArthur, B.A.; Anhorn, C.; Eirich, R.; Christakis, D.A. Associations between screen use and child language skills: A systematic review and meta-analysis. *JAMA Pediatr.* **2020**, *174*, 665–675. [CrossRef]
18. Kerai, S.; Almas, A.; Guhn, M.; Forer, B.; Oberle, E. Screen time and developmental health: Results from an early childhood study in Canada. *BMC Public Health* **2022**, *22*, 310. [CrossRef]
19. Neophytou, E.; Manwell, L.A.; Eikelboom, R. Effects of excessive screen time on neurodevelopment, learning, memory, mental health, and neurodegeneration: A scoping review. *Int. J. Ment. Health Addict.* **2021**, *19*, 724–744. [CrossRef]
20. Eggum-Wilkens, N.D.; Valiente, C.; Swanson, J.; Lemery-Chalfant, K. Children's shyness, popularity, school liking, cooperative participation, and internalizing problems in the early school years. *Early Child. Res. Q.* **2014**, *29*, 85–94. [CrossRef]
21. Coplan, R.J.; Arbeau, K. Peer interactions and play in early childhood. In *Handbook of Peer Interactions, Relationships, and Groups*; Rubin, K.H., Bukowski, W., Laursen, B., Eds.; Guilford Press: New York, NY, USA, 2009; pp. 143–161.
22. Duch, H.; Fisher, E.M.; Ensari, I.; Harrington, A. Screen time use in children under 3 years old: A systematic review of correlates. *Int. J. Behav. Nutr. Phys. Act.* **2013**, *10*, 102. [CrossRef]
23. Asendorpf, J.B. Development of inhibition during childhood: Evidence for situational specificity and a two-factor model. *Dev. Psychol.* **1990**, *26*, 721–730. [CrossRef]
24. Kagan, J. Temperament and the reactions to unfamiliarity. *Child Dev.* **1997**, *68*, 139–143. [CrossRef]
25. Chen, X.; DeSouza, A.T.; Chen, H.; Wang, L. Reticent behavior and experiences in peer interactions in Chinese and Canadian children. *Dev. Psychol.* **2006**, *42*, 656–665. [CrossRef] [PubMed]
26. Closson, L.M.; McVarnock, A.M.; Sanford, K. Social withdrawal and social surrogacy in emerging adulthood. *J. Youth Adolesc.* **2019**, *48*, 717–730. [CrossRef] [PubMed]
27. Sandstrom, A.; Uher, R.; Pavlova, B. Prospective association between childhood behavioral inhibition and anxiety: A meta-analysis. *J. Abnorm. Child Psychol.* **2020**, *48*, 57–66. [CrossRef] [PubMed]
28. Eisenberg, N.; Fabes, R.A.; Shepard, S.A.; Murphy, B.C.; Jones, S.; Guthrie, I.K. Contemporaneous and longitudinal prediction of children's sympathy from dispositional regulation and emotionality. *Dev. Psychol.* **1998**, *34*, 910–924. [CrossRef]
29. Zava, F.; Sette, S.; Baumgartner, E.; Coplan, R.J. Shyness and empathy in early childhood: Examining links between feelings of empathy and empathetic behaviours. *Br. J. Dev. Psychol.* **2021**, *39*, 54–77. [CrossRef]
30. Bekkhus, M.; Baldwin, D.; Coplan, R.J.; von Soest, T.; Skaret, S.; Ulset, V.; Borge, A.I.H. Examining launch and snare effects in the longitudinal associations between shyness and socio-emotional difficulties in childhood. *Soc. Dev.* **2022**, *31*, 109–125. [CrossRef]
31. Henderson, H.A.; Fox, N.A. Inhibited and uninhibited children: Challenges in school settings. *Sch. Psychol. Rev.* **1998**, *27*, 492–505. [CrossRef]
32. Zhang, L.; Eggum-Wilkens, N.D.; Eisenberg, N.; Spinrad, T.L. Children's shyness, peer acceptance, and academic achievement in the early school years. *Merrill-Palmer Q.* **2017**, *63*, 458–484. [CrossRef]
33. Evans, M.A. Reticent primary grade children and their more talkative peers: Verbal, nonverbal, and self-concept characteristics. *J. Edu. Psychol.* **1996**, *88*, 739–749. [CrossRef]
34. Eggum-Wilkens, N.D.; Fabes, R.A.; Castle, S.; Zhang, L.; Hanish, L.D.; Martin, C.L. Playing with others: Head Start children's play and relations with kindergarten school competence. *Early Child. Res. Q.* **2014**, *29*, 345–356. [CrossRef]
35. Chen, X. Culture and shyness in childhood and adolescence. *New Ideas Psychol.* **2019**, *53*, 58–66. [CrossRef]
36. Chen, X.; Rubin, K.H.; Sun, Y. Social reputation and peer relationships in Chinese and Canadian children: A cross-cultural study. *Child Dev.* **1992**, *63*, 1336–1343. [CrossRef]
37. Chen, X.; Rubin, K.H.; Li, Z.Y. Social functioning and adjustment in Chinese children: A longitudinal study. *Dev. Psychol.* **1995**, *31*, 531–539. [CrossRef]
38. Chen, X.; Cen, G.; Li, D.; He, Y. Social functioning and adjustment in Chinese children: The imprint of historical time. *Child Dev.* **2005**, *76*, 182–195. [CrossRef] [PubMed]
39. Steele, L.G.; Lynch, S.M. The pursuit of happiness in China: Individualism, collectivism, and subjective well-being during China's economic and social transformation. *Soc. Indic. Res.* **2013**, *114*, 441–451. [CrossRef]
40. Li, Y.; Zhu, J.J.; Coplan, R.J.; Gao, Z.Q.; Xu, P.; Li, L. Assessment and implications of social withdrawal subtypes in young Chinese children: The Chinese version of the Child Social Preference Scale. *J. Genet. Psychol.* **2016**, *177*, 97–101. [CrossRef]
41. Zhu, J.J.; Li, Y.; Zhang, Y.; Xie, Q.B.; Xu, P. Reliability and validity of the child social skills rating scale among Chinese preschoolers. *J. Clin. Psychol.* **2017**, *25*, 855–858.
42. Zhu, J.; Li, Y.; Coplan, R.J.; Liu, T. Shyness and socio-emotional adjustment among Chinese preschoolers: The moderating role of student-teacher relationships. *J. Psychol. Sci.* **2018**, *41*, 1130–1137.
43. Zhu, J.; Li, Y.; Wood, K.R.; Coplan, R.J.; Chen, X. Shyness and socioemotional functioning in young Chinese children: The moderating role of receptive vocabulary. *Early Educ. Dev.* **2019**, *30*, 590–607. [CrossRef]
44. Chen, X.; Yang, F.; Wang, L. Relations between shyness-sensitivity and internalizing problems in Chinese children: Moderating effects of academic achievement. *J. Abnorm. Child Psychol.* **2013**, *41*, 825–836. [CrossRef] [PubMed]
45. Zhu, J.; Xiao, B.; Li, Y.; Hipson, W.E.; Coplan, R.J. Shyness and socio-emotional functioning in young Chinese children: The moderating role of insecure attachment. *Merrill-Palmer Q.* **2020**, *66*, 174–198. [CrossRef]
46. Strasburger, V.C.; Jordan, A.B.; Donnerstein, E. Health effects of media on children and adolescents. *Pediatrics* **2010**, *125*, 756–767. [CrossRef] [PubMed]

47. Vanderwater, E.A.; Bickham, D.S.; Lee, J.H. Time well spent. Relating television use to childrens free-time activities. *Pediatrics* **2006**, *117*, e181–e191. [CrossRef]
48. Mistry, K.B.; Minkovitz, C.S.; Strobino, D.M.; Borzekowski, D.L.G. Children's television exposure and behavioral and social outcomes at 5.5 years: Does timing of exposure matter? *Pediatrics* **2007**, *120*, 762–769. [CrossRef]
49. Liu, W.; Wu, X.; Huang, K.; Yan, S.; Ma, L.; Cao, H.; Gan, H.; Tao, F. Early childhood screen time as a predictor of emotional and behavioral problems in children at 4 years: A birth cohort study in China. *Environ. Health Prev. Med.* **2021**, *26*, 3. [CrossRef]
50. McArthur, B.A.; Racine, N.; Browne, D.; McDonald, S.; Tough, S.; Madigan, S. Recreational screen time before and during COVID-19 in school-aged children. *Acta Paediatr.* **2021**, *110*, 2805–2807. [CrossRef]
51. Xie, G.; Deng, Q.; Cao, J.; Chang, Q. Digital screen time and its effect on preschoolers' behavior in China: Results from a cross-sectional study. *Ital. J. Pediatr.* **2020**, *46*, 9. [CrossRef]
52. Gerhold, M.; Laucht, M.; Texdorf, C.; Schmidt, M.H.; Esser, G. Early mother-infant interaction as a precursor to childhood social withdrawal. *Child Psychiatry Hum. Dev.* **2002**, *32*, 277–293. [CrossRef]
53. Gazelle, H.; Ladd, G.W. Anxious solitude and peer exclusion: A diathesis-stress model of internalizing trajectories in childhood. *Child Dev.* **2003**, *74*, 257–278. [CrossRef]
54. Lim, S.A. Longitudinal effect of social withdrawal on negative peer relations mediated by smartphone dependence among Korean early adolescents. *Int. J. Ment. Health Addict.* **2022**, 1–15. [CrossRef]
55. Li, X. Fathers' involvement in Chinese societies: Increasing presence, uneven progress. *Child Dev. Perspect.* **2020**, *14*, 150–156. [CrossRef]
56. Ji, Y.; Wu, X.; Sun, S.; He, G. Unequal care, unequal work: Toward a more comprehensive understanding of gender inequality in post-reform urban China. *Sex Roles* **2017**, *77*, 765–778. [CrossRef]
57. Li, X.-Q.; Yang, P.-P.; Wang, W.-J.; Li, D. The relationship between mother's punishment and encouragement of sociability and preschool children's social skill: The moderating effect of shyness. *Chin. J. Clin. Psychol.* **2021**, *29*, 98–103.
58. Wu, Y.; Fang, M.; Wu, J.; Chen, Y.; Li, H. Shyness and school engagement in Chinese suburban preschoolers: A moderated mediation model of teacher–child closeness and child gender. *Int. J. Environ. Res. Public Health* **2022**, *19*, 4270. [CrossRef]
59. Zhao, J.; Yu, Z.; Sun, X.; Wu, S.; Zhang, J.; Zhang, D.; Zhang, Y.; Jiang, F. Association between screen time trajectory and early childhood development in children in China. *JAMA Pediatr.* **2022**, *176*, 768–775. [CrossRef] [PubMed]
60. Little, R.J. Missing-data adjustments in large surveys. *J. Bus. Econ. Stat.* **1988**, *6*, 287–296.
61. Coplan, R.J.; Prakash, K.; O'Neil, K.; Armer, M. Do you "want" to play? Distinguishing between conflicted shyness and social disinterest in early childhood. *Dev. Psychol.* **2004**, *40*, 244–258. [CrossRef] [PubMed]
62. Zhu, J.; Wu, M.; Li, Y. Shyness and social adjustment among Chinese preschoolers: The moderating role of maternal parenting styles. *J. Psychol. Sci.* **2020**, *43*, 347–354.
63. Tomopoulos, S.; Dreyer, B.P.; Valdez, P.; Flynn, V.; Foley, G.; Berkule, S.B.; Mendelsohn, A.L. Media content and externalizing behaviors in Latino toddlers. *Ambul. Pediatr.* **2007**, *7*, 232–238. [CrossRef] [PubMed]
64. Goodman, R. The Strengths and difficulties Questionnaire: A research note. *J. Child Psychol. Psychiatry* **1997**, *38*, 581–586. [CrossRef]
65. Du, Y.; Kou, J.; Coghill, D. The validity, reliability and normative scores of the parent, teacher and self report versions of the Strengths and Difficulties Questionnaire in China. *Child Adolesc. Psychiatry Ment. Health* **2008**, *2*, 8. [CrossRef] [PubMed]
66. Stone, L.L.; Otten, R.; Engels, R.C.; Vermulst, A.A.; Janssens, J.M. Psychometric properties of the parent and teacher versions of the Strengths and Difficulties Questionnaire for 4–12-year-olds: A review. *Clin. Child Fam. Psychol. Rev.* **2010**, *13*, 254–274. [CrossRef]
67. Liu, S.-K.; Chien, Y.-L.; Shang, C.-Y.; Lin, C.-H.; Liu, Y.-C.; Shur-Fen Gau, S. Psychometric properties of the Chinese version of Strength and Difficulties Questionnaire. *Compr. Psychiatry* **2013**, *54*, 720–730. [CrossRef]
68. Gresham, F.M.; Elliott, S.N. *Social Skills Rating System*; American Guidance Service: Circle Pines, MN, USA, 1990.
69. Hart, C.H.; Robinson, C.C. *Teacher Behavior Rating Scale*; Unpublished Teacher Questionnaire; Brigham Young University: Provo, UT, USA, 1996.
70. Hayes, A.F. Partial, conditional, and moderated mediation: Quantification, inference, and interpretation. *Commun. Monogr.* **2018**, *85*, 4–40. [CrossRef]
71. Preacher, K.J.; Hayes, A.F. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav. Res. Methods* **2008**, *40*, 879–891. [CrossRef]
72. Aiken, L.S.; West, S.G. *Multiple Regression: Testing and Interpreting Interactions*; Sage: Los Angeles, CA, USA, 1991.
73. Hayes, A.F.; Matthes, J. Computational procedures for probing interactions in OLS and logistic regression: SPSS and SAS implementations. *Behav. Res. Methods* **2009**, *41*, 924–936. [CrossRef] [PubMed]
74. Johnson, P.O.; Fay, L.C. The Johnson-Neyman technique, its theory and application. *Psychometrika* **1950**, *15*, 349–367. [CrossRef]
75. Lin, H.-P.; Chen, K.-L.; Chou, W.; Yuan, K.-S.; Yen, S.-Y.; Chen, Y.-S.; Chow, J.C. Prolonged touch screen device usage is associated with emotional and behavioral problems, but not language delays, in toddlers. *Infant. Behav. Dev.* **2020**, *58*, 101424. [CrossRef] [PubMed]
76. Chassiakos, Y.R.; Radesky, J.; Christakis, D.; Moreno, M.A.; Cross, C. Children and adolescents and digital media. *Pediatrics* **2016**, *138*, e20162593. [CrossRef] [PubMed]

77. Putnick, D.L.; Trinh, M.-H.; Sundaram, R.; Bell, E.M.; Ghassabian, A.; Robinson, S.L.; Yeung, E. Displacement of peer play by screen time: Associations with toddler development. *Pediatr. Res.* **2022**, *93*, 1425–1431. [CrossRef]
78. Richert, R.A.; Robb, M.B.; Smith, E.I. Media as social partners: The social nature of children's learning from screen media. *Child Dev.* **2011**, *82*, 82–95. [CrossRef] [PubMed]
79. Li, Y.; Coplan, R.J.; Wang, Y.; Yin, J.; Zhu, J.; Gao, Z.; Li, L. Preliminary evaluation of a social skills training and facilitated play early intervention program for extremely shy young children in China. *Infant Child Dev.* **2016**, *25*, 565–574. [CrossRef]
80. Rydell, A.M.; Bohlin, G.; Thorell, L.B. Representations of attachment to parents and shyness as predictors of children's relationships with teachers and peer competence in preschool. *Attach. Hum. Dev.* **2005**, *7*, 187–204. [CrossRef]
81. Sette, S.; Baumgartner, E.; Schneider, B.H. Shyness, child–teacher relationships, and socio-emotional adjustment in a sample of Italian preschool-aged children. *Infant Child Dev.* **2014**, *23*, 323–332. [CrossRef]
82. Coplan, R.J.; McVarnock, A.; Hipson, W.E.; Bowker, J.C. Alone with my phone? Examining beliefs about solitude and technology use in adolescence. *Int. J. Behav. Dev.* **2022**, *46*, 481–489. [CrossRef]
83. Lemenager, T.; Neissner, M.; Koopmann, A.; Reinhard, I.; Georgiadou, E.; Müller, A.; Kiefer, F.; Hillemacher, T. COVID-19 lockdown restrictions and online media consumption in Germany. *Int. J. Environ. Res. Public Health* **2020**, *18*, 14. [CrossRef] [PubMed]
84. Rubenking, B.; Bracken, C.C.; Sandoval, J.; Rister, A. Defining new viewing behaviours: What makes and motivates TV binge-watching? *Int. J. Digit. Telev.* **2018**, *9*, 69–85. [CrossRef] [PubMed]
85. Van Der Schuur, W.A.; Baumgartner, S.E.; Sumter, S.R.; Valkenburg, P.M. The consequences of media multitasking for youth: A review. *Comput. Hum. Behav.* **2015**, *53*, 204–215. [CrossRef]
86. Vaterlaus, J.M.; Andersen Spruance, L.; Frantz, K.; Sloan Kruger, J. College student television binge watching: Conceptualization, gratifications, and perceived consequences. *Soc. Sci. J.* **2019**, *56*, 470–479. [CrossRef]
87. Radesky, J.S.; Weeks, H.M.; Ball, R.; Schaller, A.; Yeo, S.; Durnez, J.; Tamayo-Rios, M.; Epstein, M.; Kirkorian, H.; Coyne, S.; et al. Young children's use of smartphones and tablets. *Paediatr.* **2020**, *146*, e20193518. [CrossRef]
88. Abbey, C.; Yue, M.; Li, G.; Loyalka, P.; Rozelle, S. EdTech for equity in China: Can technology improve teaching for millions of rural students. In *Agricultural Development in Asia and Africa. Emerging-Economy State and International Policy Studies*; Estudillo, J.P., Kijima, Y., Sonobe, T., Eds.; Springer: Berlin, Germany, 2023.
89. Theunissen, M.H.C.; Vogels, A.G.C.; de Wolff, M.S.; Reijneveld, S.A. Characteristics of the Strengths and Difficulties Questionnaire in preschool children. *Pediatrics* **2013**, *131*, e446–e454. [CrossRef]
90. Achenbach, T.M. The Child Behavior Checklist and related instruments. In *The Use of Psychological Testing for Treatment Planning and Outcomes Assessment*; Maruishu, M.E., Ed.; Lawrence Erlbaum Associates Publishers: Mahwah, NJ, USA, 1999; pp. 429–466.

behavioral sciences

MDPI

Article

Association between Electronic Media Use and Internalizing Problems: The Mediating Effect of Parent–Child Conflict and Moderating Effect of Children's Age

Shuliang Geng, Ke Xu and Xiaocen Liu *

College of Preschool Education, Capital Normal University, Beijing 100048, China; 2223102004@cnu.edu.cn (S.G.); 18336930031@163.com (K.X.)
* Correspondence: cindyliu@cnu.edu.cn

Abstract: In today's digital world, children are exposed extensively to electronic media, making it an integral part of their daily lives. However, excessive use of electronic media during childhood has been associated with various internalizing problems. Moreover, parent–child conflict and children's age may be closely associated with children's problem behaviors. The current study employed a cross-sectional design and conducted a questionnaire survey of 711 parents to examine the association between children's electronic media use and their internalizing problems. Furthermore, this study probed the mediating role of parent–child conflict within this association and the moderating effect of children's age. The results of structural equation modeling showed a positive correlation between children's use of electronic media and their internalizing difficulties. Parent–child conflict served as a mediating factor in this association. Results also showed that the association between parent–child conflict and internalizing problems becomes more pronounced as children grow older. These findings imply that parents should encourage their children to develop healthy habits in using electronic media while fostering positive relationships. Parents should also be mindful of the psychological changes as children age and provide guidance to help them become proficient digital citizens.

Keywords: children; electronic media; internalizing problems; parent–child conflict; age; anxiety; depression; social withdrawal

Citation: Geng, S.; Xu, K.; Liu, X. Association between Electronic Media Use and Internalizing Problems: The Mediating Effect of Parent–Child Conflict and Moderating Effect of Children's Age. *Behav. Sci.* **2023**, *13*, 694. https://doi.org/10.3390/bs13080694

Academic Editor: Xuechen Ding

Received: 1 August 2023
Revised: 15 August 2023
Accepted: 19 August 2023
Published: 21 August 2023

1. Introduction

Investigating problem behaviors in early childhood holds substantial academic significance because such behaviors profoundly influence the individual's social adaptation and interpersonal engagements [1]. The prevalence of emotional issues among children in China is consistently increasing, displaying a gradually decreasing age of onset. Nonetheless, children's emotional problems are mainly detected by clinicians because of limited parental attention and awareness of children's internalization difficulties. Therefore, when internalizing problems are identified, irreversible damage has often occurred, jeopardizing the child's future academic achievement and social development [2].

"Internalizing problems" refer to the internal issues that individuals manifest during social interactions, primarily in the form of emotional disturbances such as anxiety and depression, as well as difficulties in peer engagement such as withdrawal [3]. Insufficient cognitive capability in children leads to deficiencies in developing strategies for regulating emotions and coping with stress, rendering them susceptible to experiencing internalizing problems [4]. As a result of maladaptive parenting behaviors, such as hostility and punitive measures, some Chinese children often exhibit reduced autonomy, limited attentional capacities, and increased dependency, potentially elevating their susceptibility to depressive symptoms and social withdrawal [5]. Research conducted by Yuan et al. revealed a notably high prevalence of depression and anxiety among a sample of 1412 children and adolescents

in Beijing, with rates reaching approximately 13.1% and 31.1%, respectively [6]. Furthermore, several studies have indicated that internalizing problems, especially depression, are frequently observed among Chinese children [7].

Children's internalizing problems are intimately related to age. Around the age of 1 year, there is a high prevalence of postnatal depression and anxiety in mothers, which may trigger children's internalizing problems [8]. Zhou et al. also highlighted the association between children's perceived conflict and internalizing problems in their first two years of life [9]. Moreover, children in the pre-school period show relatively high anxiety levels, although children's internalizing problems during this period tend to decrease with age [10]. However, the transition to primary school, changes in learning styles, and increased peer competition create particular challenges for children [11]. Adolescents are highly susceptible to internalizing problems such as anxiety and depression because they experience physiological and psychological shifts and an expansion in their social network [12]. Min et al. also identified that early adolescents tended to exhibit more substantial internalizing problems with social withdrawal due to the large number of adaptive challenges they face [13]. Therefore, examining internalizing problems in the broader age range of Chinese children is necessary.

1.1. Electronic Media Use and Internalizing Problems

"Electronic media use" is defined as an individual's use of electronic devices such as cell phones and computers [14]. With the rapid development of information technology, electronic devices are gaining popularity. Simultaneously, electronic media's visually captivating imagery and sonorous audio effortlessly captivate children's attention, increasing their exposure to such media [15]. Consequently, the employment of electronic media is regarded as a risk factor for instigating internalizing issues in children [16]. Brunborg et al. found that children who exhibit excessive addiction to video games display heightened emotional sensitivity, rendering them more susceptible to experiencing depression and anxiety [17]. The immersion of children in virtual realms can supplant their engagement in real-life socialization, leading to a sense of detachment from interpersonal interactions and consequently amplifying the likelihood of social withdrawal in children [18].

Hypothesis 1. *Children with higher levels of electronic media use are likely to experience social adjustment difficulties, i.e., children's electronic media use positively correlates with internalizing problems.*

1.2. The Mediating Role of Parent–Child Conflict

The displacement hypothesis states that individuals possess a finite amount of time and that excessive utilization of electronic media consumes a substantial portion of an individual's time, which might reduce the opportunity for children to have direct interpersonal interactions with their families [19]. Therefore, children's extended exposure to electronic media may engender a sense of "expectation deviation" among parents. In other words, children's overuse of electronic media damages healthy parent–child relationships because it contradicts parental expectations that their children will disengage from electronic devices and actively engage in face-to-face interactions [20]. Parent–child conflict is a psychological discord or outward behavior resulting from cognitive, emotional, and behavioral disparities, and is a manifestation of parent–child relationship disharmony [21]. For instance, Charlie et al. found a correlation between children's exposure to electronic media and deterioration in parent–child relationships [22]. Moreover, research by Venkatesh et al. indicated that children's problematic Internet usage might have an additional impact on their parents' occupational achievements [23]. The over-exposure of children to electronic media has been shown to contribute to increased parental stress in juggling work and parenting responsibilities, resulting in a decline in the quality of the parent–child relationship [24].

Davies and Cummings posited an emotional security hypothesis, suggesting that insecure parent–child relationships are detrimental to developing secure parent–child attachments, which might lead to problematic behaviors in children [25]. Attachment theory further underscores the notion that insecure parent–child attachment impedes children's personal development and subsequent social adaptation [26], potentially fostering tendencies towards intimacy avoidance and Internet addiction [27]. Lippold et al. found that decreased emotional warmth and increased hostility in the parent–child relationship were strong indicators of early internalizing problems in adolescents [28]. Consequently, it is plausible to postulate that parent–child conflict might mediate the relationship between children's electronic media use and internalizing problems.

Hypothesis 2. *Parent–child conflict mediates the relationship between children's electronic media use and internalizing problems. Specifically, children's enhanced electronic media use is accompanied by increased parent–child conflict, leading to a rise in internalizing difficulties among the children.*

1.3. The Moderating Role of Children's Age

Several variables, including the age of the children, may operate as moderators in the association between children's electronic media use and internalization problems through parent–child conflict [29]. Ecological systems theory states that an active two-way interaction exists between children and their surrounding environment, with characteristics such as children's age and personality also influencing parental behavior [30]. Therefore, parent–child conflict arising from children's electronic media use may be moderated by temporal systems such as children's age. The "family life stage development theory" also proposes that as children grow older, they undergo distinct and unique developmental changes, which subsequently influence the dynamics of the parent–child relationship [31]. As children mature, they gradually tend to make independent decisions and judgments, and become more resistant to parental intervention [32]. Some children may extend the negative feelings associated with parent–child conflict to other interpersonal relationships and experience social adjustment difficulties [33,34]. Parent–child conflict arising from children's exposure to electronic media may be perceived by older children as a form of regulatory behavior, which is highly likely to enhance the individual's rebelliousness [35]. Therefore, an increase in children's rebelliousness is commonly linked to parent–child conflict, which often leads to an exacerbation of internalizing problems such as social withdrawal [36,37]. Additionally, as children progress from kindergarten to elementary school, they undergo a significant developmental transition. Children may experience high academic pressure, peer competition, and academic distress during this particular stage due to parental expectations [38]. Moreover, in a competitive environment, children frequently receive less emotional care, and this lack of concern regularly results in intensified parent–child conflict and serious emotional problems such as depression and anxiety [39].

Hypothesis 3. *As children grow older, they become more resistant to parental intervention, triggering more substantial adverse effects. In other words, children's age amplifies the positive relationship between parent–child conflict and internalizing problems.*

In summary, a review of the literature indicates that children's electronic media use positively relates to internalizing problems [16–18]. Additionally, children's engagement with electronic media exhibits a positive association with parent–child conflict [20]. Greater levels of parent–child conflict are linked to an elevated likelihood of anxiety and social adjustment challenges in children [27,28]. Moreover, most previous research has predominantly conceptualized children as passive participants in the perception of parent–child conflict, prioritizing parental agency and highlighting the adverse consequences of conflict on children. Nevertheless, it is essential to acknowledge that children are not solely passive entities within the parent–child dynamic. Factors such as age, temperament, and other individual characteristics are also associated with the intricacies of the parent–child relation-

ship. In other words, children's age may moderate the relationship between parent–child conflict and children's internalizing problems. The specific hypotheses of the current study are depicted in Figure 1.

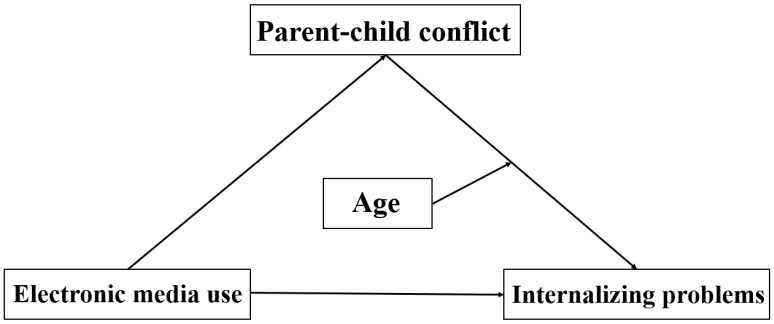

Figure 1. Conceptual framework for hypothesis testing.

2. Materials and Methods

2.1. Respondents

The respondents were from the northern part of China. The initial sample consisted of 796 parents. We did not consider 85 respondents in the subsequent analysis due to incomplete information and contradictory answers. A total of 711 responses were included in the final analysis. The age range of the respondents' children was 1.08 to 13.09 years, with a mean age of 5.23 years (*SD* = 1.91). There were 342 (48.1%) boys and 369 (51.9%) girls among the children, including 557 (78.3%) only children and 154 (21.7%) non-only children. Regarding the location of the family, 533 (75.0%) children lived in cities and 178 (25.0%) in towns or rural areas. The demographic characteristics of the parents are shown in Table 1.

Table 1. Demographic characteristics of the parents.

	Father	Mother
Mean age	34.10 years (*SD* = 5.11)	32.34 years (*SD* = 4.62)
Education (%)		
Primary and below	0.4%	0.6%
Junior high	2.4%	2.2%
Senior high and middle school	9.3%	8.6%
College and bachelor's degree	70.6%	78.4%
Postgraduate and above	17.4%	10.3%
Occupation (%)		
Managers	25.5%	18.5%
Professionals and technicians	20.1%	15.3%
Clerical support workers	8.6%	9.1%
Service and sales workers	11.5%	13.7%
Skilled agricultural, forestry, and fishery workers	1.6%	0.6%
Craft and related trades workers	2.6%	1.0%
Armed forces occupations	2.2%	0.3%
Full-time parents	0.6%	13.4%
Unemployed	0.9%	1.9%
Freelancers	26.3%	26.3%
Monthly income (%)		
≤2999 CNY	1.9%	12.8%
3000–5999 CNY	15.0%	25.9%
6000–8999 CNY	29.6%	32.6%
9000–11,999 CNY	25.9%	17.7%
≥12,000 CNY	27.6%	11.0%

2.2. Measures

2.2.1. Electronic Media Use

The Electronic Media Use Questionnaire was adapted from the Video Game Use Questionnaire by Huang et al. [40]. We changed the term "video games" to "electronic media" in order to better encompass a broader range of media genres. The initial questionnaire comprised 20 items. After performing a validated factor analysis with a sample of 277 children, the final questionnaire was reduced to 14 items in four dimensions. The questionnaire consisted of electronic media time management (e.g., "Your child spends more time using electronic media than before"), interpersonal and health conditions caused by electronic media use (e.g., "Your child often makes new friends through electronic media"), life conflicts arising from electronic media use (e.g., "Your child spends less time playing outdoors because of the use of electronic media"), and emotional experiences related to electronic media use (e.g., "Your child gets angry at you for limiting his/her time using electronic media"). The questionnaire was scored on a 5-point Likert-type scale, with 1 indicating "strongly disagree" and 5 indicating "strongly agree". Children's electronic media use scores were summed across all items. The children's Electronic Media Use Questionnaire scores ranged from 14–70. The higher the total score, the more serious the electronic media usage. The Cronbach's alpha coefficient of the questionnaire in this study was 0.93, and the coefficients of each sub-dimension were 0.73, 0.80, 0.77, and 0.82, respectively. The structural validity was $\chi^2/df = 2.71$, RMSEA = 0.08, GFI = 0.91, NFI = 0.91, IFI = 0.94, TFI = 0.92, and CFI = 0.94.

2.2.2. Parent–Child Conflict

The study employed the Child–Parent Relationship Scale (CPRS), originally developed by Pianta and subsequently revised by Zhang et al. [41]. The scale includes two dimensions: closeness (e.g., "I share an affectionate, warm relationship with my child") and conflict (e.g., "My child and I always seem to be struggling with each other"). The scale consists of 22 items and is scored on a 5-point Likert-type scale. A total of 12 items on the conflict dimension were used to calculate the parent–child conflict score. The cumulative count of items encompassing the parent–child conflict subscale was utilized to derive the parent–child conflict score. The parent–child conflict subscale scores spanned the range from 12 to 60. The higher the score, the more serious the conflict between parents and children. The scale has demonstrated strong reliability and validity in the context of research on parent–child relationships [42]. The Cronbach's alpha coefficient of the parent–child conflict subscale was 0.91, reflecting the high internal consistency of the scale. The structural validity of the scale has been demonstrated to be $\chi^2/df = 2.02$, RMSEA = 0.05, GFI = 0.92, and CFI = 0.91 [43].

2.2.3. Internalizing Problems

The study also utilized the Strengths and Difficulties Questionnaire (SDQ), initially formulated by Goodman [44] and subsequently revised by Aarø et al. [45]. Goodman et al. initially established the viability of employing the Strengths and Difficulties Questionnaire for evaluating mental health among children aged 5 to 16 through a combination of questionnaire-based assessments and clinical diagnostic cross-validation [46]. Building upon this foundation, subsequent investigations by Patel et al. and Maurice-Stam et al. further validated the questionnaire's utility for other age groups, specifically children aged 12 to 24 months and 2 to 18 years, respectively [47,48]. This cumulative evidence underscores the efficacy of the Strengths and Difficulties Questionnaire in comprehensively gauging problematic behavioral patterns among children spanning the age range of 1 to 18 years. The scale comprises three dimensions: externalizing problems, internalizing problems, and prosocial behaviors. The scale contains 21 items and is scored on a 3-point scale, with 0 meaning "not true" and 2 meaning "certainly true". Following the guidelines established by Aarø et al. [45], seven items were chosen to assess children's internalizing problems. The summation of scores across these seven items yielded the children's inter-

nalizing problems score. The internalizing problems subscale exhibits a scoring spectrum spanning from 0 to 14. The higher the score, the more serious the child's internalizing problems. The scale has good reliability in studies with groups of children [45]. The internalizing problems subscale exhibited a Cronbach's alpha coefficient of 0.77. The structural validity was assessed using various fit indices, including $\chi^2/df = 2.43$, RMSEA = 0.04, GFI = 0.95, NFI = 0.91, IFI = 0.94, TFI = 0.93, and CFI = 0.94.

2.3. Procedures

Data and consent forms for this research were obtained from the parents who resided with the respective children. To ensure clarity, especially for families with multiple children, we instructed parents to provide only information about a single child. Throughout the data-gathering phase, participants were offered detailed clarifications on study variables. For example, within the questionnaire's guidance section, the term "electronic media" was defined as encompassing platforms such as the Internet, computers, tablets, smartphones, digital television, video games, artificial intelligence aides, and intelligent learning devices that harness electronic, computer, and Internet-based technologies.

2.4. Statistical Analysis

Initial analyses of the collected data, including data cleansing, descriptive statistics, and correlation analysis, were performed using IBM SPSS software version 23.0. Subsequently, a moderated mediated model analysis was conducted with the assistance of the IBM SPSS Amos program version 26.0, and the moderating role of children's age was further explored through a simple slope analysis.

3. Results

3.1. Common Method Bias

Following the suggestions of Podsakoff et al., Harman's single-factor test was used to test for common method bias (CMB) [49]. Podsakoff and Organ considered that CMB is not serious if the variance explained by a single factor obtained by exploratory factor analysis (EFA) without rotation does not exceed 50% [50]. Tang and Wen's study pointed out that, based on applications of the test in China, it is generally accepted that the variance explained by a single factor should not exceed 40% [51]. The current study showed that the amount of variance explained by the first factor was 35.13%, which was lower than the critical value of 40%. Therefore, there was no obvious common method bias in this study.

3.2. Preliminary Analysis

The result obtained from the preliminary analysis indicated that the average age at which children initially engage with electronic media is 2.45 years (SD = 1.40). There is a trend toward younger generations in electronic media usage, suggesting that the younger the child, the earlier they start using such media. In this study, apart from one 2-year-old and one 5-year-old, all children had previous experience with electronic media. Therefore, excluding the 2-year-old cohort (97.1%) and the 5-year-old cohort (99.4%), the proportion of children using electronic media in all other age groups was 100%. Chi-square analysis revealed no significant differences in electronic media usage across various age groups, $\chi^2(12) = 10.17$, $p = 0.601$.

3.3. Descriptive Statistics and Correlation Analysis

The means and standard deviations of the main variables in this study were calculated using descriptive statistical analysis. The details are shown in Table 2.

Table 2. Descriptive statistics and correlations of the main variables.

Variables	*M*	*SD*	1	2	3	4	5
1. Gender	0.52	0.50	—				
2. Age	5.23	1.91	—	1			
3. Electronic media use	33.19	10.68	−0.05	0.15 **	1		
4. Parent–child conflict	25.97	8.29	−0.09 *	0.04	0.53 **	1	
5. Internalizing problems	2.66	2.53	−0.08 *	0.07	0.42 **	0.54 **	1

Notes: Gender: 0 = boy, 1 = girl; * $p < 0.05$, ** $p < 0.01$.

The associations among the main variables were investigated through Pearson correlation analysis. As shown in Table 2, children's electronic media use positively correlated with parent–child conflict and internalizing problems. A positive correlation was found between parent–child conflict and internalizing problems. There was a positive association between children's age and electronic media use. Additionally, children's gender exhibited negative associations with parent–child conflict and internalizing problems. Given the correlation associated with gender, we treated gender as a control variable in the subsequent analysis.

3.4. Moderated Mediation Effect Test

The current study aimed to explore the association between children's electronic media use and internalizing problems through the mediation of parent–child conflict and the moderating role of age. Hence, we conducted structural equation modeling using the maximum likelihood method in AMOS version 26.0 to assess the hypothetical model. Confidence interval bootstrap tests for bias correction were performed for the model paths, with sampling repetitions set at 5000 and confidence intervals set at 95%. According to Little et al. and Wu and Wen's suggestions for item packing when items $\geq$ nine in structural modeling, an isolated parceling should be used for scales containing multiple subscales to pack the individual subscales into a single indicator [52,53]. For unidimensional scales, factorial, correlation, radial, or random algorithms can be adopted. The random method is the most frequently recommended among these packaging methods because it is conceptually independent of established scales and samples [54]. Therefore, we employed the isolated parceling packaging method for the Electronic Media Use Questionnaire with a multidimensional structure, and the random algorithm packaging method for the parent–child conflict scale with a unidimensional structure. Conversely, the internalizing problems scale, despite being a unidimensional scale, was not subjected to packaging due to its limited item count of only seven (<nine items).

A structural equation model was constructed to investigate the relationship between children's electronic media use and internalization problems, with gender as a control variable. The model fit results were as follows: $\chi^2/df = 2.85$, RMSEA = 0.05, GFI = 0.97, NFI = 0.96, IFI = 0.97, TFI = 0.96, and CFI = 0.97. The path from children's electronic media use to internalizing problems was significantly positive ($\beta = 0.47$, $p < 0.001$, 95% CI [0.39, 0.55]). In other words, the more children use electronic media, the stronger the likelihood of internalizing problems.

To examine the possible mediating role of parent–child conflict in the association between children's electronic media use and internalizing problems, we incorporated parent–child conflict into the original structural model. The evaluation of the model fit yielded the following results: $\chi^2/df = 2.82$, RMSEA = 0.05, GFI = 0.95, NFI = 0.95, IFI = 0.97, TFI = 0.96, and CFI = 0.97. The path from children's electronic media use to parent–child conflict was significantly positive ($\beta = 0.60$, $p < 0.001$, 95% CI [0.53, 0.66]), while the path from parent–child conflict to internalizing problems was also positive ($\beta = 0.58$, $p < 0.001$, 95% CI [0.47, 0.68]). The application of bootstrap testing revealed a significant mediating effect ($ab = 0.13$, $p < 0.001$, 95% CI [0.09, 0.18]). These findings indicate that the association between children's electronic media use and internalizing problems was partially mediated by parent–child conflict, with the mediating effect explaining 73.36%

of the overall relationship. In other words, children's increased use of electronic media was more likely to trigger parent–child conflict and intensified the likelihood of children suffering from internalizing problems.

To further ascertain the moderating role of children's age in the latter half of the mediated model path, the structural model was expanded by incorporating children's age as a moderator variable and including an interaction term between children's age and parent–child conflict (post-centering). The model fit results were as follows: $\chi^2/df = 2.94$, RMSEA = 0.05, GFI = 0.94, NFI = 0.93, IFI = 0.96, TFI = 0.95, and CFI = 0.96. The specific paths are shown in Figure 2. The results of bootstrap tests showed a significant positive path from the interaction term between children's age and parent–child conflict to internalizing problems (β = 0.12, $p < 0.01$, 95% CI [0.03, 0.22]), as well as a significant path from parent–child conflict to internalizing problems (β = 0.58, $p < 0.001$, 95% CI [0.47, 0.67]). Consequently, these findings demonstrate that, as children grow older, the association between parent–child conflict and children's internalizing problems becomes more pronounced.

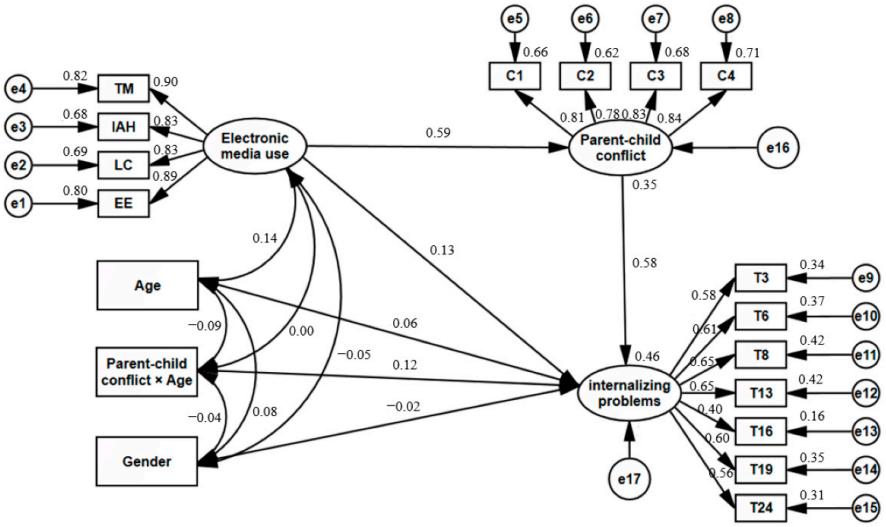

Figure 2. Mediating effect of parent–child conflict on the relationship between electronic media use and internalizing problems and the moderating role of children's age.

In addition, we carried out a simple slope analysis to illustrate the moderating role of children's age in the relationship between parent–child conflict and internalizing problems. The results, as depicted in Figure 3, indicate that parent–child conflict exhibited a significant and positive association with internalizing problems among younger children (β = 0.45, $p < 0.001$, 95% CI [0.32, 0.59]). Furthermore, the positive correlation between parent–child conflict and internalizing problems became more prominent in older children (β = 0.70, $p < 0.001$, 95% CI [0.56, 0.83]). Figure 3 vividly represents the heightened positive correlation between parent–child conflict and internalizing difficulties as children grow older.

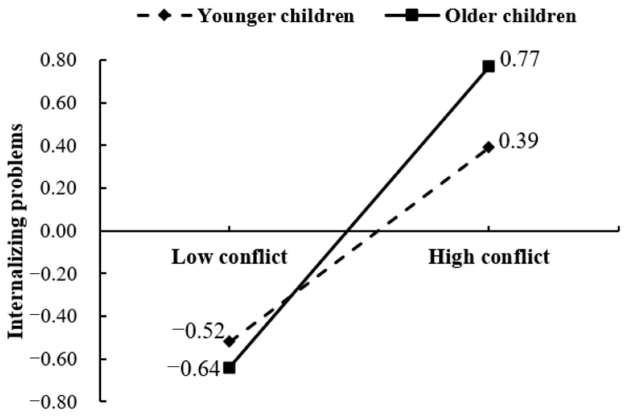

Figure 3. Simple slope analysis of the interaction between parent–child conflict and children's age in internalizing problems.

4. Discussion

4.1. Electronic Media Use and Internalizing Problems

This study revealed a positive association between children's electronic media consumption and internalizing problems, corroborating previous research findings [55] and confirming Hypothesis 1. The social displacement hypothesis posits that if individuals spend too much time using electronic media such as cell phones and computers, they inevitably spend less time communicating in the real world [19]. However, individuals who spend less time socializing in the real world will likely experience diminished interpersonal skills [56] and an increased risk of social anxiety [57,58]. Therefore, the extensive utilization of electronic media by children significantly impinges on their offline communication, leading to a gradual disengagement of children from real-world socialization. This phenomenon can be attributed to the disparities between interactions in the virtual realm and those in reality [59], as well as the predominantly fictitious or surreal nature of the content to which children are exposed in the virtual world [60]. Hence, it is plausible that children who have become accustomed to engaging in online communication may exhibit heightened vulnerability to experiencing discomfort or frustration when engaging in offline communication, potentially exacerbating internalized issues such as anxiety, depression, and social withdrawal behaviors [16–18].

Electronic media harbor a plethora of information, yet the nature of the content children are exposed to is not consistently positive. Riddle and Martins conducted a comprehensive analysis spanning two decades which included an assessment of 21 primetime television programs and movies aired on 765 broadcast and cable networks in the United States. Their findings revealed a substantial escalation in the prevalence of violent content [61]. Consequently, as children's utilization of electronic media increases, the likelihood of their exposure to objectionable online material, such as violence and pornography, increases proportionally [62]. Children's prolonged exposure to violent content negatively affects their social development [63]. Lin et al. investigated the brain structure of experimental subjects with the help of Voxel-based morphometry (VBM). They found that as an individual's exposure to online games increased, their hippocampal gray matter density decreased accordingly [64]. As a higher center for learning, the hippocampus is associated with the performance of an individual's working memory [65]. A child with deficits in working memory is likely to have suboptimal emotional regulation capabilities [66]. Therefore, these impairments significantly impede their ability to adapt effectively to societal demands, exacerbating internalizing difficulties [67].

4.2. The Mediating Role of Parent–Child Conflict

The findings also validated Hypothesis 2, demonstrating that parent–child conflict mediated the relationship between children's utilization of electronic media and internalizing problems. This result reinforces the importance of "technoference" within familial dynam-

ics, as it emerges as a crucial detriment of the quality of family relationships. Specifically, if a family member is addicted to electronic media, their interactions with other family members will be jeopardized, which is not conducive to forming a positive parent–child relationship [68]. Furthermore, it should be noted that the quality of content available on electronic media exhibits variability [69]. Concurrently, the utilization of electronic media by children has been found to affect their sleep patterns and injure their visual health [70]. Therefore, children's engagement in electronic media tends to prompt parents to adopt restrictive parenting approaches [71], giving rise to conflicts between parents and children [72].

Caution is due here because variations exist in the parental approaches embraced across different countries, driven by diverse cultural contexts [73]. Within Asia, a collectivist cultural orientation prevails, characterizing children as subservient within the family unit. In this framework, stringent discipline is often perceived as beneficial, while its absence is construed as inadequate supervision and care [74]. Conversely, European and South American societies emphasize the significance of treating children with respect and emotional acceptance, associating rigid control with adverse outcomes [75]. Asian parents lean towards cultivating discipline and constraint in child rearing, while South American and European counterparts prioritize tolerance, respect, and acceptance. As a result, parental behaviors concerning children's exposure to electronic media diverge across cultural landscapes. Yu et al. underscored that Chinese parents exhibited greater involvement in overseeing their children's electronic media usage than their American counterparts [76]. Similarly, Korean parents accentuated the adverse effects of electronic media on children [77]. However, in the Netherlands, parents assume the roles of supervisors and co-users in their children's engagement with electronic media, granting older children autonomy in its utilization [78]. Contrasting with Western perspectives, parents in Asian nations such as China and Korea display heightened vigilance and reservations towards electronic media. Moreover, public opinion associates addiction to electronic media with educational failure, leading many parents to view electronic media as a "scourge" [79]. Such extreme perceptions escalate the likelihood of authoritarian parenting and parent–child conflicts [80,81].

It is worth highlighting the notion in attachment theory that individuals who develop insecure attachments with their parents are prone to extending this sentiment to other social groups [26]. Children with insecure attachments have significantly larger late amygdala volumes [82], and the brain-structure change increases children's responses to adverse stimuli and amplifies the impact of negative events [83]. Hence, the presence of parent–child conflict may have a destructive impact on children's social and emotional well-being, impeding their ability to establish trust in others. This may manifest in avoiding intimate interactions, heightened feelings of isolation, and an escalation of internalizing issues, such as depression and anxiety [28].

4.3. The Moderating Effects of Age

Perhaps the most striking finding of this study is that the pathway of electronic media use through parent–child conflict to internalizing problems is moderated by children's age, which supports Hypothesis 3. Parent–child conflict was significantly associated with internalizing problems for younger and older children. However, age amplified the positive correlation between parent–child conflict and internalizing problems. Specifically, older children demonstrated increased vulnerability to parent–child conflict, leading to a more pronounced expression of internalizing problems than in their younger counterparts.

The concept of bidirectionality in parent–child relationships highlights the involvement of reciprocal influence in the social dynamic between parents and children [84]. This implies that children are not merely passive recipients in the parent–child relationship, but rather that their age and temperament have counteractive effects on this relationship [85]. As children mature, they progressively expand their social horizons and develop greater autonomy [86]. Therefore, when parents persist in perceiving their children to be immature

and exhibit excessive concern over them, akin to their behaviors during their children's early years, the child tends to interpret such behavior as an interference or as a negation of their autonomy [87]. This disrespectful approach is prone to inciting emotional difficulties in the child [88].

Additionally, as children grow up, they progressively encounter intensified academic demands and interpersonal rivalries [89]. Compared to students in other nations, students in some Asian countries devote much time to their educational pursuits and frequently experience severe psychological strain due to excessive after-school programs [90]. The prevailing adherence to Confucianism in China is pervasive, leading to the adoption of examination-based talent selection methods [91]. Consequently, Chinese parents commonly hold elevated expectations for their children's educational achievements, which might place a heavy psychological burden on older children [92]. Evidence suggests that psychological stress or depression generally leads to heightened susceptibility to negative events and intensified consequences of adverse events [93]. Therefore, compared to younger children, when older children are confronted with stressful situations, they may experience parent–child conflict more acutely and are more likely to have internalizing problems.

4.4. Limitations and Suggestions for Future Research

There are several noteworthy limitations inherent to the present study. Firstly, it must be acknowledged that this study did not employ a causal experimental or a longitudinal follow-up design. Consequently, it was challenging to effectively investigate the causal associations among children's utilization of electronic media, parent–child conflict, age, and internalizing problems. In other words, the model used might not be the only model supported by the data. Hence, it is recommended that future research endeavors embrace an experimental or longitudinal design to extensively elucidate the underlying effects mechanism among the variables under investigation.

Secondly, implementing the convenience sampling method for data collection in this study might warrant scrutiny. Thus, the generalizability of the findings may be exclusively constrained to the northern region of China and to those children who appear to be using electronic media. Moreover, parents from different cultural backgrounds may adopt varied parenting styles when addressing children's use of electronic media, which could further influence the manifestation of parent–child conflicts. Therefore, subsequent research should utilize a broader and more representative sample from diverse ethnic groups, regions, and cultures to thoroughly assess the association between children's electronic media use and its outcomes.

Thirdly, the data for this study were sourced from parents residing with their children, predicated on the assumption that such parents possess significant insight into their children's behavior and experiences. However, some working parents might need more time to monitor their children closely. We should have inquired about the parents' parenting styles, the daily amount of time they spend with their children, or their confidence in evaluating their child's behavior, which might affect the accuracy of our study's results. Thus, we will enhance our understanding of these factors in future research to yield more convincing results.

Fourthly, this study examined children's internalizing problems across a broader age range and found no significant correlation between age and internalizing problems. However, due to the utilization of a unidimensional measurement scale for internalizing problems in our study, it could not capture the qualitative differences in various aspects of internalizing problems (such as depression, anxiety, and social withdrawal) that may evolve with age. Therefore, future research could employ alternative tools that comprehensively depict internalizing problems, aiming to provide a more nuanced understanding of how these issues transform with age.

Lastly, it is essential to note that the data relied solely on parental reports, thus somewhat neglecting the "voices" and perspectives of the children. Subsequent studies should incorporate children's perspectives to systematically explore the relationships among

children's age, electronic media use, parent–child conflict, and internalizing problems, accounting for the diverse viewpoints of both parents and children.

5. Conclusions

In summary, the results of this study revealed a noteworthy and affirmative correlation between children's utilization of electronic media and the display of internalizing problems. The involvement of parent–child conflict was identified as a mediator in this connection. Furthermore, the age of the children was observed to moderate the relationship between parent–child conflict and internalizing problems. Specifically, the positive association between parent–child conflict and internalizing problems intensified with the children's increasing age.

Author Contributions: Conceptualization, X.L. and S.G.; methodology, S.G.; software, S.G. and K.X.; validation, X.L., S.G. and K.X.; formal analysis, S.G.; investigation, X.L.; resources, X.L.; data curation, S.G.; writing—original draft preparation, S.G.; writing—review and editing, X.L.; visualization, K.X.; supervision, X.L.; project administration, X.L.; funding acquisition, X.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by grants from the National Social Science Fund of China (Grant number: 18BSH130), Beijing Social Science Foundation Project (Grant number: 22GJB017), and R&D Program of Beijing Municipal Education Commission (Grant number: SZ202310028013).

Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of Capital Normal University (No. 2023011201). Respondents' information was maintained confidential and anonymized.

Informed Consent Statement: Informed consent was acquired from all respondents who participated in this study.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments: We sincerely appreciate the editors and reviewers for their invaluable guidance, comments, and suggestions. Their expertise and insights significantly contributed to improving the quality of this manuscript. Our profound gratitude goes to the respondents who willingly participated in this study.

Conflicts of Interest: The authors have no conflict of interest to declare.

References

1. Lulla, D.; Mascarenhas, S.S.; How, C.H.; Yeleswarapu, S.P. An approach to problem behaviours in children. *Singap. Med. J.* **2019**, *60*, 168–172. [CrossRef]
2. Bevilacqua, L.; Hale, D.; Barker, E.D.; Viner, R. Conduct problems trajectories and psychosocial outcomes: A systematic review and meta-analysis. *Eur. Child Adolesc. Psychiatry* **2018**, *27*, 1239–1260. [CrossRef]
3. Lougheed, J.P.; Duncan, R.J.; Keskin, G.; Marceau, K. Longitudinal associations between mother-child conflict and child internalizing problems in mid-childhood. *Dev. Psychopathol.* **2022**, *34*, 263–272. [CrossRef] [PubMed]
4. Crespo, L.M.; Trentacosta, C.J.; Aikins, D.; Wargo-Aikins, J. Maternal emotion regulation and children's behavior problems: The mediating role of child emotion regulation. *J. Child Fam. Stud.* **2017**, *26*, 2797–2809. [CrossRef]
5. Xiao, B.; Bullock, A.; Coplan, R.J.; Liu, J.; Cheah, C.S.L. Exploring the relations between parenting practices, child shyness, and internalizing problems in Chinese culture. *J. Fam. Psychol.* **2021**, *35*, 833–843. [CrossRef]
6. Yuan, W.; Zhang, Y.; Chen, L.; Jiang, J.N.; Chen, M.M.; Liu, J.Y.; Ma, T.; Ma, Q.; Cu, M.J.; Guo, T.J.; et al. Association of body fat distribution with depression and social anxiety in children and adolescents: A cross-sectional study based on dual-energy X-ray detection. *Beijing Da Xue Xue Bao Yi Xue Ban* **2023**, *55*, 429–435. [CrossRef]
7. Xiao, B.W.; Bullock, A.; Liu, J.S.; Coplan, R.J. The longitudinal links between marital conflict and Chinese children's internalizing problems in mainland China: Mediating role of maternal parenting styles. *Fam. Process* **2022**, *61*, 1749–1766. [CrossRef]
8. Howard, L.M.; Molyneaux, E.; Dennis, C.L.; Rochat, T.; Stein, A.; Milgrom, J. Perinatal mental health 1 Non-psychotic mental disorders in the perinatal period. *Lancet* **2014**, *384*, 1775–1788. [CrossRef] [PubMed]
9. Zhou, N.; Cao, H.J.; Leerkes, E.M. Interparental conflict and infants' behavior problems: The mediating role of maternal sensitivity. *J. Fam. Psychol.* **2017**, *31*, 464–474. [CrossRef] [PubMed]
10. Spence, S.H.; Rapee, R.; McDonald, C.; Ingram, M. The structure of anxiety symptoms among preschoolers. *Behav. Res. Ther.* **2001**, *39*, 1293–1316. [CrossRef]

11. Walker, O.L.; Degnan, K.A.; Fox, N.A.; Henderson, H.A. Social problem solving in early childhood: Developmental change and the influence of shyness. *J. Appl. Dev. Psychol.* **2013**, *34*, 185–193. [CrossRef]
12. Bongers, I.L.; Koot, H.M.; van der Ende, J.; Verhulst, F.C. The normative development of child and adolescent problem behavior. *J. Abnorm. Psychol.* **2003**, *112*, 179–192. [CrossRef] [PubMed]
13. Min, M.O.; Yoon, D.; Minnes, S.; Ridenour, T.; Singer, L.T. Profiles of individual assets and mental health symptoms in at-risk early adolescents. *J. Adolesc.* **2019**, *75*, 1–11. [CrossRef] [PubMed]
14. Clifford, S.; Doane, L.D.; Breitenstein, R.; Grimm, K.J.; Lemery-Chalfant, K. Effortful control moderates the relation between electronic-media use and objective sleep indicators in childhood. *Psychol. Sci.* **2020**, *31*, 822–834. [CrossRef] [PubMed]
15. Brushe, M.E.; Islam, T.; Monroy, N.S.; Sincovich, A.; Gregory, T.; Finlay-Jones, A.; Brinkman, S.A. Prevalence of electronic device use before bed among Australian children and adolescents: A cross-sectional population level study. *Aust. N. Z. J. Public Health* **2022**, *46*, 286–291. [CrossRef] [PubMed]
16. Hinkley, T.; Verbestel, V.; Ahrens, W.; Lissner, L.; Molnar, D.; Moreno, L.A.; Pigeot, I.; Pohlabeln, H.; Reisch, L.A.; Russo, P.; et al. Early childhood electronic media use as a predictor of poorer well-being: A prospective cohort study. *JAMA Pediatr.* **2014**, *168*, 485–492. [CrossRef]
17. Brunborg, G.S.; Mentzoni, R.A.; Froyland, L.R. Is video gaming, or video game addiction, associated with depression, academic achievement, heavy episodic drinking, or conduct problems? *J. Behav. Addict.* **2014**, *3*, 27–32. [CrossRef]
18. Elsayed, W. COVID-19 pandemic and its impact on increasing the risks of children's addiction to electronic games from a social work perspective. *Heliyon* **2021**, *7*, e08503. [CrossRef]
19. Kraut, R.; Patterson, M.; Lundmark, V.; Kiesler, S.; Mukopadhyay, T.; Scherlis, W. Internet paradox—A social technology that reduces social involvement and psychological well-being? *Am. Psychol.* **1998**, *53*, 1017–1031. [CrossRef]
20. Aierbe, A.; Oregui, E.; Bartau, I. Video games, parental mediation and gender socialization. *Digit. Educ. Rev.* **2019**, *36*, 100–116. [CrossRef]
21. Fu, W.Q.; Zhu, Y.H.; Wang, J.Y.; Dong, H.Q. Parent-child conflict and friendship quality of Chinese adolescence: The mediating role of resilience. *Curr. Psychol.* **2023**, 1–12. [CrossRef]
22. Charlie, C.W.D.; Hyekyung, C.; Khoo, A. Role of parental relationships in pathological gaming. *Procedia Soc. Behav. Sci.* **2011**, *30*, 1230–1236. [CrossRef]
23. Venkatesh, V.; Sykes, T.A.; Chan, F.K.Y.; Thong, J.Y.L.; Hu, P.J.H. Children's internet addiction, family-to-work conflict, and job outcomes: A study of parent-child dyads. *MIS Q.* **2019**, *43*, 903–927. [CrossRef]
24. Fonseca, A.; Moreira, H.; Canavarro, M.C. Uncovering the links between parenting stress and parenting styles: The role of psychological flexibility within parenting and global psychological flexibility. *J. Context. Behav. Sci.* **2020**, *18*, 59–67. [CrossRef]
25. Davies, P.T.; Cummings, E.M. Marital conflict and child adjustment: An emotional security hypothesis. *Psychol. Bull.* **1994**, *116*, 387–411. [CrossRef]
26. Bretherton, I. Attachment theory: Retrospect and prospect. *Monogr. Soc. Res. Child Dev.* **1985**, *50*, 3–35. [CrossRef]
27. Wilke, N.; Howard, A.H.; Morgan, M.; Hardin, M. Adverse childhood experiences and problematic media use: The roles of attachment and impulsivity. *Vulnerable Child Youth Stud.* **2020**, *15*, 344–355. [CrossRef]
28. Lippold, M.A.; Hussong, A.; Fosco, G.; Ram, N. Youth internalizing problems and changes in parent–child relationships across early adolescence: Lability and developmental trends. *J. Early Adolesc.* **2021**, *41*, 472–497. [CrossRef]
29. Strelau, J. Biologically determined dimensions of personality or temperament. *Pers. Individ. Dif.* **1982**, *3*, 355–360. [CrossRef]
30. Darling, N. Ecological systems theory: The person in the center of the circles. *Res. Hum. Dev.* **2007**, *4*, 203–217. [CrossRef]
31. Li, Q.M.; Wang, J.T. The relationship between family atmosphere children's life satisfaction and intergenerational transmission of mental health: The difference of parent-child gender and children age. *Stud. Psychol. Behav.* **2022**, *20*, 282–288.
32. Smetana, J.G.; Campione-Barr, N.; Metzger, A. Adolescent development in interpersonal and societal contexts. *Annu. Rev. Psychol.* **2006**, *57*, 255–284. [CrossRef] [PubMed]
33. Lee, D.Y. The role of attachment style in building social capital from a social networking site: The interplay of anxiety and avoidance. *Comput. Hum. Behav.* **2013**, *29*, 1499–1509. [CrossRef]
34. Kim, E.; Koh, E. Avoidant attachment and smartphone addiction in college students: The mediating effects of anxiety and self-esteem. *Comput. Hum. Behav.* **2018**, *84*, 264–271. [CrossRef]
35. Feng, Y.; Xie, W.J. Teens' concern for privacy when using social networking sites: An analysis of socialization agents and relationships with privacy-protecting behaviors. *Comput. Hum. Behav.* **2014**, *33*, 153–162. [CrossRef]
36. Liu, L.; Wang, M.F. Parental harsh discipline and adolescent problem behavior in China: Perceived normativeness as a moderator. *Child Abuse Negl.* **2018**, *86*, 1–9. [CrossRef]
37. Dunbar, A.S.; Zeytinoglu, S.; Leerkes, E.M. When is parental suppression of black children's negative emotions adaptive? The role of preparation for racial bias and children's resting cardiac vagal tone. *Res. Child Adolesc. Psychopathol.* **2022**, *50*, 163–176. [CrossRef]
38. Fishstrom, S.; Wang, H.H.; Bhat, B.H.; Daniel, J.; Dille, J.; Capin, P.; Vaughn, S. A meta-analysis of the effects of academic interventions on academic achievement and academic anxiety outcomes in elementary school children. *J. Sch. Psychol.* **2022**, *92*, 265–284. [CrossRef]
39. Flouri, E.; Midouhas, E. Environmental adversity and children's early trajectories of problem behavior: The role of harsh parental discipline. *J. Fam. Psychol.* **2017**, *31*, 234–243. [CrossRef]

40. Huang, H.Q.; Zhou, Y.; Qu, F.B.; Liu, X.C. The Role of Parenting Styles and Parents' Involvement in Young Children's Videogames Use. In Proceedings of the HCI in Games: Second International Conference, Copenhagen, Denmark, 19–24 July 2020.
41. Zhang, X. Parent-child and teacher-child relationships in Chinese preschoolers: The moderating role of preschool experiences and the mediating role of social competence. *Early Child. Res. Q.* **2011**, *26*, 192–204. [CrossRef]
42. Kay, M.A.; Saglam, M.; Ozdemir, F.; Ucuz, I.; Bugday, B. The effect of physical activity on mother-child relationship and parental attitudes: A follow-up study examining the long-term effects of COVID-19. *Eur. Rev. Med. Pharmacol. Sci.* **2023**, *27*, 4299–4308.
43. Zhang, X.; Chen, H.C.; Zhang, G.F.; Zhou, B.F.; Wu, W. A longitudinal study of parent–child relationships and problem behaviors in early childhood: Transactional models. *Acta Psychol. Sin.* **2008**, *5*, 571–582. [CrossRef]
44. Goodman, R. The Strengths and Difficulties Questionnaire: A research note. *J. Child Psychol. Psychiatry* **1997**, *38*, 581–586. [CrossRef]
45. Aarø, L.E.; Davids, E.L.; Mathews, C.; Wubs, A.G.; Smith, O.R.F.; de Vries, P.J. Internalizing problems, externalizing problems, and prosocial behavior—Three dimensions of the strengths and difficulties questionnaire (SDQ): A study among South African adolescents. *Scand. J. Psychol.* **2022**, *63*, 415–425. [CrossRef]
46. Goodman, A.; Goodman, R. Strengths and Difficulties Questionnaire as a dimensional measure of child mental health. *J. Am. Acad. Child Adolesc. Psychiatry* **2009**, *48*, 400–403. [CrossRef]
47. Patel, J.; Smith, R.; O'Farrelly, C.; Iles, J.; Rosan, C.; Ryan, R.; Ramchandani, P. Assessing behavior in children aged 12-24 months using the Strengths and Difficulties Questionnaire. *Infancy* **2021**, *26*, 724–734. [CrossRef] [PubMed]
48. Maurice-Stam, H.; Haverman, L.; Splinter, A.; van Oers, H.A.; Schepers, S.A.; Grootenhuis, M.A. Dutch norms for the Strengths and Difficulties Questionnaire (SDQ)—Parent form for children aged 2–18 years. *Health Qual. Life Outcomes* **2018**, *16*, 123. [CrossRef] [PubMed]
49. Podsakoff, P.M.; MacKenzie, S.B.; Lee, J.Y.; Podsakoff, N.P. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **2003**, *88*, 879–903. [CrossRef] [PubMed]
50. Podsakoff, P.M.; Organ, D.W. Self-reports in organizational research: Problems and prospects. *J. Manag.* **1986**, *12*, 531–544. [CrossRef]
51. Tang, D.D.; Wen, Z.L. Statistical approaches for testing common method bias: Problems and suggestions. *J. Psychol. Sci.* **2020**, *43*, 215–223. [CrossRef]
52. Little, T.D.; Cunningham, W.A.; Shahar, G.; Widaman, K.F. To parcel or not to parcel: Exploring the question, weighing the merits. *Struct. Equ. Model.* **2002**, *9*, 151–173. [CrossRef]
53. Wu, Y.; Wen, Z.L. Item parceling strategies in structural equation modeling. *Adv. Psychol. Sci.* **2011**, *19*, 1859–1867.
54. Matsunaga, M. Item parceling in structural equation modeling: A primer. *Commun. Methods Meas.* **2008**, *2*, 260–293. [CrossRef]
55. Gu, J.J.; Wang, H.Z.; Xu, Y.; Zhan, P.P.; Wang, J.L. Childhood maltreatment, basic psychological needs satisfaction, internet addiction and internalizing problems. *J. Appl. Dev. Psychol.* **2023**, *86*, 101533. [CrossRef]
56. Lim, S.A. Longitudinal effect of social withdrawal on negative peer relations mediated by smartphone dependence among Korean early adolescents. *Int. J. Ment. Health Addict.* **2022**, 1–15. [CrossRef]
57. Kong, F.C.; Lan, N.N.; Zhang, H.B.; Sun, X.J.; Zhang, Y. How does social anxiety affect Mobile phone dependence in adolescents? The mediating role of self-concept clarity and self-esteem. *Curr. Psychol.* **2022**, *41*, 8070–8077. [CrossRef]
58. Coelho, V.A.; Marchante, M.; Romao, A.M. Adolescents' trajectories of social anxiety and social withdrawal: Are they influenced by traditional bullying and cyberbullying roles? *Contemp. Educ. Psychol.* **2022**, *69*, 102053. [CrossRef]
59. Grinberg, A.M.; Careaga, J.S.; Mehl, M.R.; O'Connor, M.F. Social engagement and user immersion in a socially based virtual world. *Comput. Hum. Behav.* **2014**, *36*, 479–486. [CrossRef]
60. Laato, S.; Rauti, S.; Islam, A.; Sutinen, E. Why playing augmented reality games feels meaningful to players? The roles of imagination and social experience. *Comput. Hum. Behav.* **2021**, *121*, 106816. [CrossRef]
61. Riddle, K.; Martins, N. A content analysis of American primetime television: A 20-year update of the national television violence studies. *J. Commun.* **2022**, *72*, 33–58. [CrossRef]
62. Macchioni, E.; Santoni, C. The youth on-line life: Risks, violence and support networks. *Int. Rev. Sociol.* **2022**, *32*, 463–482. [CrossRef]
63. Holtz, P.; Appel, M. Internet use and video gaming predict problem behavior in early adolescence. *J. Adolesc.* **2011**, *34*, 49–58. [CrossRef] [PubMed]
64. Lin, X.; Dong, G.; Wang, Q.; Du, X. Abnormal gray matter and white matter volume in 'Internet gaming addicts'. *Addict. Behav.* **2015**, *40*, 137–143. [CrossRef] [PubMed]
65. Axmacher, N.; Elger, C.E.; Fell, J. Working memory-related hippocampal deactivation interferes with long-term memory formation. *J. Neurosci.* **2009**, *29*, 1052–1960. [CrossRef]
66. Xiu, L.; Zhou, R.; Jiang, Y. Working memory training improves emotion regulation ability: Evidence from HRV. *Physiol. Behav.* **2016**, *155*, 25–29. [CrossRef] [PubMed]
67. Liu, J.W.; Bolland, J.M.; Dick, D.; Mustanski, B.; Kertes, D.A. Effect of environmental risk and externalizing comorbidity on internalizing problems among economically disadvantaged African American youth. *J. Res. Adolesc.* **2016**, *26*, 552–566. [CrossRef]
68. McDaniel, B.T.; Coyne, S.M. Technology interference in the parenting of young children: Implications for mothers' perceptions of coparenting. *Soc. Sci. J.* **2016**, *53*, 435–443. [CrossRef]

69. Luo, Q.; Liu, J.J.; Wang, J.D.; Tan, Y.W.; Cao, Y.R.; Kato, N. Automatic content inspection and forensics for children android apps. *IEEE Internet Things J.* **2020**, *7*, 7123–7134. [CrossRef]
70. Zhou, M.; Zhu, W.M.; Sun, X.T.; Huang, L. Internet addiction and child physical and mental health: Evidence from panel dataset in China. *J. Affect. Disord.* **2022**, *309*, 52–62. [CrossRef]
71. Hsieh, Y.P.; Shen, A.C.T.; Wei, H.S.; Feng, J.Y.; Huang, S.C.Y.; Hwa, H.L. Internet addiction: A closer look at multidimensional parenting practices and child mental health. *Cyberpsychol. Behav. Soc. Netw.* **2018**, *21*, 768–773. [CrossRef]
72. Leung, J.T.Y. Overparenting, parent–child conflict and anxiety among Chinese adolescents: A cross-lagged panel study. *Int. J. Environ. Res. Public Health* **2021**, *18*, 11887. [CrossRef]
73. Anicama, C.; Zhou, Q.; Ly, J. Parent involvement in school and Chinese American children's academic skills. *J. Educ. Res.* **2018**, *111*, 574–583. [CrossRef]
74. Dwairy, M.; Achoui, M.; Abouserie, R.; Farah, A.; Sakhleh, A.A.; Fayad, M.; Khan, H.K. Parenting styles in Arab societies—A first cross-regional research study. *J. Cross Cult. Psychol.* **2006**, *37*, 230–247. [CrossRef]
75. Martinez, I.; Garcia, J.F. Internalization of values and self-esteem among brazilian teenagers from authoritative, indulgent, authoritarian, and neglectful homes. *Adolescent* **2008**, *43*, 13–29.
76. Yu, J.; Widman, S.; Roque, R. Family Negotiation in Joint Media Engagement with Creative Computing. In Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems, Hamburg, Germany, 23–28 April 2023.
77. Kim, R.; Lee, K.J.; Choi, Y.J. Mobile phone overuse among elementary school students in Korea factors associated with mobile phone use as a behavior addiction. *J. Addict. Nurs.* **2015**, *26*, 81–85. [CrossRef] [PubMed]
78. Nikken, P.; Schols, M. How and why parents guide the media use of young children. *J. Child Fam. Stud.* **2015**, *24*, 3423–3435. [CrossRef]
79. Zhang, X.C. Education video games in China. *Multiling. Comput. Technol.* **2010**, *21*, 45–49.
80. Thompson, D.A.; Johnson, S.L.; Vandewater, E.A.; Schmiege, S.J.; Boles, R.E.; Lev, J.; Tschann, J.M. Parenting and preschooler TV viewing in low-income Mexican Americans: Development of the parenting practices regarding TV viewing (PPRTV) Scale. *J. Dev. Behav. Pediatr.* **2016**, *37*, 465–474. [CrossRef] [PubMed]
81. Halpin, S.; Mitchell, A.E.; Baker, S.; Morawska, A. Parenting and child behaviour barriers to managing screen time with young children. *J. Child Fam. Stud.* **2021**, *30*, 824–838. [CrossRef]
82. Lyons-Ruth, K.; Pechtel, P.; Yoon, S.A.; Anderson, C.M.; Teicher, M.H. Disorganized attachment in infancy predicts greater amygdala volume in adulthood. *Behav. Brain Res.* **2016**, *308*, 83–93. [CrossRef]
83. Belsky, J.; de Haan, M. Annual Research Review: Parenting and children's brain development: The end of the beginning. *J. Child Psychol. Psychiatry* **2011**, *52*, 409–428. [CrossRef] [PubMed]
84. Lollis, S.; Kuczynski, L. Beyond one hand clapping: Seeing bidirectionality in parent–child relations. *J. Soc. Pers. Relat.* **1997**, *14*, 441–461. [CrossRef]
85. Walsh, G.; Zadurian, N. Exploring the links between parental attachment style, child temperament and parent–child relationship quality during adolescence. *J. Child Fam. Stud.* **2022**, 1–16. [CrossRef]
86. Meeus, W. Adolescent psychosocial development: A review of longitudinal models and research. *Dev. Psychol.* **2016**, *52*, 1969–1993. [CrossRef]
87. Baudat, S.; Van Petegem, S.; Antonietti, J.P.; Zimmermann, G. Parental solicitation and adolescents' information management: The moderating role of autonomy-supportive parenting. *J. Child Fam. Stud.* **2020**, *29*, 426–441. [CrossRef]
88. Marcone, R.; Affuso, G.; Borrone, A. Parenting styles and children's internalizing-externalizing behavior: The mediating role of behavioral regulation. *Curr. Psychol.* **2020**, *39*, 13–24. [CrossRef]
89. Hargreaves, E.; Buchanan, D.; Quick, L. "Look at them! They all have friends and not me": The role of peer relationships in schooling from the perspective of primary children designated as "lower-attaining". *Educ. Rev.* **2022**, *74*, 1224–1242. [CrossRef]
90. Carollo, A.; Chai, W.Y.; Halstead, E.; Dimitriou, D.; Esposito, G. An exploratory analysis of the effect of demographic features on sleeping patterns and academic stress in adolescents in China. *Int. J. Environ. Res. Public Health* **2022**, *19*, 7032. [CrossRef]
91. Fu, Y.; Ren, W.T.; Liang, Z.R. Perceived academic stress and depressive symptoms among Chinese adolescents: A moderated mediation analysis of overweight status. *J. Affect. Disord.* **2022**, *296*, 224–232. [CrossRef]
92. Man, X.O.; Liu, J.T.; Bai, Y.T. The influence of discrepancies between parents' educational aspirations and children's educational expectations on depressive symptoms of left-behind children in rural China: The mediating role of self-efficacy. *Int. J. Environ. Res. Public Health* **2021**, *18*, 11713. [CrossRef]
93. Nishikawa, S.; Fujisawa, T.X.; Kojima, M.; Tomoda, A. Type and timing of negative life events are associated with adolescent depression. *Front. Psychiatry* **2018**, *9*, 41. [CrossRef] [PubMed]

behavioral sciences

MDPI

Article

Developing a Short-Form Buss–Warren Aggression Questionnaire Based on Machine Learning

Xiuyu Jiang, Yitian Yang and Junyi Li *

College of Psychology, Sichuan Normal University, Chengdu 610066, China; mrjiangxiuyu@outlook.com (X.J.); yyt200011@163.com (Y.Y.)
* Correspondence: junyili@sicnu.edu.cn

Abstract: For adolescents, high levels of aggression are often associated with suicide, physical injury, worsened academic performance, and crime. Therefore, there is a need for the early identification of and intervention for highly aggressive adolescents. The Buss–Warren Aggression Questionnaire (BWAQ) is one of the most widely used offensive measurement tools. It consists of 34 items, and the longer the scale, the more likely participants are to make an insufficient effort response (IER), which reduces the credibility of the results and increases the cost of implementation. This study aimed to develop a shorter BWAQ using machine learning (ML) techniques to reduce the frequency of IER and simultaneously decrease implementation costs. First, an initial version of the short-form questionnaire was created using stepwise regression and an ANOVA F-test. Then, a machine learning algorithm was used to create the optimal short-form questionnaire (BWAQ-ML). Finally, the reliability and validity of the optimal short-form questionnaire were tested using independent samples. The BWAQ-ML contains only four items, thirty items less than the BWAQ, and its AUC, accuracy, recall, precision, and F1 score are 0.85, 0.85, 0.89, 0.83, and 0.86, respectively. BWAQ-ML has a Cronbach's alpha of 0.84, a correlation with RPQ of 0.514, and a correlation with PTM of −0.042, suggesting good measurement performance. The BWAQ-ML can effectively measure individual aggression, and its smaller number of items improves the measurement efficiency for large samples and reduces the frequency of IER occurrence. It can be used as a convenient tool for early adolescent aggression identification and intervention.

Keywords: aggression questionnaire; machine learning; short-form questionnaire; adolescents

Citation: Jiang, X.; Yang, Y.; Li, J. Developing a Short-Form Buss–Warren Aggression Questionnaire Based on Machine Learning. *Behav. Sci.* **2023**, *13*, 799. https://doi.org/10.3390/bs13100799

Academic Editor: Scott D. Lane

Received: 29 July 2023
Revised: 20 September 2023
Accepted: 25 September 2023
Published: 26 September 2023

1. Introduction

1.1. Negative Effects of High Aggressiveness

Aggressive behavior is prevalent in children and adolescents. In a survey of approximately 15,000 middle school students in China, the detection rate of highly aggressive adolescents was 23.5% [1]; in a survey of approximately 80,000 middle school students in the United States, 18.8% of adolescents reported committing aggressive acts, and 20.1% of adolescents reported having been assaulted [2]. Additionally, highly aggressive individuals are more likely to maintain a high level of aggression. A short-term longitudinal study found that 87.4% of adolescents were still highly aggressive one year later compared to 52.3% of low-aggressive adolescents [3]. Aggressive behavior has many negative effects. High aggression can lead to physical injuries to others, with 700,000 adolescents (10–24 years old) in the United States alone being treated in hospitals for injuries from aggressive behavior in 2011 [4]. In addition, aggression is a potential risk factor for non-suicidal self-injury [5] and is positively associated with suicidal behavior [6,7]. Highly aggressive adolescents are more likely to commit crimes [8], and academic performance among them is worse [9–11]. Therefore, the efficient identification of highly aggressive adolescents and providing comprehensive interventions for aggressive adolescents are essential for reducing social risk and maintaining mental health.

1.2. Limitations of Buss–Warren Aggression Questionnaire

The Buss–Warren Aggression Questionnaire, which was developed based on the Buss–Perry Aggression Questionnaire (BPAQ) and contains a comparatively more concise and more transparent formulation of questions [12,13], is one of the most widely used instruments for measuring and rating aggression, and it has good psychometric properties [6,14]. However, the BWAQ consists of 34 items, and participants must exert a certain degree of effort to complete all of the items. In practice, participants do not answer every question carefully [15]. The incidence of insufficient effort response (IER) ranges up to 30% in all types of surveys [16]. As the length of the questionnaire increases, the proportion of participants seriously completing the questionnaire decreases, and the later the item, the worse the quality of the responses [17]. Therefore, the longer the questionnaire is, the more likely it is to result in more low-quality responses and lower questionnaire completion rates, making results less accurate. Failure to deal with this appropriately can adversely affect the veracity of study results [18]. An effective means of reducing IER is to reduce the length of the questionnaire; this is an ex ante control method that reduces the perceived difficulty of the task for participants, thereby reducing the frequency of IER [16]. Although shorter versions of the Aggression Questionnaire exist, such as the BPAQ-12 and BWAQ-15 [19,20], both shorter versions of the questionnaire have more than ten items and still require some effort for participants to complete. In addition, organizing and completing a large-scale measurement will inevitably consume many human and material resources for teachers, clinicians, and researchers, which may hamper research efforts. Therefore, it is necessary to use appropriate methods to streamline the questionnaire as much as possible while ensuring its performance. A streamlined questionnaire reduces IER and research costs, improves measurement efficiency, and enables the researcher to measure more variables simultaneously in one administration.

1.3. Developing Short Versions of Questionnaires Using Machine Learning

A common method researchers use in adapting and simplifying psychometric instruments is exploratory factor analysis, but this method requires items to be retained for each dimension of the questionnaire. Therefore, making psychometric instruments more streamlined via traditional methods is challenging. In recent years, some researchers have applied machine learning techniques to the study of simplifying psychometric tools. Machine learning belongs to the field of artificial intelligence, which can use the patterns learned from training data in the prediction of new data, and it is a reliable data analysis technique that can make the questionnaire simplification research free from the constraints of dimensions. An increasing number of studies have used machine learning techniques to simplify psychometric instruments, but they are mainly focused on clinical psychological assessment [21]. Wang reduced the Berg Balance Scale from 14 to 6 items based on machine learning techniques, with a 57% reduction in the number of items [22]. The R^2 of the short version of the questionnaire was more significant than 0.96, and the LoAs were less than 95%, indicating good recognition performance. Lee used six machine learning algorithms to reduce the Insomnia Severity Index (which contains seven items) and Epworth Sleepiness Scale (which contains eight items) to a six-item short-form questionnaire, with a 60% reduction in the number of items, and accuracy reached 0.93 [23]. Orrù reduced the Structured Inventory of Malingered Symptomatology (which includes 75 items) to a 21-item short-form version, reporting a 72% reduction in the number of items and retaining 92% of the variance of the original scale [24]. Morrison reduced the Cognitive Distortions Questionnaire (which involves 15 items) into a 5-item ultrashort version, which was reduced by 67% from the original questionnaire, with an R^2 of between 78.2 and 85.5% [25]. Lin reduced the Fugl-Meyer motor scale (which contains 50 items) into a short version of 10 items, a reduction of 80% in number, with Pearson's correlation coefficient (r) ranging between 0.88 and 0.98 with the original measurement tool [26]. Machine learning techniques are a reliable method capable of simplifying psychometric instruments. However, past studies have primarily used R^2 as performance indicators and have not explored the

cutoff of short-form questionnaires. Machine learning classification algorithms can provide performance indicators such as AUC, accuracy, recall, precision, and F1 Score, which can help researchers to assess the optimal cutoff for short-form scales.

Therefore, this study proposes simplifying the BWAQ through the use of machine learning classification algorithms to develop a more streamlined short-form aggression questionnaire with an explicit cutoff to improve the efficiency of examining adolescent aggression and provide teachers, clinicians, and researchers with a more convenient tool.

2. Materials and Methods

2.1. Participants

Before the beginning of the survey, the investigator informed the participants that the purpose of the study was to understand the current situation of adolescents, that there are no right or wrong answers, that the results of the survey will be used only for scientific research, that the questionnaire was collected anonymously, and that the data were to be treated with strict confidentiality. The study was ethically approved by the Ethics Committee of Sichuan Normal University on 15 March 2023 (No. 2023LS029).

The participants were 796 middle school students. The sample was divided into two parts, namely simplification samples, which were used to simplify the BWAQ, and validation samples, which were used to validate the short-form BWAQ. There were 340 middle school students in the simplification samples, with a mean age of 14.83 $\pm$ 1.57 years. There were 200 female students, accounting for 58.8% of the simplification samples. The number of students categorized as highly aggressive by the BWAQ was 175 (or 51.5%). Seventh, eighth, tenth, and eleventh graders comprised 84, 75, 113, and 68 students, or 24.7%, 22.1%, 33.2%, and 20%, respectively. Validation samples comprised 456 middle school students with a mean age of 15.3 $\pm$ 1.3 years. There were 265 females, comprising 58.1% of the validation sample, and 236 students, i.e., 51.8% of the validation sample, whom the BWAQ-ML categorized as having highly aggressive tendencies. The percentages of grades 8 through 12 of the validation sample were 37.9%, 2.9%, 36.4%, 21.7%, and 1.1%, respectively.

2.2. Measurements

The BWAQ has 34 items belonging to the following five dimensions: physical aggression, verbal aggression, hostility, anger, and indirect aggression. The scale consists of 5 points, with "1" indicating "not at all like me" and "5" indicating "completely like me", with higher scores indicating higher levels of aggression. Maxwell revised the Chinese version of the BWAQ [27], based on which Zhang developed the standard BWAQ for students aged 12 to 18 years old, with total scores of 89 and above potentially indicating highly aggressive behavior [28,29].

The validity scale adopted for this study used the Reactive–Proactive Aggression Questionnaire (RPQ) developed by Raine [30]. The RPQ is divided into two dimensions: reactive aggression (which includes 11 items) and proactive aggression (which includes 12 items). It is scored on a 3-point scale: 0 for never, 1 for sometimes, and 2 for often. Higher total RPQ scores indicate higher levels of aggression. The RPQ has good psychometric properties in mainland China [31–33].

Carlo and Randall developed the Prosocial Tendencies Measure (PTM) to measure individuals' prosocial tendencies [34], and we used the PTM to test the discriminant validity of the short-form scale. The PTM consists of 23 items and is scored on a 5-point, with "1" meaning "not at all like me" and "5" meaning "completely like me". Higher total PTM scores indicate higher prosocial tendencies. The PTM has good psychometric properties in mainland China [35].

2.3. Statistical Analysis

We analyzed data using Python 3.9 in PyCharm 2023.1.2 (Community Edition). The whole process was divided into two phases: simplification and validation. In the simplification phase, the simplification sample is randomly divided into a training set (80%

simplification sample) that has been used for feature selection and model training and a test set (20% simplification sample) to evaluate the model's performance. The first step is feature selection. The initial version of the short-form BWAQ was created by analyzing the training set using stepwise regression and an ANOVA F-test to extract the items that contribute most to the questionnaire results (i.e., the most important features) [36,37]. The second step is machine learning modeling. The initial version of the short-form BWAQ was modeled by classification algorithms, including a Logistic Regression (LR) algorithm, a Support Vector Machine (SVM), a Random Forest (RF) algorithm, and a Naïve Bayes (NB) algorithm [38,39]. Then, the short-form BWAQ was evaluated according to the model's AUC, accuracy, recall, and precision performance to construct the optimal short-form questionnaire. The third step is to determine the cutoff. We calculated AUC, accuracy, recall, precision, and F1 scores based on the confusion matrix under different cutoff conditions to specify the cutoff of BWAQ-ML. The cutoff is the minimum score at which a participant is categorized as highly aggressive. During the validation phase, we verified the reliability and validity of BWAQ-ML using validation samples, and we tested the reliability of the BWAQ-ML as a streamlined version of the BWAQ using RPQ and PTM.

The specifics of the evaluation metrics for the machine learning models are described below:

(1) The horizontal axis of the ROC curve is the False Positive Rate, and the vertical axis is the True Positive Rate. AUC is the area under the ROC curve; its value ranges from 0 to 1. The closer the AUC is to 1, the more correctly the model can distinguish between positive and negative cases. The calculation method of AUC considers both the classification ability of the classifier for positive and negative cases. It is still able to make a reasonable evaluation of the classifier in cases of sample imbalance. Therefore, AUC can be regarded as the primary index for evaluating the classification ability of a model [38].

(2) Accuracy indicates the proportion of the whole dataset that a model correctly classifies. Accuracy has the advantage of being easy to understand and facilitates communication for non-technical people, but accuracy may not be effective enough in unbalanced datasets. For example, a model will be highly accurate in a dataset with far more negative than positive cases, even if it classifies all the data as negative. Therefore, other metrics are often calculated when evaluating the performance of a machine learning model [38].

(3) Recall, also known as True Positive Rate, indicates the percentage of positive case samples that the model correctly predicts. A higher recall indicates that the model can better identify positive case samples but may also result in more false positive cases [38].

(4) Precision measures the proportion of samples predicted by the model to be positive cases that are true positive cases. Precision concerns how many of the model's predictions of positive examples are correct. Thus, recall and precision are complementary [38].

(5) The F1 score is the weighted average of recall and precision. In cases where both recall and precision need to be taken into account, the closer the F1 score is to 1, the better balance the model achieves between recall and precision, and the model's comprehensive performance is better [38].

3. Results

3.1. Simplifying BWAQ

We determined the initial version of the short-form questionnaire using stepwise regression and an ANOVA F-test. At a significance level of 0.01, stepwise regression identified the eight most important features, which (in descending order of importance) were items 29, 14, 21, 18, 7, 30, 1, and 23 of the BWAQ. The ANOVA F-test ranked the importance of the features differently than the stepwise regression (Table 1). In the ANOVA F-test, the larger the F-value of a feature is, the higher its correlation with the outcome,

and the *p*-value is the significance level of this correlation. Overall, 32 of all of the 34 items have a significance level below 0.001, and the top 25% are the most important features according to our collected F-values, and they are (in descending order) items 29, 7, 21, 9, 12, 5, 33, and 14 of the BWAQ. Stepwise regression and the ANOVA F-test each identified eight short-form questionnaires of different lengths (one to eight items), resulting in sixteen initial short-form questionnaires. These initial questionnaires were named after the algorithms and the number of items they contained. For example, AF-4 is the short-form questionnaire consisting of the first four items of the eight items identified using the ANOVA F-test. In comparison, SR-8 is the short-form questionnaire consisting of all eight items of the eight items identified using stepwise regression.

Table 1. Ranking of feature importance using ANOVA F-tests.

Item Number of BWAQ	F-Value	*p*-Value
29	144.42	0.000
7	139.02	0.000
21	121.43	0.000
9	113.42	0.000
12	111.52	0.000
5	107.33	0.000
33	107.04	0.000
14	101.99	0.000
32	95.03	0.000
31	89.48	0.000
22	85.48	0.000
23	78.79	0.000
11	76.98	0.000
17	74.72	0.000
13	67.59	0.000
30	65.80	0.000
16	65.04	0.000
20	61.14	0.000
8	57.78	0.000
1	57.73	0.000
4	55.79	0.000
10	55.43	0.000
34	53.03	0.000
6	53.00	0.000
15	47.13	0.000
2	46.40	0.000
3	45.77	0.000
18	43.27	0.000
25	43.24	0.000
27	40.16	0.000
24	36.40	0.000
28	19.15	0.000
26	6.53	0.011
19	4.53	0.034

The modeling results of the 16 initial short-form questionnaires generated via a Logistic Regression, Support Vector Machine, Random Forest algorithm, and Naïve Bayes algorithm showed that the AUC of all models ranged from 0.72 to 0.98 (Table 2), indicating that all the initial short-form questionnaires are effective in recognizing individual aggression. In general, the trained machine learning models perform better on the training set than the test set, and the smaller the difference in AUC between the models on the training set and the test set, the more stable their performance is and the closer their prediction results are to the actual results. We further compared the differences in the AUC of different algorithms on training and test data (Figure 1) and found that the AUC of the Random Forest algorithm is the most stable among all algorithms, making it more suitable for subsequent analyses.

Table 2. AUC of machine learning algorithms on initial version of short-form questionnaires.

Questionnaire	Logistics Regression		Support Vector Machine		Random Forest		Naïve Bayes	
	Train	Test	Train	Test	Train	Test	Train	Test
SR-1	0.83	0.72	0.83	0.72	0.83	0.72	0.83	0.72
SR-2	0.90	0.79	0.90	0.82	0.87	0.83	0.89	0.79
SR-3	0.93	0.83	0.92	0.83	0.87	0.81	0.92	0.83
SR-4	0.94	0.84	0.94	0.84	0.90	0.82	0.93	0.83
SR-5	0.95	0.86	0.95	0.87	0.92	0.87	0.94	0.85
SR-6	0.97	0.89	0.97	0.88	0.94	0.88	0.96	0.87
SR-7	0.98	0.91	0.98	0.91	0.95	0.87	0.97	0.89
SR-8	0.98	0.93	0.98	0.93	0.95	0.89	0.97	0.91
AF-1	0.83	0.72	0.83	0.72	0.83	0.72	0.83	0.72
AF-2	0.88	0.78	0.89	0.78	0.86	0.82	0.89	0.78
AF-3	0.93	0.81	0.92	0.80	0.85	0.79	0.93	0.80
AF-4	0.94	0.82	0.94	0.83	0.89	0.86	0.95	0.81
AF-5	0.95	0.85	0.95	0.85	0.90	0.88	0.95	0.85
AF-6	0.95	0.85	0.95	0.85	0.90	0.86	0.95	0.85
AF-7	0.95	0.87	0.96	0.87	0.93	0.91	0.95	0.86
AF-8	0.96	0.90	0.96	0.90	0.93	0.90	0.96	0.89

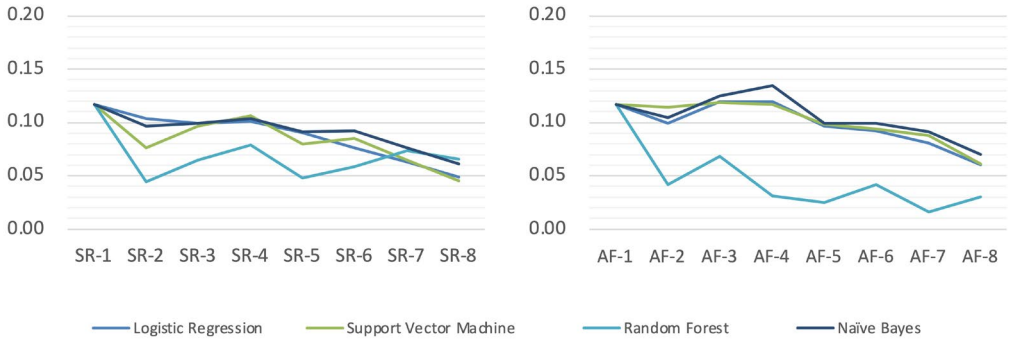

Figure 1. AUC differences between machine learning algorithms on training and test sets.

As can be seen in Table 3, among the sixteen initial versions of the short-form questionnaire models in Random Forest, there are three short-form questionnaires with AUC, accuracy, recall, and precision values above 0.8, namely SR-5, AF-4, and AF-8 (Table 3). AF-4 has 50% fewer items than AF-8; AUC, accuracy, and precision have decreased by 4%, 1%, and 4%, respectively, and recall has increased by 3%. AF-4 has 20% fewer items than SR-5, 1% less AUC, and the same accuracy, recall, and precision. In contrast, AF-4 reduced the number of items by 20–50%, but the performance indicator changed by only 1–5%, and there was a high correlation with BWAQ (Pearson's correlation = 0.85; $p < 0.001$).

AF-4 includes four items, and its cutoff ranges from 4 to 20. We calculated the evaluation metrics corresponding to each cutoff according to the confuse matrix (Table 4). As the cutoff increases, AUC and accuracy first increase and then decrease; recall decreases from 1 to 0.04, and precision increases from 0.52 to 1 (Figure 2). When the cutoff of the AF-4 is changed, the relationship between recall and precision becomes a trade-off relationship. Therefore, the performance of the questionnaire under a particular cutoff condition cannot be judged by either recall or precision alone; both recall and precision are essential and need to be considered. Therefore, to better estimate the cutoff, it is necessary to calculate the F1 score, which is the harmonic mean of recall and precision, to estimate the optimal cutoff for the AF-4 (Table 4). Comparing the AF-4 under 17 cutoff conditions, AF-4 has the best AUC, accuracy, and F1 score when the cutoff is 11. Therefore, the optimal short-form version of BWAQ based on the machine learning algorithm is AF-4 with a cutoff of 11, which we named BWAQ-ML.

Table 3. Performance of the initial version of short-form questionnaires based on Random Forest.

Questionnaire	AUC	Accuracy	Recall	Precision
SR-1	0.72	0.77	0.85	0.77
SR-2	0.83	0.77	0.85	0.77
SR-3	0.81	0.72	0.80	0.74
SR-4	0.82	0.75	0.78	0.80
SR-5	0.87	0.81	0.83	0.85
SR-6	0.88	0.79	0.78	0.86
SR-7	0.87	0.81	0.78	0.89
SR-8	0.89	0.79	0.75	0.88
AF-1	0.72	0.77	0.85	0.77
AF-2	0.82	0.75	0.75	0.81
AF-3	0.79	0.75	0.78	0.80
AF-4	0.86	0.81	0.83	0.85
AF-5	0.88	0.77	0.75	0.83
AF-6	0.86	0.77	0.75	0.83
AF-7	0.91	0.81	0.78	0.89
AF-8	0.90	0.82	0.80	0.89

Table 4. Evaluation metrics for different cutoffs of AF-4.

Cutoff	AUC	Accuracy	Recall	Precision	F1 Score
4	0.50	0.52	1.00	0.52	0.68
5	0.56	0.57	1.00	0.55	0.71
6	0.59	0.60	1.00	0.57	0.72
7	0.63	0.64	1.00	0.59	0.74
8	0.68	0.69	1.00	0.62	0.77
9	0.75	0.75	0.97	0.68	0.80
10	0.82	0.83	0.94	0.77	0.85
11	0.85	0.85	0.89	0.83	0.86
12	0.84	0.84	0.81	0.87	0.84
13	0.79	0.79	0.65	0.91	0.76
14	0.75	0.74	0.55	0.91	0.69
15	0.69	0.68	0.40	0.96	0.56
16	0.61	0.60	0.23	0.93	0.37
17	0.57	0.56	0.14	1.00	0.24
18	0.55	0.54	0.11	1.00	0.20
19	0.54	0.52	0.07	1.00	0.14
20	0.52	0.51	0.04	1.00	0.08

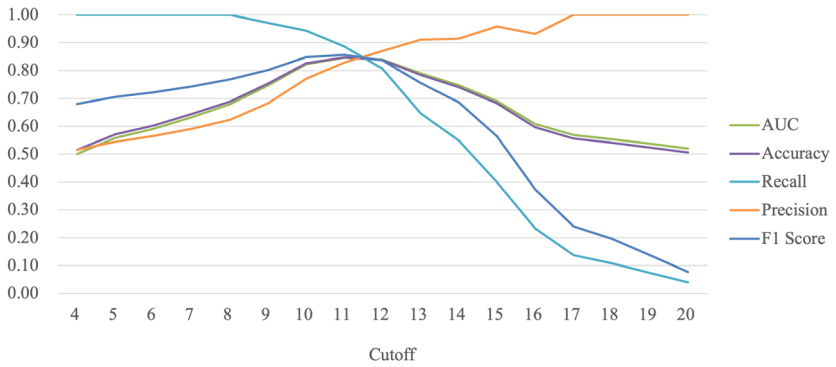

Figure 2. Trend of the evaluation metrics with cutoff.

3.2. Validating BWAQ

Cronbach's alpha for the BWAQ-ML, RPQ, and PTM were 0.84, 0.83, and 0.93, respectively, and Pearson's correlation for the BWAQ-ML with the RPQ and PTM was 0.514

($p < 0.001$) and -0.042 ($p = 0.375$), respectively, indicating that the BWAQ-ML can effectively measure individual aggression. We labeled samples scoring in the top 50% on the RPQ as high aggression and those scoring in the bottom 50% as low aggression. Comparing the classification results of the BWAQ-ML and the RPQ, the degree of overlap was 71%, indicating that the content measured by the BWAQ-ML was consistent with that of the RPQ. There was a significant positive correlation between the items of the BWAQ-ML, with correlation coefficients ranging from 0.469 to 0.621; there was a significant positive correlation between the items and the total score, with correlation coefficients ranging from 0.618 to 0.730 (Table 5), which indicates good differentiation between the items.

Table 5. Correlation matrix for each item and total of BWAQ-ML.

	BWAQ-ML_1	BWAQ-ML_2	BWAQ-ML_3	BWAQ-ML_4	BWAQ-ML_Total
BWAQ-ML_1	1				
BWAQ-ML_2	0.579 **	1			
BWAQ-ML_3	0.469 **	0.547 **	1		
BWAQ-ML_4	0.609 **	0.621 **	0.609 **	1	
BWAQ-ML_Total	0.618 **	0.702 **	0.677 **	0.730 **	1

Note: ** Correlation is significant at the 0.01 level (two-tailed).

4. Discussion

The number of items in the BWAQ-ML is only 12% of the BWAQ but retains 85% of the AUC and accuracy, 89% of the recall, and 83% of the precision of the full version of the questionnaire. In other words, the BWAQ-ML, despite having an 88% reduction in the number of items, can identify 89% of the cases classified by the BWAQ as high aggression. The internal consistency coefficient of the short version of the questionnaire was 0.84, which was significantly positively correlated with the RPQ, and its categorization results reached a 71% overlap with the RPQ, with no significant correlation with the PTM, which indicated that the BWAQ-ML had good reliability and validity. Overall, the BWAQ-ML, which contains only four items, has sufficient validity as a condensed version of the BWAQ.

Previous studies have used regression algorithms to develop a shortened version of the scale without a cutoff (or call it a threshold) [22,24–26], making it difficult for teachers and clinicians to categorize participants as positive or negative cases based on the shortened version of the scale alone. In contrast, the BWAQ-ML is a shortened version of the BWAQ that has been developed based on machine learning classification algorithms with an explicit cutoff, and the results that can be derived from its use are easier to understand and interpret. In practice measurements, teachers and clinicians can quickly identify positive examples from the survey sample (i.e., individuals with a BWAQ-ML score of no less than 11). Therefore, for teachers and clinicians, the BWAQ-ML dramatically improves the test's efficiency and makes screening for highly aggressive individuals easy to administer. The BWAQ-ML helps identify highly aggressive youths early and focuses more resources on those who need further attention through interventions that can reduce the risk of academic underachievement, violent victimization, delinquency, suicide, and self-injury.

As the length of the questionnaire increases, participants experience IER due to carelessness or a lack of effort [15], and the more complex the items, the more likely they are to experience IER [17], which can adversely affect the credibility of the study results [18]. The percentage of participants experiencing IER while completing the questionnaire can be up to 30% [16]. Therefore, the questionnaire should not be too long. The BWAQ-ML contains only four items, and the time required for participants to complete all the items is no more than 1 min, which significantly reduces the perceived difficulty of the participants in completing the questionnaire, improves the completion rate and credibility of the questionnaire responses, and reduces the likelihood of the emergence of IER. In addition, by using the short-form questionnaire, the researcher could also measure more variables at once during the administration process. If necessary, the researcher can obtain the results quickly via oral calculation on the spot, which is easy and minimizes the risk of errors. For researchers, the BWAQ-ML (4-item) has two advantages over the BWAQ (34-item ques-

tionnaire): Firstly, respondents will be less likely to experience IER while completing the BWAQ-ML. Secondly, the researcher can administer more scales while ensuring accuracy, which could help to improve the efficiency of studies. In addition, the data output from the BWAQ-ML can be either categorical or continuous, which also meets different needs in the data analysis process.

The BWAQ contains five aggressive behavioral manifestations: physical aggression, verbal aggression, hostility, anger, and indirect aggression [13]. The first two items of the BWAQ-ML belong to the anger dimension, and the last two belong to the hostility dimension. The positive correlation between hostility and suicide is more significant than the other dimensions [6,40]. Therefore, the short-form questionnaire may be more conducive to detecting highly aggressive individuals with suicidal tendencies. In addition, since these four items do not directly ask participants about the frequency of aggression, they reduce the social desirability of participants, which would facilitate the investigator's early identification of high-risk individuals for comprehensive intervention.

This study has the following limitations. First, the BWAQ-ML is simplified based on the BWAQ, so the performance of the short-form questionnaire relies on the original questionnaire. Second, the mean score of the BWAQ's norm for adolescents aged 12 to 18 ranged from 61 to 79, but the mean score for the simplification samples in this study was 90. There are two possible reasons for the higher mean score: (1) the urban norms were developed 12 years ago (2011); (2) this study was at the end of the secondary school year when the sample was administered, and exam pressure may have influenced subjects' scores on the BWAQ. Third, although Random Forest, which has a more stable AUC, is used as a reliable algorithm in the simplification phase, it is still possible that the machine learning algorithm may be overfitted due to the small sample size, affecting the results. Fourth, the BWAQ-ML has only four items, which is unsuitable for embedding recognition scales in the questionnaire for the recognition of IER. In summary, it is recommended that future studies validate the BWAQ-ML using a larger sample.

5. Conclusions

The BWAQ-ML contains four items, each with a score range of 1 to 5, and respondents are categorized as highly aggressive when they score 11 and above. The number of items in the BWAQ-ML is 12% of the BWAQ, and its predictive performance reaches 83-89% (AUC = 0.85, accuracy = 0.85, recall = 0.89, precision = 0.83) of the BWAQ. Validation analyses using independent samples indicate that the BWAQ-ML has good reliability (Cronbach's alpha = 0.84) and validity (correlation with RPQ is 0.514, $p < 0.001$; correlation with PTM is -0.042, $p = 0.375$). In other words, the BWAQ-ML, as a streamlined version of the BWAQ, substantially reduces the number of items and has better measurement performance.

The applications of the BWAQ-ML are promising. Firstly, aggressive adolescents are at risk of academic failure, physical injury, delinquency, suicide, and self-harm, and the BWAQ-ML makes the measurement of aggression easy to administer, which can help to identify highly aggressive adolescents at an early stage, increasing the potential for intervention. Secondly, reducing the length of the questionnaire is an effective means of reducing IER [16], and the BWAQ-ML, which contains only four items, reduces the frequency of IER among participants. In addition, its streamlined nature allows researchers to measure more variables while ensuring accuracy, which could help to improve the efficiency of studies. Third, the BWAQ-ML has clear thresholds that measure aggression as simple and easy to understand and interpret, reducing the workload of clinical workers and teachers, saving costs, and making measuring aggression more efficient.

The BWAQ-ML is a streamlined version of the BWAQ that can be used to measure adolescent aggression effectively. The items of BWAQ-ML are as follows:

(1) At times I feel like a bomb ready to explode.
(2) At times I get very angry for no good reason.
(3) I sometimes feel that people are laughing at me behind my back.
(4) I wonder why sometimes I feel so bitter about things.

Author Contributions: Conceptualization, J.L. and X.J.; methodology, X.J.; software, X.J.; validation, J.L., X.J. and Y.Y.; formal analysis, X.J.; investigation, Y.Y.; resources, Y.Y.; data curation, X.J.; writing—original draft preparation, X.J.; writing—review and editing, J.L.; visualization, X.J.; supervision, J.L.; project administration, J.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research study was funded by the Institute of Psychology, CAS (grant number GJ202011), Chengdu Office of Philosophy and Social Science (grant number 2022CZ083), and Sichuan Provincial Center for Educational Informationization and Big Data (grant number DSJ2022050).

Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of Sichuan Normal University (2023LS029).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are openly available in OSF Registries at https://osf.io/znr46/ (accessed on 29 July 2023).

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Ma, Y.; Jiao, T.; Guo, S.; Tang, J. Association of aggression and social support among adolescents. *Chin. J. Sch. Health* **2022**, *43*, 671–675. [CrossRef]
2. Carlyle, K.E.; Steinman, K.J. Demographic Differences in the Prevalence, Co-Occurrence, and Correlates of Adolescent Bullying at School. *J. Sch. Health* **2007**, *77*, 623–629. [CrossRef] [PubMed]
3. Wu, P.; Liu, H.; Chen, J.; Xie, J. The Transition of Aggressive Patterns among Youth: An Application of Latent Transition Analysis. *J. Psychol. Sci.* **2014**, *37*, 1167–1173. [CrossRef]
4. Schlomer, G.L.; Cleveland, H.H.; Vandenbergh, D.J.; Feinberg, M.E.; Neiderhiser, J.M.; Greenberg, M.T.; Spoth, R.; Redmond, C. Developmental Differences in Early Adolescent Aggression: A Gene × Environment × Intervention Analysis. *J. Youth Adolesc.* **2015**, *44*, 581–597. [CrossRef] [PubMed]
5. Tang, J.; Ma, Y.; Guo, Y.; Ahmed, N.I.; Yu, Y.; Wang, J. Association of Aggression and Non-Suicidal Self Injury: A School-Based Sample of Adolescents. *PLoS ONE* **2013**, *8*, e78149. [CrossRef] [PubMed]
6. Peng, C.; Guo, T.; Cheng, J.; Wang, M.; Tan, Y.; Rong, F.; Kang, C.; Ding, H.; Wang, Y.; Yu, Y. Association between childhood physical abuse and suicidal behaviors among Chinese adolescents: The mediation of aggression. *J. Affect. Disord.* **2022**, *318*, 338–346. [CrossRef]
7. Zhang, Y.; Wu, C.; Yuan, S.; Xiang, J.; Hao, W.; Yu, Y. Association of aggression and suicide behaviors: A school-based sample of rural Chinese adolescents. *J. Affect. Disord.* **2018**, *239*, 295–302. [CrossRef]
8. Preddy, T.M.; Fite, P.J. Differential Associations Between Relational and Overt Aggression and Children's Psychosocial Adjustment. *J. Psychopathol. Behav. Assess.* **2012**, *34*, 182–190. [CrossRef]
9. Vuoksimaa, E.; Rose, R.J.; Pulkkinen, L.; Palviainen, T.; Rimfeld, K.; Lundström, S.; Bartels, M.; van Beijsterveldt, C.; Hendriks, A.; de Zeeuw, E.L.; et al. Higher aggression is related to poorer academic performance in compulsory education. *J. Child Psychol. Psychiatry* **2021**, *62*, 327–338. [CrossRef]
10. Fite, P.J.; Hendrickson, M.; Rubens, S.L.; Gabrielli, J.; Evans, S. The Role of Peer Rejection in the Link between Reactive Aggression and Academic Performance. *Child Youth Care Forum* **2013**, *42*, 193–205. [CrossRef]
11. Muñoz Reyes, J.A.; Guerra, R.; Polo, P.; Cavieres, E.; Pita, M.; Turiégano, E. Using an evolutionary perspective to understand the relationship between physical aggression and academic performance in late adolescents. *J. Sch. Violence* **2019**, *18*, 39–48. [CrossRef]
12. Buss, A.H.; Perry, M. The Aggression Questionnaire. *J. Personal. Soc. Psychol.* **1992**, *63*, 452–459. [CrossRef] [PubMed]
13. Buss, A.H.; Warren, W.L. *The Aggression Questionnaire Manual*; Western Psychological Services: Los Angeles, CA, USA, 2000.
14. Huang, J.; Tang, J.; Tang, L.; Chang, H.J.; Ma, Y.; Yan, Q.; Yu, Y. Aggression and related stressful life events among Chinese adolescents living in rural areas: A cross-sectional study. *J. Affect. Disord.* **2017**, *211*, 20–26. [CrossRef]
15. Curran, P.G. Methods for the detection of carelessly invalid responses in survey data. *J. Exp. Soc. Psychol.* **2016**, *66*, 4–19. [CrossRef]
16. Zhong, X.; Li, M.; Li, L. Preventing and detecting insufficient effort survey responding. *Adv. Psychol. Sci.* **2021**, *29*, 225–237. [CrossRef]
17. Galesic, M.; Bosnjak, M. Effects of Questionnaire Length on Participation and Indicators of Response Quality in a Web Survey. *Public Opin. Q.* **2009**, *73*, 349–360. [CrossRef]
18. Maniaci, M.R.; Rogge, R.D. Caring about carelessness: Participant inattention and its effects on research. *J. Res. Personal.* **2014**, *48*, 61–83. [CrossRef]
19. Maxwell, J.P. Development and Preliminary Validation of a Chinese Version of the Buss–Perry Aggression Questionnaire in a Population of Hong Kong Chinese. *J. Personal. Assess.* **2007**, *88*, 284–294. [CrossRef]

20. Kiewitz, C.; Weaver Iii, J.B. The aggression questionnaire. In *Handbook of Research on Electronic Surveys and Measurements*; Idea Group Reference/IGI Global: Hershey, PA, USA, 2007; pp. 343–347.
21. Lin, G.-H.; Li, C.-Y.; Sheu, C.-F.; Huang, C.-Y.; Lee, S.-C.; Huang, Y.-H.; Hsieh, C.-L. Using Machine Learning to Develop a Short-Form Measure Assessing 5 Functions in Patients with Stroke. *Arch. Phys. Med. Rehabil.* **2022**, *103*, 1574–1581. [CrossRef]
22. Wang, I.; Li, P.-C.; Lee, S.-C.; Lee, Y.-C.; Wang, C.-H.; Hsieh, C.-L. Development of a Berg Balance Scale Short-Form Using a Machine Learning Approach in Patients with Stroke. *J. Neurol. Phys. Ther.* **2023**, *47*, 44–51. [CrossRef]
23. Lee, W.; Kim, H.; Shim, J.; Kim, D.; Hyeon, J.; Joo, E.; Joo, B.-E.; Oh, J. The simplification of the insomnia severity index and epworth sleepiness scale using machine learning models. *Sci. Rep.* **2023**, *13*, 6214. [CrossRef]
24. Orrù, G.; De Marchi, B.; Sartori, G.; Gemignani, A.; Scarpazza, C.; Monaro, M.; Mazza, C.; Roma, P. Machine learning item selection for short scale construction: A proof-of-concept using the SIMS. *Clin. Neuropsychol.* **2022**, *37*, 1371–1388. [CrossRef] [PubMed]
25. Morrison, A.S.; Ustun, B.; Horenstein, A.; Kaplan, S.C.; de Oliveira, I.R.; Batmaz, S.; Gross, J.J.; Sadikova, E.; Hemanny, C.; Pires, P.P.; et al. Optimized short-forms of the Cognitive Distortions Questionnaire. *J. Anxiety Disord.* **2022**, *92*, 102624. [CrossRef] [PubMed]
26. Lin, G.-H.; Huang, C.-Y.; Lee, S.-C.; Chen, K.-L.; Lien, J.-J.J.; Chen, M.-H.; Huang, Y.-H.; Hsieh, C.-L. A 10-item Fugl-Meyer Motor Scale Based on Machine Learning. *Phys. Ther.* **2021**, *101*, pzab036. [CrossRef] [PubMed]
27. Maxwell, J.P. Psychometric properties of a Chinese version of the Buss–Warren Aggression Questionnaire. *Personal. Individ. Differ.* **2008**, *44*, 943–953. [CrossRef]
28. Zhang, P.; Yu, Y.; Liu, Z.; Meng, X. Chinese Norm of Buss-Warren Aggression Questionnaire from a standardized school-based sample aged 9–18 in urban areas. *Sch. Public Health* **2011**, *32*, 897–900. [CrossRef]
29. Wang, M.; Peng, C.; Chang, H.; Yu, M.; Rong, F.; Yu, Y. Interaction between Sirtuin 1 (SIRT1) polymorphisms and childhood maltreatment on aggression risk in Chinese male adolescents. *J. Affect. Disord.* **2022**, *309*, 37–44. [CrossRef]
30. Raine, A.; Dodge, K.; Loeber, R.; Gatzke-Kopp, L.; Lynam, D.; Reynolds, C.; Stouthamer-Loeber, M.; Liu, J. The reactive–proactive aggression questionnaire: Differential correlates of reactive and proactive aggression in adolescent boys. *Aggress. Behav.* **2006**, *32*, 159–171. [CrossRef]
31. Quan, F.; Xia, L. The Prediction of Hostile Attribution Bias on Reactive Aggression and the Mediating Role of Revenge Motivation. *J. Psychol. Sci.* **2019**, *42*, 1434–1440. [CrossRef]
32. Wang, Y.; Xiong, Y.; Ren, P.; Yang, L.; Miao, W. Effects of Bully-victimization on Proactive and Reactive Aggression in Early Adolescence: The Role of Moral Disengagement and Gender. *Psychol. Dev. Educ.* **2023**, *39*, 410–418. [CrossRef]
33. Li, R.; Xia, L. The mediating effect of aggression motivation on the relationship between trait anger and reactive aggression: A longitudinal study. *Acta Psychol. Sin.* **2021**, *53*, 788–797. [CrossRef]
34. Carlo, G.; Randall, B.A. The Development of a Measure of Prosocial Behaviors for Late Adolescents. *J. Youth Adolesc.* **2002**, *31*, 31–44. [CrossRef]
35. Yin, K.; Wu, X.; Zhang, T. Relationship between psychological privilege and prosocial behavior in college students in the post-epidemic period: A moderated chain mediation model. *China J. Health Psychol.* **2022**, *30*, 1549–1554. [CrossRef]
36. Perangin-Angin, D.J.; Bachtiar, F.A. Classification of Stress in Office Work Activities Using Extreme Learning Machine Algorithm and One-way ANOVA F-Test Feature Selection. In Proceedings of the 2021 4th International Seminar on Research of Information Technology and Intelligent Systems (ISRITI), Yogyakarta, Indonesia, 16–17 December 2021; pp. 503–508. [CrossRef]
37. Elhai, J.D.; Montag, C. The compatibility of theoretical frameworks with machine learning analyses in psychological research. *Curr. Opin. Psychol.* **2020**, *36*, 83–88. [CrossRef]
38. Priya, A.; Garg, S.; Tigga, N.P. Predicting Anxiety, Depression and Stress in Modern Life using Machine Learning Algorithms. *Procedia Comput. Sci.* **2020**, *167*, 1258–1267. [CrossRef]
39. Peng, C.-Y.J.; Lee, K.L.; Ingersoll, G.M. An Introduction to Logistic Regression Analysis and Reporting. *J. Educ. Res.* **2002**, *96*, 3–14. [CrossRef]
40. Zhang, P.; Roberts, R.E.; Liu, Z.; Meng, X.; Tang, J.; Sun, L.; Yu, Y. Hostility, Physical Aggression and Trait Anger as Predictors for Suicidal Behavior in Chinese Adolescents: A School-Based Study. *PLoS ONE* **2012**, *7*, e31044. [CrossRef]

behavioral sciences

MDPI

Review

Face Blindness in Children and Current Interventions

Weina Ma [1,2], Zeyu Xiao [1], Yannan Wu [1], Xiaoxian Zhang [1,2], Dongwen Zheng [1], Xue Lei [3] and Chengyang Han [1,2,*]

[1] Jing Hengyi School of Education, Hangzhou Normal University, Hangzhou 311121, China
[2] Zhejiang Philosophy and Social Science Laboratory for Research in Early Development and Childcare, Hangzhou Normal University, Hangzhou 311121, China
[3] School of Business Administration, Zhejiang University of Finance and Economics, Hangzhou 310018, China
* Correspondence: cyhan@hznu.edu.cn

Abstract: Children with prosopagnosia, also known as face blindness, struggle to recognize the faces of acquaintances, which can have a negative impact on their social interactions and overall functioning. This paper reviews existing research on interventions for children with prosopagnosia, including compensatory and remedial strategies, and provides a summary and comparison of their effectiveness. However, despite the availability of these interventions, their effectiveness remains limited and constrained by various factors. The lack of a widely accepted treatment for children with prosopagnosia emphasizes the need for further research to improve intervention strategies. Last, three future research directions were proposed to improve interventions for prosopagnosia, including ecological approaches, the social challenges faced by children, and new potential intervention methods.

Keywords: children with prosopagnosia; face blindness; face memory; face perception; intervention

Citation: Ma, W.; Xiao, Z.; Wu, Y.; Zhang, X.; Zheng, D.; Lei, X.; Han, C. Face Blindness in Children and Current Interventions. *Behav. Sci.* **2023**, *13*, 676. https://doi.org/10.3390/bs13080676

Academic Editors: Xuechen Ding and Wan Ding

Received: 10 July 2023
Revised: 5 August 2023
Accepted: 8 August 2023
Published: 11 August 2023

1. Introduction

Face recognition plays a crucial role in social interactions as it enables individuals to process various social categories of information conveyed by faces, including gender, age, and race. It allows for the quick identification and understanding of others [1]. Moreover, subtle facial cues can be utilized to discern trustworthiness and personality traits [2,3]. The ability to recognize familiar faces is fundamental to human cognition and vital for establishing and maintaining social connections.

However, for individuals with prosopagnosia, this ability is significantly impaired. Prosopagnosia, also known as face blindness, is a condition in which individuals are unable to easily and accurately recognize others by their faces [4]. Prosopagnosia can manifest in two primary forms: acquired prosopagnosia (AP) and developmental prosopagnosia (DP). AP arises as a consequence of identifiable neurological damage, while DP, also known as congenital prosopagnosia, emerges without any accompanying intellectual deficits, emotional disturbances, object recognition difficulties, or acquired brain damage. Although cases of AP are relatively rare, DP is more prevalent in the general population, affecting approximately 2–2.5% of adults and 1.2–4% of children [5,6]. Research has revealed considerable comorbidity between prosopagnosia and other developmental and neurological conditions [7]. Prosopagnosia frequently co-occurs with autism spectrum disorder, Alzheimer's disease, nonverbal learning disability, and epilepsy [8–10]. This implies that the high comorbidity with other developmental disorders must be considered during the diagnosis and treatment of prosopagnosia. The early identification of prosopagnosia symptoms and the concurrent treatment of co-occurring conditions would greatly aid in improving overall outcomes for children.

Notably, the study of prosopagnosia, particularly in the context of children, remains an area that calls for further research and exploration. While extensive research has been conducted on prosopagnosia in adults, there is a noticeable dearth of studies specifically

focusing on the challenges faced by children with this condition [11]. This discrepancy highlights the need for further investigation into the unique challenges faced by children with prosopagnosia and the development of targeted interventions to support their social and cognitive development.

Prosopagnosia can have lasting effects on children's ability to form and maintain social relationships. In one study, nearly all individuals with prosopagnosia had trouble recognizing people they knew well, such as friends, co-workers, and family members. This can cause them to feel embarrassed or belittled, and may increase anxiety and guilt about social interactions [12]. Furthermore, children with prosopagnosia may be at an increased risk of danger due to their inability to accurately recognize faces. For instance, they may mistake strangers for acquaintances or fail to recognize family members when outside the home, potentially leading to unsafe situations [13].

Given the significant impact of prosopagnosia on children's social interactions and overall well-being, it is imperative to explore effective intervention methods to mitigate the challenges associated with this condition. By implementing targeted interventions, it may be possible to improve face recognition abilities in children with prosopagnosia and enhance their overall social functioning and quality of life.

A comprehensive search was performed in June 2022 and updated in May 2023 using Web of Science, PubMed, and Google Scholar. The search strategy combined the keywords "prosopagnosia" AND "face recognition, face processing, face memory, face perception, training, intervention". Studies were excluded if participants had comorbid autism spectrum disorder or other developmental disorders in order to isolate interventions specifically targeting prosopagnosia. Given the limited evidence-based interventions for pediatric populations with prosopagnosia, no age restrictions were imposed in order to collect data across the lifespan. After applying these eligibility criteria, 38 articles were included in the final review. This process allowed us to thoroughly survey the current literature on prosopagnosia interventions and identify gaps needing further research, especially among children and adolescents.

2. Intervention Basis of Prosopagnosia

The mechanisms underlying face recognition during development differ from those involved in other forms of visual recognition. Specifically, defects in face-specific mechanisms can lead to prosopagnosia, a condition that arises when specific parts of the brain are damaged or lesions occur [14,15]. However, there is promising evidence suggesting that the face processing system exhibits neural reorganization capabilities following injury, indicating a degree of plasticity [16]. Moreover, research suggests that the face recognition system in children may possess greater plasticity compared to adults, highlighting the critical role of early intervention [17]. A study conducted by De Heering et al. utilized a digital version of the Benton Face Recognition Test (BFRT) to evaluate children and adults, revealing that children exhibited significantly longer correct response times than adults for both upright and inverted faces [18]. Additionally, there was an improvement in accuracy for upright faces between the ages of 6 and 12 years. Although some studies have proposed that face learning abilities may continue to improve into early adulthood, it is well established that recognition of inverted faces reaches its peak earlier in development [19]. Therefore, early intervention for children with prosopagnosia is crucial as their developing brains may be more responsive to targeted interventions aimed at improving face recognition abilities.

Face recognition is a complex cognitive process that involves multiple stages, including perceiving a face, encoding it into memory, and retrieving it later to determine familiarity and identity [20]. When any of these stages are impaired, the overall function of the face recognition system can be disrupted. Previous research has proposed three loci of impairment that can lead to prosopagnosia [16]. The first locus is the patient's inability to accurately perceive faces. The second locus is the patient's ability to correctly perceive faces but the inability to access stored face memories. The third locus involves the patient's ability to perceive faces and make familiarity judgments, but this locus is unable to extract

any semantic or identity information related to the person. In summary, the three loci refer to deficits in (1) face perception, (2) linking faces to identity/memory, and (3) deriving identity-specific semantic information from faces. Differentiating the locus of impairment can help better understand the specific deficits underlying prosopagnosia in a given patient.

Moreover, studies have suggested that AP can be divided into two subtypes: apperceptive prosopagnosia and associative prosopagnosia [21]. Patients with apperceptive prosopagnosia have difficulty perceiving faces and have damage to the fusiform gyrus, while those with associative prosopagnosia have difficulty remembering faces and have damage to the anterior temporal region. This classification is also reflected in patients with DP [15]. DP may manifest in multiple indistinct types. The researchers used four face tests to evaluate three DP patients, focusing on their abilities to perceive and remember faces. The tests included the Unknown Face Matching Test, Age Estimation Test, Familiarity Check Test, and Famous Face Recognition Test. The results exhibited significant variations among the three patients, suggesting that DP can be further divided into impaired face perception and impaired face memory types [22]. It is important to note that brain injury can also lead to prosopagnosia in children, and similar to adults, children may exhibit a separation between face perception and face memory [6]. In addition to the subtypes of prosopagnosia mentioned earlier, there are other factors that contribute to the complexity of this condition. For instance, individual differences in the severity and specific manifestations of prosopagnosia can widely vary [23].

Therefore, gaining a comprehensive understanding of the various types and subtypes of prosopagnosia, along with their specific impairments, is essential for the development of effective intervention strategies. By focusing on the specific areas of impairment and customizing interventions to meet the unique needs of children with prosopagnosia, it becomes possible to optimize their face recognition abilities and enhance their overall functioning in social interactions and daily life.

3. Intervention Strategies for Children with Prosopagnosia

Prosopagnosia can be improved through training [24], and the dissociation between face perception and face memory mechanisms is evident in the recovery process [25]. Therefore, a preliminary assessment should be conducted to determine whether the patient's impaired functional parts are related to perception, memory, or more common semantic memory problems before implementing an intervention. Subsequent intervention should focus on the impaired functions of the patient. Currently, there are two strategies for intervention: compensatory strategies and remedial strategies (See Table 1). Compensatory strategies seek to intervene through facial memory and semantic memory, while remedial strategies target interventions through facial perception. It is important to note that although the concept of prosopagnosia has been recognized for many years, intervention approaches remain inconsistent and even more lacking for children. Therefore, generalizing interventions across different age groups still requires further evidence and validation in future research. It should be mentioned that the following strategies are proposed assuming prosopagnosia patients do not have co-occurring psychiatric conditions.

3.1. Compensatory Strategies

Compensatory strategies play a crucial role in assisting individuals with prosopagnosia to distinguish others by utilizing extra-facial information. These strategies can involve focusing on distinctive features, physical defects, specific body movements, voice, hairstyle, glasses, clothing, or ornamentation before encountering individuals [26]. Two research-backed strategies, namely Attention of Facial Features and Semantic Association, have been proven effective in this regard.

Table 1. Interventions for Children with Face Blindness (Prosopagnosia).

Intervention Type	Specific Strategies	Description
Compensatory Strategies	Attention of Facial Features	- Caricaturing: Exaggerating facial features during learning to increase distinction between faces - Feature naming: Verbal guidance to focus attention on specific facial features during learning
	Semantic Association	- Associating identity-related information (e.g., name, occupation) with faces during learning
Remedial Strategies	Visual Scan Paths Training	- Establishing correct face scanning patterns through games/tasks
	Face Feature Discrimination Training	- Improving the ability to discern facial features (e.g., eyes, nose, mouth)
	Holistic Face Training	- Enhancing the capacity to perceive the spatial arrangement of facial features

The Attention of Facial Features strategy focuses on guiding participants to direct their attention to the relevant facial regions they need to focus on. There are two evidence-supported approaches: Caricaturing and Feature Naming training. Caricaturing involves the presentation of exaggerated facial features during the face-learning phase. Computers can generate comic faces by exaggerating the difference between individual faces and ordinary faces [27,28]. This is based on a face space model [29,30]. Caricaturing reduces the similarity between the target face and other faces, resulting in faster and more accurate face recognition [31]. Mayer and Rossion utilized caricatured faces, unfamiliar adult faces, unfamiliar child faces, and familiar child faces to allow prosopagnosia patients to categorize and describe the characteristics of each face in each category [32]. After four months of training (twice a week), patients showed significant improvements in their ability to recognize faces using internal features. In another study, it was found that subjects trained with caricatured faces were more accurate in recognizing faces compared to those who were simply exposed to faces [33]. Recently, Limbach et al. combined perceptual training with specific parameters of deformed faces, which selectively exaggerated the shape or texture of faces [34]. This approach generated photo-realistic face pictures for subjects trained with the intervention and showed that parameter-specific caricatured face training improved the performance of individuals with poor face recognition and was transferable to untrained faces. Feature Naming training involves guiding participants during the learning phase through verbal instructions that include the name of the face and descriptions of its specific features. Face recognition relies on the holistic processing of the overall facial configuration. In contrast, part-based recognition approaches train patients to focus on local facial features rather than the whole configuration [35,36]. This can aid some prosopagnosia patients who have developed such strategies on their own, bypassing potentially impaired holistic face processing. This approach can compensate for the impairment of typical face recognition systems and may further facilitate a more natural adoption of compensatory strategies by patients. Brunsdon et al. used Feature Naming training to intervene with an eight-year-old patient diagnosed with prosopagnosia [37]. The patient was required to observe, discuss, and memorize five different features of each face, including age, gender, and three unique facial features. Following 14 training sessions over a one-month period, the patient's recognition ability showed significant improvement, encompassing not only the initially trained faces but also images of faces viewed from various angles. Feature Naming training underscores the significance of focusing on facial features to enhance face recognition. Subsequently, a growing body of evidence supports the effectiveness of feature naming training in improving the ability to recognize familiar faces [33,38,39]. Overall, caricaturing modifies facial space and reduces face similarity to make faces more memorable, while Feature Naming training compensates for impaired

configuration processing by directly highlighting facial features. These approaches hold the potential for benefiting individuals with prosopagnosia as well as those interested in enhancing their face recognition abilities.

Semantic Association involves providing identity-related information, such as occupation and name, while participants are learning a face. The interactive activation model proposes that person identity nodes can access semantic memories specific to a person [40]. For patients, activating semantic information can facilitate face recognition even when the face itself fails to activate identification. The partial activation of semantic information can feedback to support the activation of the person identity node. Therefore, the purpose of this approach is to establish connections between personal identity nodes and specific semantic information, thus enhancing familiarity during the face recognition process. In simpler terms, the goal is to associate semantic information with each face to be remembered, which aids in improving recognition. Previous studies have demonstrated significant improvements in overt recognition among individuals with prosopagnosia when famous faces sharing identity-specific information, such as occupation, were presented [41]. Research has revealed that associating faces with person-related labels, such as names or occupations, leads to better face recognition performance than associating them with person-unrelated labels, such as object names or symbols. This underscores the importance of semantic information in elucidating our capacity to recognize familiar faces [42]. In summary, semantic association allows patients to compensate for impaired face recognition abilities by utilizing their intact semantic memory.

While compensatory strategies are beneficial for individuals with prosopagnosia, they may result in more laborious face recognition skills and might not easily generalize to untrained faces. Several factors, including the severity of symptoms, types of impairments, and individual differences such as age, can influence the effectiveness of these interventions [16]. Further research is necessary to determine the optimal conditions for employing compensatory strategies to improve face recognition and to identify ways to extend the application of these strategies to untrained faces.

3.2. Remedial Strategies

Remedial strategies, which aim to train more general skills that can be applied to any face, can facilitate more effective "normal" processing strategies and are typically used in patients with prosopagnosia due to impaired non-perceptual mechanisms that would be difficult to achieve otherwise [43]. These interventions can be divided into three strategies: Visual Scan Paths training, Face Feature Discrimination training, and Holistic Face training.

Visual Scan Paths training involves establishing correct face scanning paths by changing the eye movement trajectory of patients during face perception through games or tasks. Schwarzer et al. analyzed the eye movements of patients with prosopagnosia during face perception and found significant differences in the way they perceive faces compared to the general population [44]. Schmalzl et al. suggested that abnormalities in the visual scan paths for faces are likely to be a common feature in children with prosopagnosia [39]. A four-year-old and a six-year-old patient with DP received Visual Scan Paths training and demonstrated significant improvements in their ability to recognize target faces [45,46]. These findings suggest that establishing the correct visual scan paths for faces can enhance the ability to perceive internal facial features, particularly the eyes. The specific training for visual scan paths varies in different studies. Pizzamiglio et al. designed a task to search and clip eye images. Children were required to track different parts of each face (eyes, nose, mouth, facial contour, ears, and hair) in a specific order and quickly circle the eyes and clip out the eye area [46]. Di Vita et al. designed 16 explored intervention training programs presented in a game-like manner to help children. Two of these training programs also involved interventions in Visual Scan Paths training: The Eyes: "Search And Cut Out" and "Trace And Color The Faces". The first training program also requires circling and cutting out the eye area of the face images, but only focuses on the eyes; the second training program requires participants to reproduce and color the facial features (eyes, nose, mouth,

facial contour, ears) and hair of each face in a specific order [47]. However, they did not provide sufficient information about the efficiency of the interventions.

Internal Feature training entails focusing on the ability to discern various facial features, such as lip shape, eye color, or distances between facial features, such as the spacing between the eyes and eyebrows or the nose and mouth [48,49]. Internal facial features play an important role in face processing. In recent years, several studies have found that DP patients struggle to holistically integrate internal features and instead demonstrate more piecemeal feature sampling [50,51]. Research has also suggested that children's reliance on internal features in faces may stem from a lack of facial experience [52]. This hints at the feasibility and potential of training focused on internal features. A study conducted distance discrimination training for facial features in 24 patients with DP and found that patients' face perception was significantly improved [53]. There were four interventions specifically aimed at improving face feature recognition. The first intervention, called "Guess Who", involved two patients selecting one of sixteen frontal photographs (eight females and eight males) and taking turns asking questions about the facial features in the picture to identify which image the other had chosen. The second intervention, "Spot the Differences", required patients to identify differences between two altered face pictures, such as variations in eye color, lip thickness, and hairline. In the third intervention, "Same or Different", children were presented with cards containing images of eyes, noses, and mouths, and were asked to identify whether there were differences between the cards and provide an explanation. The fourth intervention, "Face Puzzles", required patients to combine images of a regular person's face that had been divided into four, nine, or twelve parts. These training interventions helped patients process intrinsic facial features more effectively and had a greater impact on improving their face recognition ability [47,54].

Holistic Face training has also yielded positive outcomes, aiming to enhance the perceptual capacity of individuals with DP to discern the spatial arrangement of internal facial features across an expanded range [55]. Additionally, this training method has shown potential for improving the face recognition ability of children with AP. After receiving 14 weeks of online perception training, an eight-year-old girl found that her face perception skills were significantly improved. Eye movement analysis also showed that she spent more time observing internal facial features after the training [38]. The training also resulted in improved sensitivity of facial perception among participants, with some patients reporting lasting improvement in their daily lives for at least three months. However, the extent of improvement for untrained faces was comparatively less noticeable [56]. Further research is warranted to explore the long-term efficacy and generalizability of Holistic Face training across diverse populations.

The above studies indicated that remedial strategies targeting face perception can enhance face cognition in children with prosopagnosia, potentially extending these improvements to their everyday lives. However, it is important to acknowledge that remedial training may not benefit all children with prosopagnosia or improve all aspects of their face processing abilities. Nonetheless, these studies offer a promising direction for restoring the face processing system and provide hope for improving the quality of life for children with prosopagnosia. Future research should continue to investigate and refine these remedial strategies to optimize their effectiveness and applicability.

3.3. A New Approach: Wearable Devices for Prosopagnosia

With the rapid advancement of information technology, wearable devices have emerged as a significant innovation. Initially, research focused on developing wearable devices to assist visually impaired individuals in enhancing their social interactions [57–59]. These early devices aimed to alleviate the challenges faced by visually impaired individuals during social encounters. Over time, their application expanded to include brain-injured patients, such as those affected by stroke, Alzheimer's disease, and other causes of prosopagnosia [60–62]. However, these wearable devices have primarily functioned as

social aids, offering mechanical cues during face recognition, while neglecting the potential for rehabilitative capabilities in face recognition.

In response to this limitation, one researcher developed a new integrated wearable system to aid patients with prosopagnosia [63]. The system consists of an Android application that has both real-time face recognition and at-home training modes, and a wearable eyepiece that collects and transmits face information in real time through an external webcam. The real-time face recognition mode of the system detects the face of the person interacting with the patient and generates a unique face code that is compared with the contact face code list generated during pre-training. The at-home training mode allows patients to train and self-test using contact list face images in real-time face recognition mode. The training process includes feature naming training that combines memory and perception training and focuses on the internal features of patients. The study used the inverted face effect to simulate recognition difficulties of patients with prosopagnosia, and the results showed that training using the system can enhance subjects' recognition of inverted face images, thus supporting the hypothesis that this training can improve face recognition ability. However, further research is necessary to determine the generalizability of these results to patients with prosopagnosia, particularly pediatric patients.

4. Future Directions

This paper presents a summary and comparison of potential interventions for children with prosopagnosia, which include compensatory strategies and remedial strategies. Compensatory strategies reviewed include Attention of Facial Features and Semantic Association, while remedial strategies reviewed include Visual Scan Path training, Internal Feature training, and Holistic Face training. Previous studies have shown that compensatory strategies may be more effective than remedial strategies for patients with AP, while both compensatory and remedial strategies showed some improvement in both children and adults with DP [16,53].

Despite showing some promise, the effectiveness of these interventions for children with prosopagnosia remains limited, and their applicability and efficacy are subject to various constraints. The lack of a widely accepted treatment for children with prosopagnosia emphasizes the need for further research to improve intervention strategies. This paper proposes three future research directions to enhance intervention methods for prosopagnosia. By focusing on these research directions, it is possible to significantly improve the effectiveness of interventions and enhance the quality of life of children with prosopagnosia. Nevertheless, additional research is required to fully understand the potential benefits of these approaches.

4.1. From Laboratory to Real Life

Overall, the current research and practice on interventions for children with prosopagnosia are still in their early stages, leaving room for further exploration and development. Compensatory and remedial strategies have shown potential benefits for children with prosopagnosia. However, before implementing interventions, it is crucial for researchers and practitioners to conduct thorough evaluations of the underlying cause of the child's disorder, identify specific symptoms and areas of impairment, and accordingly tailor interventions. This individualized approach ensures that interventions address the unique needs and challenges of each child, maximizing their chances of improvement.

In a study, children with prosopagnosia were trained for 18 months, but no improvement was observed in their face processing skills. The child in this study had impaired perceptual mechanisms, which made direct face perception training challenging [64]. Many current intervention methods are designed in laboratory settings and primarily rely on the recognition of face pictures to assess effectiveness. However, this approach is often sensitive to environmental factors and may not easily translate to daily life. Future interventions could consider using more ecologically valid materials, such as motion pictures and videos. While most current interventions require highly skilled professionals and are

limited to small groups, the rise of the Internet has allowed some researchers to develop online interventions for prosopagnosia [65]. Future studies could explore combining online intervention systems with families and schools to improve intervention outcomes.

4.2. Social Challenges for Children with Prosopagnosia

The inability to recognize and remember faces can result in significant impairments in social skills, causing patients to experience anxiety and depression [12]. Face recognition serves as the initial step for children to engage in face-to-face social interactions, and the impairment of this ability can significantly hinder their social development [66]. While current intervention studies have primarily focused on remedying damaged face recognition or memory skills, there has been comparatively less emphasis on addressing other factors that can negatively impact a child's life, such as social interaction skills [12,13].

Research has shown that age and certain personality traits may be associated with reduced stress and anxiety levels caused by prosopagnosia [13]. Future investigations should include the study of age and personality factors in children with prosopagnosia, providing additional perspectives for addressing intervention issues related to anxiety, depression, and social relationships. In addition to current behavioral interventions, children with prosopagnosia also require supplementary methods to address their daily challenges, such as symptom disclosure to inform family, friends, classmates, and teachers about the condition, raising awareness of the effects of prosopagnosia on individuals. Future interventions may consider standardizing symptom disclosure methods and incorporating them into existing intervention programs, ensuring children's safety, optimal education, and social interactions.

4.3. New Intervention Paths

Although current intervention methods for improving facial recognition abilities in children have shown effectiveness, they still have certain limitations. In the future, there is potential for the development of more diverse and efficient approaches to enhance children's facial recognition abilities beyond simple behavioral interventions. Two promising methods that can supplement behavioral training have been identified: the intranasal administration of oxytocin and non-invasive brain stimulation [67,68].

Oxytocin is a neuropeptide that has been found to enhance social cognition by increasing the salience of social cues [69]. In one study, ten adult DP patients and ten matched control subjects were tested. Each participant underwent two testing sessions separated by 14–25 days. In each session, they inhaled either oxytocin or a placebo spray and completed two face-processing tests and the Multidimensional Mood Questionnaire (MMQ) to control for any mood effects. The results showed that patients improved in both face tests under the oxytocin condition [65]. It suggests that oxytocin may be a promising intervention method for improving face recognition in children with prosopagnosia.

Non-invasive brain stimulation comes in many forms, such as transcranial direct current stimulation (tDCS), transcranial random noise stimulation (tRNS), and galvanic vestibular stimulation (GVS), all of which have shown potential for intervention in prosopagnosia [16,70,71]. Among them, tDCS has been demonstrated to enhance performance in cognitive tasks [72]. Similarly, tRNS has been found to improve cognitive performance in motor and perceptual learning, and a combination of cognitive training with tRNS may enhance training effects [53,73]. Moreover, GVS also has some therapeutic effects. Research has shown that a 61-year-old patient with right-brain damage who was completely unable to recognize faces showed symptom relief in face perception after GVS treatment [74]. Moreover, some studies have provided theoretical rationale based on brain correlates for using non-invasive brain stimulation; e.g., N170, N250 [75]. The mechanisms behind these modalities likely involve altering cortical plasticity and excitability in regions critical for face processing. By selectively targeting key nodes in the distributed face processing network, non-invasive brain stimulation may rebalance neural circuits disrupted in prosopagnosia. Further research optimizing stimulation parameters and pairing with cog-

nitive or perceptual training could unlock the full potential of these promising technologies for prosopagnosia intervention.

The intranasal inhalation of oxytocin and non-invasive brain stimulation can improve face recognition skills in the short term. However, neither tDCS nor tRNS has been widely used in the treatment of prosopagnosia. These techniques are still in their early stages and have only been applied to adult populations. As intervention methods continue to advance and mature, future research may consider combining these two methods with behavioral training and gradually introducing them into intervention training for children. Additionally, the potential mechanisms underlying the effects of oxytocin and non-invasive brain stimulation on face recognition should be investigated to optimize the intervention strategies. With continued advancements in technology and scientific understanding, the future holds promise for the development of more comprehensive and effective approaches to enhance facial recognition abilities in children with prosopagnosia.

Author Contributions: C.H. and W.M. developed the study concept. W.M., Z.X. and Y.W. wrote the first version of the paper. X.Z., D.Z. and X.L. provided critical revisions. All authors have read and agreed to the published version of the manuscript.

Funding: This study was supported by the discipline funds of Hangzhou Normal University's Jinghengyi School of Education (19JYXK007), and the Natural Science Foundation of Zhejiang Province (LQ23C090004).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Johnson, K.J.; Fredrickson, B.L. "We all look the same to me" Positive emotions eliminate the own-race bias in face recognition. *Psychol. Sci.* **2005**, *16*, 875–881. [CrossRef]
2. Oosterhof, N.N.; Todorov, A. Shared perceptual basis of emotional expressions and trustworthiness impressions from faces. *Emotion* **2009**, *9*, 128. [CrossRef]
3. Zhang, Y.H.; Zhu, L.Q. Impression Formation Based on Face: From the Perspective of Neuroscience. *Adv. Psychol. Sci.* **2012**, *20*, 1031–1039. [CrossRef]
4. Damasio, A.R.; Tranel, D.; Damasio, H. Face agnosia and the neural substrates of memory. *Annu. Rev. Neurosci.* **1990**, *13*, 89–109. [CrossRef] [PubMed]
5. DeGutis, J.; Bahierathan, K.; Barahona, K.; Lee, E.; Evans, T.C.; Shin, H.M.; Mishra, M.; Likitlersuang, J.; Wilmer, J.B. What is the prevalence of developmental prosopagnosia? An empirical assessment of different diagnostic cutoffs. *Cortex* **2023**, *161*, 51–64. [CrossRef] [PubMed]
6. Bennetts, R.J.; Murray, E.; Boyce, T.; Bate, S. Prevalence of face recognition deficits in middle childhood. *Q. J. Exp. Psychol.* **2017**, *70*, 234–258. [CrossRef]
7. Shah, P.; Gaule, A.; Sowden, S.; Bird, G.; Cook, R. The 20-item prosopagnosia index (PI20): A self-report instrument for identifying developmental prosopagnosia. *R. Soc. Open Sci.* **2015**, *2*, 140343. [CrossRef]
8. Davies-Thompson, J.; Pancaroglu, R.; Barton, J. Acquired prosopagnosia: Structural basis and processing impairments. *Front. Biosci.-Elite* **2014**, *6*, 159–174.
9. Barton, J.J.; Davies-Thompson, J.; Corrow, S.L. Prosopagnosia and disorders of face processing. In *Handbook of Clinical Neurology*; Elsevier: Amsterdam, The Netherlands, 2021; Volume 178, pp. 175–193.
10. Sakki, H.E.; Dale, N.J.; Sargent, J.; Perez-Roche, T.; Bowman, R. Is there consensus in defining childhood cerebral visual impairment? A systematic review of terminology and definitions. *Br. J. Ophthalmol.* **2018**, *102*, 424–432. [CrossRef] [PubMed]
11. Bate, S.; Tree, J.J. The definition and diagnosis of developmental prosopagnosia. *Q. J. Exp. Psychol.* **2017**, *70*, 193–200. [CrossRef]
12. Yardley, L.; McDermott, L.; Pisarski, S.; Duchaine, B.; Nakayama, K. Psychosocial consequences of developmental prosopagnosia: A problem of recognition. *J. Psychosom. Res.* **2008**, *65*, 445–451. [CrossRef] [PubMed]
13. Dalrymple, K.A.; Fletcher, K.; Corrow, S.; das Nair, R.; Barton, J.J.; Yonas, A.; Duchaine, B. "A room full of strangers every day": The psychosocial impact of developmental prosopagnosia on children and their families. *J. Psychosom. Res.* **2014**, *77*, 144–150. [CrossRef]
14. Lin, F.; Chen, X.; Zhou, C.; Ma, J.; Ran, G. The Neural Mechanism of Prosopagnosia. *Adv. Psychol. Sci.* **2013**, *21*, 1755. [CrossRef]

15. Dalrymple, K.A.; Elison, J.T.; Duchaine, B. Face-specific and domain-general visual processing deficits in children with developmental prosopagnosia. *Q. J. Exp. Psychol.* **2017**, *70*, 259–275. [CrossRef]
16. Bate, S.; Bennetts, R.J. The rehabilitation of face recognition impairments: A critical review and future directions. *Front. Hum. Neurosci.* **2014**, *8*, 491. [CrossRef]
17. Tree, J.J.; Horry, R.; Riley, H.; Wilmer, J.B. Are portrait artists superior face recognizers? Limited impact of adult experience on face recognition ability. *J. Exp. Psychol. Hum. Percept. Perform.* **2017**, *43*, 667. [CrossRef] [PubMed]
18. De Heering, A.; Rossion, B.; Maurer, D. Developmental changes in face recognition during childhood: Evidence from upright and inverted faces. *Cogn. Dev.* **2012**, *27*, 17–27. [CrossRef]
19. Germine, L.T.; Duchaine, B.; Nakayama, K. Where cognitive development and aging meet: Face learning ability peaks after age 30. *Cognition* **2011**, *118*, 201–210. [CrossRef]
20. Bruce, V.; Young, A. Understanding face recognition. *Br. J. Psychol.* **1986**, *77*, 305–327. [CrossRef]
21. Corrow, S.L.; Dalrymple, K.A.; Barton, J.J. Prosopagnosia: Current perspectives. *Eye Brain* **2016**, *8*, 165–175.
22. De Renzi, E.; Faglioni, P.; Grossi, D.; Nichelli, P. Apperceptive and associative forms of prosopagnosia. *Cortex* **1991**, *27*, 213–221. [CrossRef]
23. Berger, A.; Fry, R.; Bobak, A.K.; Juliano, A.; DeGutis, J. Distinct abilities associated with matching same identity faces versus discriminating different faces: Evidence from individual differences in prosopagnosics and controls. *Q. J. Exp. Psychol.* **2022**, *75*, 2256–2271. [CrossRef] [PubMed]
24. Towler, A.; Kemp, R.I.; White, D. Can Face Identification Ability Be Trained? In *Forensic Face Matching: Research and Practice*; Oxford University Press: Oxford, UK, 2021; p. 89.
25. Malone, D.R.; Morris, H.H.; Kay, M.C.; Levin, H.S. Prosopagnosia: A double dissociation between the recognition of familiar and unfamiliar faces. *J. Neurol. Neurosurg. Psychiatry* **1982**, *45*, 820–822. [CrossRef] [PubMed]
26. Adams, A.; Hills, P.J.; Bennetts, R.J.; Bate, S. Coping strategies for developmental prosopagnosia. *Neuropsychol. Rehabil.* **2020**, *30*, 1996–2015. [CrossRef] [PubMed]
27. Benson, P.J.; Perrett, D.I. Perception and recognition of photographic quality facial caricatures: Implications for the recognition of natural images. *Eur. J. Cogn. Psychol.* **1991**, *3*, 105–135. [CrossRef]
28. Rhodes, G. *Superportraits: Caricatures and Recognition*; Psychology Press: London, UK, 1997.
29. Valentine, T. A unified account of the effects of distinctiveness, inversion, and race in face recognition. *Q. J. Exp. Psychol.* **1991**, *43*, 161–204. [CrossRef]
30. Valentine, T. Representaiton and Process in face recognition. In *Vision and Visual Dysfunction Volume 14: Pattern Recognition by Man and Machine*; Watt, R.J., Ed.; Macmillan: London, UK, 1991.
31. Lee, K.J.; Perrett, D.I. Manipulation of colour and shape information and its consequence upon recognition and best-likeness judgments. *Perception* **2000**, *29*, 1291–1312. [CrossRef]
32. Mayer, E.; Rossion, B. Prosopagnosia. In *The Behavioral and Cognitive Neurology of Stroke*; Cambridge University Press: Cambridge, UK, 2007.
33. Powell, J.; Letson, S.; Davidoff, J.; Valentine, T.; Greenwood, R. Enhancement of face recognition learning in patients with brain injury using three cognitive training procedures. *Neuropsychol. Rehabil.* **2008**, *18*, 182–203. [CrossRef]
34. Limbach, K.; Itz, M.L.; Schweinberger, S.R.; Jentsch, A.D.; Romanova, L.; Kaufmann, J.M. Neurocognitive effects of a training program for poor face recognizers using shape and texture caricatures: A pilot investigation. *Neuropsychologia* **2022**, *165*, 108133. [CrossRef]
35. Diamond, R.; Carey, S. Why faces are and are not special: An effect of expertise. *J. Exp. Psychol. Gen.* **1986**, *115*, 107. [CrossRef]
36. Donnelly, N.; Davidoff, J. The mental representations of faces and houses: Issues concerning parts and wholes. *Vis. Cogn.* **1999**, *6*, 319–343. [CrossRef]
37. Brunsdon, R.; Coltheart, M.; Nickels, L.; Joy, P. Developmental prosopagnosia: A case analysis and treatment study. *Cogn. Neuropsychol.* **2006**, *23*, 822–840. [CrossRef] [PubMed]
38. Bate, S.; Bennetts, R.; Mole, J.A.; Ainge, J.A.; Gregory, N.J.; Bobak, A.K.; Bussunt, A. Rehabilitation of face-processing skills in an adolescent with prosopagnosia: Evaluation of an online perceptual training programme. *Neuropsychol. Rehabil.* **2015**, *25*, 733–762. [CrossRef] [PubMed]
39. Schmalzl, L.; Palermo, R.; Green, M.; Brunsdon, R.; Coltheart, M. Training of familiar face recognition and visual scan paths for faces in a child with congenital prosopagnosia. *Cogn. Neuropsychol.* **2008**, *25*, 704–729. [CrossRef] [PubMed]
40. Brédart, S.; Valentine, T.; Calder, A.; Gassi, L. An interactive activation model of face naming. *Q. J. Exp. Psychol.* **1995**, *48*, 466–486. [CrossRef] [PubMed]
41. De Haan, E.H.; Campbell, R. A fifteen year follow-up of a case of developmental prosopagnosia. *Cortex* **1991**, *27*, 489–509. [CrossRef]
42. Schwartz, L.; Yovel, G. The roles of perceptual and conceptual information in face recognition. *J. Exp. Psychol. Gen.* **2016**, *145*, 1493. [CrossRef]
43. Young, A.W.; Ellis, H.D. Childhood prosopagnosia. *Brain Cogn.* **1989**, *9*, 16–47. [CrossRef]
44. Schwarzer, G.; Huber, S.; Grueter, M.; Grueter, T.; Groß, C.; Hipfel, M.; Kennerknecht, I. Gaze behaviour in hereditary prosopagnosia. *Psychol. Res.* **2007**, *71*, 583–590. [CrossRef]

45. Schmalzl, L.; Palermo, R.; Coltheart, M. Cognitive heterogeneity in genetically based prosopagnosia: A family study. *J. Neuropsychol.* **2008**, *2*, 99–117. [CrossRef]
46. Pizzamiglio, M.; De Luca, M.; Di Vita, A.; Palermo, L.; Tanzilli, A.; Dacquino, C.; Piccardi, L. Congenital prosopagnosia in a child: Neuropsychological assessment, eye movement recordings and training. *Neuropsychol. Rehabil.* **2017**, *27*, 369–408. [CrossRef]
47. Di Vita, A.; Palermo, L.; Pizzamiglio, M.R.; Piccardi, L. Training per i deficit nel riconoscimento di volti ed emozioni. In *Giochi e Attività per Bambini e Adulti*; Edizioni Centro Studi Erickson Spa: Trento, Italy, 2021.
48. Ding, L.; Martinez, A.M. Features versus context: An approach for precise and detailed detection and delineation of faces and facial features. *IEEE Trans. Pattern Anal. Mach. Intell.* **2010**, *32*, 2022–2038. [CrossRef]
49. Tanaka, J.W.; Gordon, I. Features, configuration, and holistic face processing. In *The Oxford Handbook of Face Perception*; Oxford University Press: Oxford, UK, 2011; pp. 177–194.
50. Marsh, J.E.; Biotti, F.; Cook, R.; Gray, K.L. The discrimination of facial sex in developmental prosopagnosia. *Sci. Rep.* **2019**, *9*, 19079. [CrossRef] [PubMed]
51. Tsantani, M.; Gray, K.L.; Cook, R. Holistic processing of facial identity in developmental prosopagnosia. *Cortex* **2020**, *130*, 318–326. [CrossRef] [PubMed]
52. Ge, L.; Anzures, G.; Wang, Z.; Kelly, D.J.; Pascalis, O.; Quinn, P.C.; Slater, A.M.; Yang, Z.; Lee, K. An inner face advantage in children's recognition of familiar peers. *J. Exp. Child. Psychol.* **2008**, *101*, 124–136. [CrossRef]
53. DeGutis, J.M.; Chiu, C.; Grosso, M.E.; Cohan, S. Face processing improvements in prosopagnosia: Successes and failures over the last 50 years. *Front. Hum. Neurosci.* **2014**, *8*, 561. [CrossRef] [PubMed]
54. Bate, S.; Adams, A.; Bennetts, R.J. Guess who? Facial identity discrimination training improves face memory in typically developing children. *J. Exp. Psychol. Gen.* **2020**, *149*, 901. [CrossRef]
55. DeGutis, J.; Cohan, S.; Nakayama, K. Holistic face training enhances face processing in developmental prosopagnosia. *Brain* **2014**, *137*, 1781–1798. [CrossRef] [PubMed]
56. Corrow, S.L.; Davies-Thompson, J.; Fletcher, K.; Hills, C.; Corrow, J.C.; Barton, J.J. Training face perception in developmental prosopagnosia through perceptual learning. *Neuropsychologia* **2019**, *134*, 107196. [CrossRef]
57. Krishna, S.; Little, G.; Black, J.; Panchanathan, S. A wearable face recognition system for individuals with visual impairments. In Proceedings of the 7th International ACM SIGACCESS Conference on Computers and Accessibility, Baltimore, MD, USA, 9–12 October 2005; pp. 106–113.
58. Mann, S. Wearable, tetherless computer–mediated reality: WearCam as a wearable face–recognizer, and other applications for the disabled. In Proceedings of the AAAI Fall Symposium on Developing Assistive Technology for People with Disabilities, Cambridge, MA, USA, 9–11 November 1996.
59. Takizawa, H.; Aoyagi, M. Assistive systems for the visually impaired based on image processing. In *Causes and Coping with Visual Impairment and Blindness*; IntechOpen: London, UK, 2017.
60. Capela, N.A.; Lemaire, E.D.; Baddour, N. Feature selection for wearable smartphone-based human activity recognition with able bodied, elderly, and stroke patients. *PLoS ONE* **2015**, *10*, e0124414. [CrossRef]
61. Sisson, S.; George, K. Programmable errorless face-name association device with real-time processing. In Proceedings of the 2018 9th IEEE Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), New York, NY, USA, 8–10 November 2018; pp. 82–88.
62. Wang, X.; Zhao, X.; Prakash, V.; Shi, W.; Gnawali, O. Computerized-eyewear based face recognition system for improving social lives of prosopagnosics. In Proceedings of the 2013 7th International Conference on Pervasive Computing Technologies for Healthcare and Workshops, Venice, Italy, 5–8 May 2013; pp. 77–80.
63. Mann, S.; Pan, Z.; Tao, Y.; Gao, A.; Tao, X.; Garcia, D.E.; Shi, D.; Kannan, G. Face recognition and rehabilitation: A wearable assistive and training system for prosopagnosia. In Proceedings of the 2020 IEEE International Conference on Systems, Man, and Cybernetics (SMC), Toronto, ON, Canada, 11–14 October 2020; pp. 731–737.
64. Ellis, H.D.; Young, A.W. Training in face-processing skills for a child with acquired prosopagnosia. *Dev. Neuropsychol.* **1988**, *4*, 283–294. [CrossRef]
65. Bate, S.; Cook, S.J.; Duchaine, B.; Tree, J.J.; Burns, E.J.; Hodgson, T.L. Intranasal inhalation of oxytocin improves face processing in developmental prosopagnosia. *Cortex* **2014**, *50*, 55–63. [CrossRef] [PubMed]
66. Mandal, B.; Chia, S.-C.; Li, L.; Chandrasekhar, V.; Tan, C.; Lim, J.-H. A wearable face recognition system on google glass for assisting social interactions. In *Proceedings of the Computer Vision—ACCV 2014 Workshops, Singapore, 1–2 November 2014*; Lecture Notes in Computer Science; Springer: Cham, Switzerland, 2015; pp. 419–433.
67. Prevost, M.; Zelkowitz, P.; Tulandi, T.; Hayton, B.; Feeley, N.; Carter, C.S.; Joseph, L.; Pournajafi-Nazarloo, H.; Yong Ping, E.; Abenhaim, H. Oxytocin in pregnancy and the postpartum: Relations to labor and its management. *Front. Public. Health* **2014**, *2*, 1. [CrossRef] [PubMed]
68. Yavari, F.; Jamil, A.; Samani, M.M.; Vidor, L.P.; Nitsche, M.A. Basic and functional effects of transcranial electrical stimulation (tES)—An introduction. *Neurosci. Biobehav. Rev.* **2018**, *85*, 81–92. [CrossRef]
69. Bartz, J.A.; Zaki, J.; Bolger, N.; Ochsner, K.N. Social effects of oxytocin in humans: Context and person matter. *Trends Cogn. Sci.* **2011**, *15*, 301–309. [CrossRef] [PubMed]
70. Lopatina, O.L.; Komleva, Y.K.; Gorina, Y.V.; Higashida, H.; Salmina, A.B. Neurobiological aspects of face recognition: The role of oxytocin. *Front. Behav. Neurosci.* **2018**, *12*, 195. [CrossRef] [PubMed]

71. Ulrich, P.I. *Behavioural, Electrophysiological and Neurostimulatory Investigations into Developmental Prosopagnosia*; University of Kent: Kent, UK, 2017.
72. Pąchalska, M.; Góral-Półrola, J.; Chojnowska-Ćwiąkała, I. Effect of individually-tailored TDCS and symbolic art therapy for chronic associative prosopagnosia after infection by SARS-COV-2, neuroCOVID-19 and ischemic stroke. *Acta Neuropsychol.* **2021**, *19*, 329–345. [CrossRef]
73. Fertonani, A.; Pirulli, C.; Miniussi, C. Random noise stimulation improves neuroplasticity in perceptual learning. *J. Neurosci.* **2011**, *31*, 15416–15423. [CrossRef]
74. Wilkinson, D.; Ko, P.; Kilduff, P.; McGlinchey, R.; Milberg, W. Improvement of a face perception deficit via subsensory galvanic vestibular stimulation. *J. Int. Neuropsychol. Soc.* **2005**, *11*, 925–929. [CrossRef]
75. Eimer, M.; Gosling, A.; Duchaine, B. Electrophysiological markers of covert face recognition in developmental prosopagnosia. *Brain* **2012**, *135*, 542–554. [CrossRef]

behavioral sciences

MDPI

Article

Other-Benefiting Lying Behavior in Preschool Children and Its Relation to Theory of Mind and Empathy

Xiaoyan Zhang [1,2,†], Shenqinyi Wang [1,†], Ying Wang [1], Qiuming Zhao [1], Siyuan Shang [1] and Liyang Sai [1,3,4,*]

[1] Department of Psychology, Hangzhou Normal University, Hangzhou 311121, China
[2] Shengzhou Wuai Kindergarten, Shengzhou 312400, China
[3] Zhejiang Philosophy and Social Science Laboratory for Research in Early Development and Childcare, Hangzhou Normal University, Hangzhou 311121, China
[4] Zhejiang Key Laboratory for Research in Assessment of Cognitive Impairments, Hangzhou Normal University, Hangzhou 311121, China
* Correspondence: liyangsai@hznu.edu.cn
† These authors contributed equally to this work.

Abstract: The present study examined children's lies to help others obtain benefits (other-benefiting lying) and its relation to theory of mind (ToM) and empathy among 3–5-year-old preschool children. One hundred nine children were recruited from preschools in China. A modified hide-and-seek paradigm was used to measure children's other-benefiting lying behavior, a ToM scale was used to measure children's ToM abilities, and an empathy scale was used to measure children's empathy abilities. Results showed that children tended to tell more lies to help other to get benefits as age increased, and further analyses showed that this other-benefiting lying was related to children's ToM component of false belief understanding and their cognitive empathy performance. These findings provide evidence that cognitive factors play important roles in children's lying to help others.

Keywords: children; other-benefiting lie; theory of mind; empathy

Citation: Zhang, X.; Wang, S.; Wang, Y.; Zhao, Q.; Shang, S.; Sai, L. Other-Benefiting Lying Behavior in Preschool Children and Its Relation to Theory of Mind and Empathy. *Behav. Sci.* **2023**, *13*, 634. https://doi.org/10.3390/bs13080634

Academic Editors: Xuechen Ding and Wan Ding

Received: 24 June 2023
Revised: 27 July 2023
Accepted: 28 July 2023
Published: 30 July 2023

1. Introduction

Prosocial lies refer to those lies that are told for the purpose of meeting the needs or interests of others [1]. Prosocial lies can promote trust and play an important role in maintaining good interpersonal relationships [2]. In recent years, developmental psychologists have begun to examine children's prosocial lies, as studying children's prosocial lies can help us better understand how children learn social norms and solve moral conflicts [3]. In the present study, we sought to examine a type of prosocial lies told to help others obtain benefits, called other-benefiting lies, among preschool children and their relation to theory of mind (ToM) and empathy.

Prosocial lying is a complex behavior because it requires an individual to choose between two opposite rules of communication [4]. Specifically, speakers are expected to be truthful with listeners to obey the rule of maxim of quality [5]. In contrast, telling prosocial lies conforms to the basic rule of communication that requires speakers to be friendly and help [6]. Prior research has shown that children as young as 3–4 years old rate prosocial lying more positively than antisocial lying, and this rating becomes more positive as age increases [7,8]. These findings suggest that children could perceive the positive aspect of prosocial lying. Recently, researchers have begun to pay substantial attention to children's actual prosocial lying behavior. Most of the existing research focuses on children's polite lying behavior, which is usually adopted to avoid hurting the listener's feelings [4]. Specifically, an undesirable gift paradigm is used to assess children's polite lying behavior. In the paradigm, children receive a gift they do not like after completing a game with the experimenter, and then the experimenter asks the children if they like the gift. Results consistently show that children as young as 3–4 years old are able to tell polite

lies to the experimenter by stating they like the gift (while telling their parents that they do not like the gift) [4,9–14]. As age increases, children tend to tell more polite lies (but also see [10]) and their lying behavior becomes more sophisticated. For example, children are more capable of telling polite lies that are credible enough to deceive the experimenters as their age increases [4].

Researchers have also examined what factors play important roles in children's polite lying behavior. Cognitive theory of children's lying proposes that cognitive factors are essential to the emergence and development of children's polite lying behavior [3,15]. One of the cognitive factors that researchers intensively focus on is ToM. ToM refers to the ability to understand others' minds and to attribute others' behaviors to the actors' mental states (e.g., [16]). According to cognitive theory, children's polite lying should be related to their ToM because successful lying requires creating false beliefs in others. Several studies have supported this view. For example, Lavoie et al. [14] found that children who told polite lies in the undesirable gift paradigm had higher ToM scores, and Williams et al. [13] found that children who are able to tell a convincing polite lie (i.e., semantic leakage control) showed more advanced ToM understanding. However, other studies using similar paradigms did not find a significant relation between children's polite lying behavior and their ToM performances. For example, Wang et al. [12] found that preschoolers' polite lying was not significantly related to their ToM performances (also see [17]).

Although substantial knowledge of children's polite lie-telling behavior has been acquired, it is still unclear whether children tell lies to help others gain benefits (e.g., help others gain prizes) and what factors play important roles in this kind of prosocial lies. Examining children's lying behavior aimed at helping others obtain benefits (other-benefiting lying) has great implications. First, previous research has shown that adults are more likely to lie when lying can help others gain benefits [18]. Thus, examining children's other-benefiting lying behavior could help us understand how children learn to balance the tension between the satisfaction of fundamental conventions of being truthful and considerations of helping another [3,17]. Second, as most existing research focuses on polite lying and its relation to cognitive factors, examining children's other-benefiting lying behavior would improve our understanding of whether the role of cognitive factors on prosocial lying varies with motivation. To date, only two studies have examined whether preschool children tell lies to help others gain benefits. For example, Talwar et al. [19] used a helping scenario paradigm to examine whether 3–5-year-old children would lie to benefit others. In the paradigm, children played a competitive game with an experimenter (Experimenter 2) for four rounds, and Experimenter 1 rewarded the winner of each round with a sticker. The game was designed to ensure that children won every round. In the final round, Experimenter 1 left the room, and Experimenter 2 asked the child to tell Experimenter 1 that he or she had won, so Experimenter 2 could earn a sticker. The results showed that, when Experimenter 1 returned and asked who had won the game, 45% of the children chose to lie to help Experimenter 2 earn the sticker, and the tendency to lie increased with age (also see [17]).

Talwar et al. [19] also examined the relation between children's lies to help others and their false belief understanding, but neither study found a significant relation between children's lies to help others and their false belief understanding. However, since only two studies have examined this issue, more studies are needed to confirm this null result. In addition, several previous studies have shown that preschool-aged children's lying is related to ToM components before false belief understanding. For example, Zhao et al. [20] found that children's lying for self-benefiting is significantly related to early ToM components such as diverse desires. It is possible that preschool-aged children's other-benefiting lying is also related to early ToM components. Moreover, prosocial lies may require more other-oriented motivation, and previous research has found a significant correlation between altruistic behavior and empathy [21–23]. The ability to feel empathy refers to the ability of individuals to interpret and predict the emotional and mental state of others based on their understanding and sharing of others' feelings [24]. Empathy not only includes emotional

empathy, i.e., the ability of individuals to generate emotional experiences similar or identical to those of the protagonist, but it also includes cognitive empathy, where individuals understand and speculate on the emotional state of the protagonist in the context [24,25]. Therefore, in addition to ToM, preschoolers' lies to help others may be related to their ability to feel empathy. Currently, only one study has examined the relation between children's lies to help others and empathy. Specifically, Nagar et al. [26] used the same helping scenario paradigm as Talwar and found a significant positive correlation between empathy and lying to help others in 6–12-year-old children. However, it is unclear whether this relation holds for preschool children.

In summary, this study aimed to investigate 3–5-year-old children's lying behaviour to help others and its relation to children's ToM and empathy. We aimed to address two research questions: (1) how preschoolers' other-benefiting lying changed with age; (2) whether ToM and empathy abilities play important roles in children's other-benefiting lying. To address these questions, a modified version of the hide-and-seek paradigm was used to assess children's lying behavior in this study. In the task, children hide a prize (e.g., a sticker) in one of two cups, and then the experimenter searches for the prize. If the experimenter finds it, the prize goes to the experimenter, but if the experimenter does not find it, the child successfully helps another child win the prize. Prior to the search, the experimenter asks the child in which cup the prize is hidden, and the child can mislead the experimenter by lying. In addition, a ToM scale was used to measure different kinds of ToM components such as diverse desires, diverse beliefs, knowledge access, false belief understanding, belief–emotion, and hidden emotion [27]. This is because previous research showed that preschool children's lying behavior is also related to the ToM components before false belief understanding [28]. Based on findings from previous research [19], we hypothesized that as age increases, children are more inclined to tell lies to help another child obtain benefits (hypothesis 1). Given the role of empathy in children's prosocial lying [29], and the findings on the relation between empathy and prosocial lying in older children [12,26], we hypothesized that children's other-benefiting lying would be significantly correlated with empathy (hypothesis 2). Finally, since the findings on the relation between children's prosocial lying and their ToM are controversial, we did not make hypotheses about the relation between children's other-benefiting lying and ToM.

2. Methods

2.1. Participants

A priori test was used to compute the required sample size by G*Power 3.1 [30] with Power $(1 - \beta)$ set to 0.95 and α set to 0.05, which revealed that, to detect a significant effect in the hierarchical linear regression with a medium effect size ($f^2 = 0.15$), 119 children would be required in total (about 40 children in each age group). We successfully recruited 109 children aged 3-to-5 years to participate in the study from two kindergartens in Zhejiang, China. There were 41 participants in the 3-year-old group (M_{age} = 3.64 years, SD = 0.25, 20 boys), 35 participants in the 4-year-old group (M_{age} = 4.65 years, SD = 0.23, 17 boys), and 33 participants in the 5-year-old group (M_{age} = 5.56 years, SD = 0.29, 17 boys). Our study obtained permission from the children's legal guardians, as well as verbal consent from the children themselves prior to the commencement of the study. This study was approved by the university ethics review board.

2.2. Procedure

Participants performed tests individually in a quiet room of their kindergarten. Children were tested on one lying task, one ToM task, and one Affective Situations Test for Empathy. The order of the tasks was counterbalanced across participants.

2.2.1. Hide-and-Seek Task (Other-Benefiting Lie Task)

We used a modified hide-and-seek task to assess children's other-benefiting lies [31]. Children were informed by the experimenter that they would participate in a game on

behalf of another child who could not be present. In the task, children needed to complete practice trials to learn the rules of the hide-and-seek task and then started the test trials. In the practice trials, children were required to hide a prize in one of two cups. The cups were upside down on the table, with a "window" on the side facing the children which only allowed children to see the inside of the cup. The experimenter provided a clear explanation of the game's rules to the children. When the experimenter guessed correctly, the experimenter was declared winner of the game and was allowed to keep the prize. When the experimenter guessed incorrectly, the children were declared winners of the game and were allowed to keep the prize. After the child had hidden, the experimenter guessed where the prize was. After the experimenter had made the choice, the experimenter asked the child whether he/she could get the prize. Only when children could answer the questions correctly, they were allowed to play the formal game.

After the warm-up, children were shown a photo of another child who was of the same age and gender as them, the experimenter told the children that the child, named Huahua (for boys) or Feifei (for girls), had the opportunity to win 10 prizes by playing a hide-and-seek game. However, he/she could not come to play, so the other children could play the game on his/her behalf. If the prize hidden by the child was found by the experimenter, Huahua could not obtain the prize; otherwise, Huahua could get the prize. Then, the child played 10 formal trials to win the prizes for Huahua. In each of the 10 trials, while the experimenter had her eyes closed, the children concealed a prize inside one of two cups. Upon the children's declaration that they had concealed the prize, the experimenter opened her eyes and inquired, "where did you stash the prize?"; the experimenter always guessed the cup that the children had indicated. When children truthfully pointed to the cup where the prize had been hidden, it was considered truth-telling (scored 0). Conversely, if they indicated the empty cup, it was regarded as lie-telling (scored 1). The lying score varied between 0 and 10.

2.2.2. ToM Scale

A Chinese version of the ToM Scale [27] was used to assess the children's ToM understanding. The Chinese edition closely resembles the North American version, with the only difference being the substitution of character and object names with ones that resonate with Chinese children [32]. The scale includes six subtasks: Diverse Desires [33,34], Diverse Beliefs [35], Knowledge Access [36], False Belief [37], Belief–Emotion [38], and Hidden Emotion [39]. Diverse desires pertain to the acknowledgement of the fact that individuals may possess desires different from one's own, diverse beliefs pertain to the recognition of the fact that others may hold different beliefs from one's own, knowledge access pertains to the understanding of the fact that people may not necessarily have equal access to information, false belief pertains to the understanding of the fact that others may hold incorrect beliefs about a given situation, belief–emotion pertains to the capacity to anticipate an emotional reaction within the context of a false belief, and hidden emotion pertains to the ability to predict an emotional feeling hidden or not. Each task involved a story. The experimenter read the story to the child and asked two questions, including a warm-up or control question along with its target question, and if children answered both questions correctly, they received 1 point. As an example, for the diverse desires assessment, the researcher presented two images of food—an enticing cookie and a healthy carrot—and asked the child to indicate their preference. After the child had made their choice, the researcher introduced another child named Xiaofang, stating that Xiaofang preferred the item not selected by the participant. The researcher then inquired about which item Xiaofang would choose. Hence, the cumulative scores ranged from 0 to 6 [32].

2.2.3. Affective Situations Test (Empathy Task)

The Affective Situations Test [25] is widely used to test children's empathy in the early and middle childhood years. In the current study, it was used to assess children's cognitive and affective empathy. There were four stories used for four affects: happiness (birthday

party), sadness (a lost rabbit), fear (frightening dog), and anger (the toy snatcher). Each story was recorded in a voice that contained emotion, which was consistent with the affect reflected in the story.

Four stories with pictures were shown to the child with the recording in random order. After each story, the child was asked two questions. One was "how does the protagonist feel" (cognitive empathy) and another was "how do you feel" (affective empathy). For each question, if the child's answer corresponded to what the story had described, he/she obtained 1 point. Thus, scores for cognitive and affective empathy both ranged from 0 to 4.

2.2.4. Data Analyses Plan

First, we used descriptive analyses to assess children's other-benefiting lying frequency for each age group, and then a one-way ANOVA was conducted to examine whether children's tendency to tell other-benefiting lies differed across age groups (hypothesis 1). Multiple comparisons were corrected by Bonferroni correction. Second, Pearson correlations and a hierarchical linear regression were conducted to examine whether children's ToM scores and empathy scores predicted their other-benefiting lying behavior (hypothesis 2).

3. Result

Preliminary analyses showed no significant correlation between gender and children's lying frequency, and between gender and cognitive abilities (*ps* > 0.10), so all reported analyses collapsed across gender.

3.1. Children's Other-Benefiting Lies

A total of 57.7% of the children lied at least once, lying, on average, 4.25 times (10 trials in total). Specifically, the lying frequency for 3-, 4- and 5-year-olds was 1.66, 4.97, and 6.70, respectively (for details, see Figure 1).

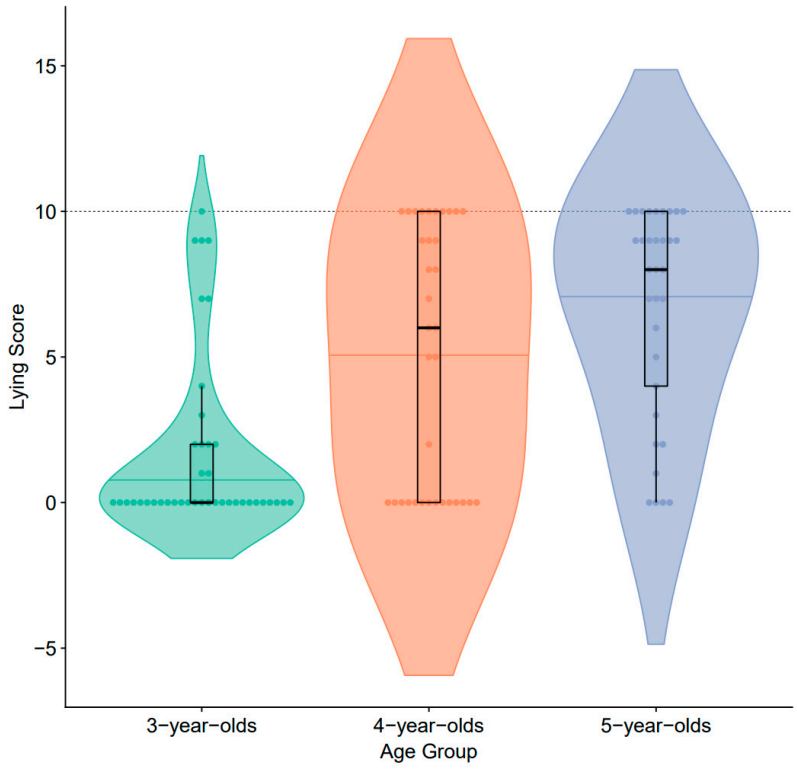

Figure 1. Scores of children's other-benefiting lies in each age group.

To examine the effect of age on the children's other-benefiting lying behavior, a one-way ANOVA was conducted with age (3, 4, and 5 years) as the independent variable and children's lying score as the dependent variable. There was a significant main effect of the age group, F (2, 109) = 17.67, $p < 0.001$, $\eta_p^2 = 0.25$. Follow-up analyses with Bonferroni correction revealed that 3-year-olds told fewer lies ($M = 1.65$, $SE = 0.48$) than 4-year-olds ($M = 4.97$, $SE = 0.76$, $p < 0.01$) and 5-year-olds ($M = 6.70$, $SE = 0.63$, $p < 0.001$), while the difference between 4-year-olds and 5-year-olds' other-benefiting lying frequency was marginally significant ($p = 0.059$) (see Table 1). This result is consistent with hypothesis 1.

Table 1. Lying score, ToM, and empathy by age group (*M*, *SD*).

Age Group		3-Year-Olds	4-Year-Olds	5-Year-Olds	Age Group Difference [a]	
					F	*p*
n		41	35	33		
Lying score		1.66 (3.05)	4.97 (4.48)	6.70 (3.63)	20.59	<0.001
ToM	Diverse Desires	0.98 (0.16)	0.91 (0.28)	0.94 (0.24)	0.30	0.742
	Diverse Beliefs	0.59 (0.50)	0.94 (0.24)	0.94 (0.24)	17.42	<0.001
	Knowledge Access	0.71 (0.46)	0.86 (0.36)	0.88 (0.33)	1.99	0.139
	False Belief	0.10 (0.30)	0.54 (0.51)	0.85 (0.36)	30.71	<0.001
	Belief Emotion	0.34 (0.48)	0.51 (0.57)	0.88 (0.33)	31.87	<0.001
	Hidden Emotion	0.17 (0.38)	0.34 (0.48)	0.30 (0.47)	1.09	0.339
Cognitive Empathy [b]		2.33 (.82)	2.72 (1.10)	3.46 (.69)	8.96	<0.001
Affective Empathy [b]		1.67 (.98)	2.48 (1.12)	2.96 (1.00)	7.52	0.001

Note. [a.] The analysis of variance (ANOVA) results for the main effect of age group. [b.] Some of the children could not understand the story and their data on empathy were excluded. The remaining sample sizes were 15, 29, and 28 for each age group. The main effect of the age group was tested.

3.2. The Relation among Children's Other-Benefiting Lies, ToM, and Empathy

To explore the relation among children's other-benefiting lies, ToM, and empathy, partial correlations were conducted between scores of other-benefiting lies and ToM scores, and between scores of other-benefiting lies and empathy scores. The results showed that, after controlling for age (see Table 2), children's other-benefiting lie scores were positively correlated with their understanding of false belief ($r = 0.27$, $p = 0.024$) and their cognitive empathy scores ($r = 0.29$, $p = 0.014$).

Table 2. Partial correlations between other-benefiting lying score, ToM, and empathy (controlling for age).

	1	2	3	4	5	6	7	8	9
1. Lying score	–								
2. Diverse desires	0.08	–							
3. Diverse beliefs	0.19	0.18	–						
4. Knowledge access	0.13	−0.03	0.07	–					
5. False belief	0.27 *	0.06	0.16	0.06	–				
6. Belief emotion	0.14	0.05	0.12	−0.02	0.23	–			
7. Hidden emotion	−0.07	−0.15	−0.26 *	0.16	0.08	−0.06	–		
8. Cognitive empathy	0.29 *	0.14	−0.14	0.06	0.06	0.21	−0.05	–	
9. Affective empathy	0.14	−0.03	−0.06	−0.05	0.26 *	0.02	−0.23	0.33 **	–

Note. * $p < 0.05$, ** $p < 0.01$.

To further examine the influence of ToM and empathy on children's other-benefiting lies, a hierarchical linear regression was conducted with scores of other-benefiting lies as the predicted variable. Age was entered into the model in the first block, followed by scores of different ToM in the second block, and scores of empathy in the third block. Results showed

that the first block was significant, ΔF (1, 70) = 19.82, ΔR^2 = 0.23, $p < 0.001$, indicating that older children's propensity to engage in other-benefiting lies increased (β = 0.48, t = 4.45, $p < 0.001$). The second was also significant, ΔF (1, 69) = 5.75, ΔR^2 = 0.06, p = 0.019, and the remaining subscale of ToM was false belief, β = 0.29, t = 2.40, p = 0.019, indicating that children who had a better understanding of false belief told more other-benefiting lies. The third block was also significant, ΔF (1, 68) = 5.01, ΔR^2 = 0.05, p = 0.029, and the remaining subscale of empathy was cognitive empathy, β = 0.25, t = 2.24, p = 0.029, indicating that children who had better cognitive empathy skills told more other-benefiting lies, which is consistent with hypothesis 2 (see Table 3).

Table 3. The results of the hierarchical linear regression on other-benefiting lying scores.

	Variable	β	t	p	ΔR^2	ΔF
Block 1	Age	0.48	4.45	<0.001	0.23	19.82 ***
Block 2	False belief	0.29	2.40	0.019	0.06	5.75 *
Block 3	Cognitive empathy	0.25	2.24	0.029	0.05	5.01 *

Note. * $p < 0.05$, *** $p < 0.001$.

4. Discussion

The present study examined other-benefiting lying behavior in 3–5-year-old preschool children and its relationship with ToM and empathy. To date, research on children's prosocial lying behavior mostly focuses on polite lie-telling behavior. Given that lying to help others gain benefits is prevalent in adults [18], it is important to examine how this other-benefiting lying behavior develops and what factors are essential to its development. Our results showed that 3-year-old children rarely engaged in other-benefiting lies and, as age increased, 4–5-year-old children tended to engage more in other-benefiting lying behavior. In addition, we found a significant positive correlation between children's other-benefiting lies and their ToM and empathy abilities.

First, we found that 3-year-old children told very few other-benefiting lies in the high-and-seek task (1.66 out of 10, on average), but children's tendency to tell other-benefiting lies increased with age, and children told other-benefiting lies in more than half of the test trials at the age of 5 (6.70 out of 10, on average). These results (in line with hypothesis 1) suggest that children are more likely to tell other-benefiting lies as they grow older. This finding is consistent with research which found that children become more concerned with the needs of others as their age increases [15]. Talwar et al. [17] examined 3–6-year-old children's other-benefiting lying and found that 45% of children were willing to tell other-benefiting lies and that children became more likely to lie as their age increased. Thus, our results pattern is similar to findings from Talwar and colleagues, although the paradigm they used is different from ours. In addition, previous studies found that children's tendency to tell a polite lie increases with the children's age [10]. These results together demonstrate that children's prosocial lying increases with age regardless of whether the prosocial lying occurs to be polite or to help others gain benefits. One possible reason for this increased tendency to exhibit prosocial lying behavior is that, as age increases, children are more likely to value prosocial lying positively and behaving accordingly [8]. Further studies should investigate the relation between children's actual other-benefiting lying and their judgment about that kind of lying to test this hypothesis.

Second, we found that children's ToM significantly predicted their other-benefiting lying behavior. Specifically, the false belief understanding component of ToM predicted other-benefiting lying in preschool children. This is because children require the ability to implant a false belief in others to successfully deceive them [3]. This finding is consistent with previous research which showed that children's prosocial lying such as polite lying is related to false belief understanding [8]. It should be noted that previous research has shown a significant positive correlation between preschool children's antisocial lies and false belief understanding [40]. These results suggest that lying, regardless of the motivation, requires the cognitive process of ToM. However, our result is not consistent

with the findings from Talwar et al. [19], in which they did not find a significant correlation between children's other-benefiting lying and false belief understanding. One possible explanation is that, in their study, other-benefiting lying required children to compromise their interests, which may have led even children with ToM abilities not to engage in other-benefiting lying; hence, the lack of correlation between the two.

In addition, we found that preschool children's empathy, especially cognitive empathy, predicted their other-benefiting lying behavior, a finding which supports hypothesis 2. Specifically, children who could understand others' emotional states were more likely to engage in other-benefiting lying. In the current paradigm, children are aware that the child who did not come to play will be happy/sad if he/she can get/not get the stickers. Understanding these emotional states may drive children to tell lies to help the child obtain the sticker. This result is consistent with previous findings. For example, Nagar et al. [26] found that other-benefiting lying in 7–11-year-old children was related to cognitive empathy, indicating that cognitive empathy may be an internal motivation for altruistic lying [23,26]. The present findings suggest that young children are similar to school-age children in that their other-benefiting lying behavior is also related to cognitive empathy. This discovery suggests that cognitive empathy may reflect children's other-oriented motivation to some extent [11,26].

There are some limitations to this study. Firstly, the results were based on the cultural background of China. Cross-cultural studies have found that children's moral understanding and evaluation of prosocial lies differ between the Chinese and Western cultural backgrounds [8]. Given the significant positive correlation between lying behavior and moral evaluation of lying, future studies should further explore the influence of different cultures on children's other-benefiting lying behavior. Secondly, this study was a cross-sectional study. Future longitudinal studies are required to explore the possible causal relationship among ToM, empathy, and other-benefiting lying in children (e.g., [17]). Thirdly, several previous studies have shown that children's prosocial lying behavior is related to their executive function abilities. For example, Williams [13] found that 6–12-years-old children's prosocial lying is significantly correlated to their inhibitory control and working memory abilities. Future studies should also examine the relation between executive function abilities and children's other-benefiting lying. Lastly, this study only examined cognitive factors (ToM and empathy) that may affect children's other-benefiting lying behavior, but previous research has shown that social and situational factors such as social class can also affect children's lying behavior [41]. Thus, future studies should further explore how social and situational factors influence children's other-benefiting lying.

In summary, research on children's other-benefiting lying behavior is helpful in understanding how children resolve conflicts between different moral norms, such as honesty versus helping others. The present study found that 3-year-old children were less likely to tell other-benefiting lies, but the tendency to tell other-benefiting lies increased significantly with age, with 5-year-old children telling other-benefiting lies in more than half of the total trials. Furthermore, this study found positive correlations among children's other-benefiting lying and their ToM understanding and cognitive empathy ability, indicating that cognitive factors play important roles in the age-related changes in children's other-benefiting lying. These results not only provide evidence of how cognitive factors influence children's other-benefiting lying, but also have important implications for teachers and parents in relation to the guiding of children in the development of a correct understanding of other-benefiting lies.

Author Contributions: Conceptualization, L.S.; methodology and formal analysis, X.Z., Y.W. and Q.Z.; investigation, Y.W. and Q.Z.; resources, X.Z.; data curation, S.S.; writing—original draft preparation, S.W. and X.Z.; writing—review and editing, L.S. and S.W.; visualization, X.Z. and S.W.; supervision, project administration and funding acquisition, L.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by National Natural Science Foundation of China, grant number 32271111.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board of the Department of Psychology, College of Education, Hangzhou Normal University (2022-1136).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data will be available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Levine, E.E.; Lupoli, M.J. Prosocial lies: Causes and consequences. *Curr. Opin. Psychol.* **2022**, *43*, 335–340. [CrossRef] [PubMed]
2. Levine, E.E.; Schweitzer, M.E. Prosocial lies: When deception breeds trust. *Organ. Behav. Hum. Decis. Process.* **2015**, *126*, 88–106. [CrossRef]
3. Lee, K. Little Liars: Development of Verbal Deception in Children. *Child Dev. Perspect.* **2013**, *7*, 91–96. [CrossRef] [PubMed]
4. Popliger, M.; Talwar, V.; Crossman, A. Predictors of children's prosocial lie-telling: Motivation, socialization variables, and moral understanding. *J. Exp. Child Psychol.* **2011**, *110*, 373–392. [CrossRef]
5. Grice, H.P. *Studies in the Way of Words*; Harvard University Press: Cambridge, MA, USA, 1980.
6. Sweetser, E.E. The definition of lie: An Examination of the Folk Models Underlying a Semantic Prototype. In *Cultural Models in Language and Thought*; Holland, D., Quinn, N., Eds.; Cambridge University Press: New York, NY, USA, 1987; pp. 43–66.
7. Bussey, K. Children's categorization and evaluation of different types of lies and truths. *Child Dev.* **1999**, *70*, 1338–1347. [CrossRef]
8. Xu, F.; Bao, X.H.; Fu, G.Y.; Talwar, V.; Lee, K. Lying and Truth-Telling in Children: From Concept to Action. *Child Dev.* **2010**, *81*, 581–596. [CrossRef] [PubMed]
9. Talwar, V.; Lee, K. Emergence of white-lie telling in children between 3 and 7 years of age. *Merrill-Palmer Q.* **2002**, *48*, 160–181. [CrossRef]
10. Talwar, V.; Murphy, S.M.; Lee, K. White lie-telling in children for politeness purposes. *Int. J. Behav. Dev.* **2007**, *31*, 1–11. [CrossRef]
11. Demedardi, M.J.; Brechet, C.; Gentaz, E.; Monnier, C. Prosocial lying in children between 4 and 11 years of age: The role of emotional understanding and empathy. *J. Exp. Child Psychol.* **2021**, *203*, 105045. [CrossRef]
12. Wang, Y.Y.; Hong, S.; Pei, M.; Wang, X.N.; Su, Y.J. Emotion matters in early polite lies: Preschoolers' polite lie-telling in relation to cognitive and emotion-related abilities. *Soc. Dev.* **2022**, *31*, 406–422. [CrossRef]
13. Williams, S.; Moore, K.; Crossman, A.M.; Talwar, V. The role of executive functions and theory of mind in children's prosocial lie-telling. *J. Exp. Child Psychol.* **2016**, *141*, 256–266. [CrossRef]
14. Lavoie, J.; Yachison, S.; Crossman, A.; Talwar, V. Polite, instrumental, and dual liars: Relation to children's developing social skills and cognitive ability. *Int. J. Behav. Dev.* **2017**, *41*, 257–264. [CrossRef]
15. Talwar, V.; Crossman, A. From Little White Lies to Filthy Liars: The Evolution of Honesty and Deception in Young Children. In *Advances in Child Development and Behavior*; Benson, J.B., Ed.; Elsevier: Amsterdam, The Netherlands, 2011; Volume 40, pp. 139–179.
16. Wellman, H.M.; Cross, D.; Watson, J. Meta-Analysis of Theory-of-Mind Development: The Truth about False Belief. *Child Dev.* **2003**, *72*, 655–684. [CrossRef]
17. Talwar, V.; Lavoie, J.; Crossman, A.M. Carving Pinocchio: Longitudinal examination of children's lying for different goals. *J. Exp. Child Psychol.* **2019**, *181*, 34–55. [CrossRef]
18. Wiltermuth, S.S. Cheating more when the spoils are split. *Organ. Behav. Hum. Decis. Process.* **2011**, *115*, 157–168. [CrossRef]
19. Talwar, V.; Crossman, A.; Wyman, J. The role of executive functioning and theory of mind in children's lies for another and for themselves. *Early Child. Res. Q.* **2017**, *41*, 126–135. [CrossRef]
20. Zhao, C.Z.; Shang, S.Y.; Compton, A.M.; Fu, G.Y.; Sai, L.Y. A Longitudinal Study of the Relations Between Theory of Mind, Executive Function, and Lying in Children. *Front. Psychol.* **2021**, *12*, 766891. [CrossRef] [PubMed]
21. Batson, C.D. The altruism question: Toward a social-psychological answer. *Choice Rev. Online* **1992**, *29*, 29–4797.
22. Klimecki, O.M.; Mayer, S.V.; Jusyte, A.; Scheeff, J.; Schonenberg, M. Empathy promotes altruistic behavior in economic interactions. *Sci. Rep.* **2016**, *6*, 31961. [CrossRef]
23. Pavey, L.; Greitemeyer, T.; Sparks, P. "I Help Because I Want to, Not Because You Tell Me to": Empathy Increases Autonomously Motivated Helping. *Personal. Soc. Psychol. Bull.* **2012**, *38*, 681–689. [CrossRef] [PubMed]
24. Decety, J.; Jackson, P.L. The Functional Architecture of Human Empathy. *Behav. Cogn. Neurosci. Rev.* **2004**, *3*, 71–100. [CrossRef]
25. Feshbach, N.D.; Roe, K. Empathy in Six- and Seven-Year-Olds. *Child Dev.* **1968**, *39*, 133. [CrossRef]
26. Nagar, P.M.; Caivano, O.; Talwar, V. The role of empathy in children's costly prosocial lie-telling behaviour. *Infant Child Dev.* **2020**, *29*, e2179. [CrossRef]
27. Wellman, H.M.; Liu, D. Scaling of Theory-of-Mind Tasks. *Child Dev.* **2004**, *75*, 523–541. [CrossRef]
28. Ma, F.L.; Evans, A.D.; Liu, Y.; Luo, X.M.; Xu, F. To lie or not to lie? The influence of parenting and theory-of-mind understanding on three-year-old children's honesty. *J. Moral Educ.* **2015**, *44*, 198–212. [CrossRef]

29. Eisenberg, N.; Spinrad, T.L.; Sadovsky, A. Empathy-Related Responding in Children. In *Handbook of Moral Development*; Psychology Press: London, UK, 2006; pp. 517–549.
30. Faul, F.; Erdfelder, E.; Buchner, A.; Lang, A.G. Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behav. Res. Methods* **2009**, *41*, 1149–1160. [CrossRef] [PubMed]
31. Hala, S.; Chandler, M.; Fritz, A.S. Fledgling Theories of Mind: Deception as a Marker of Three-Year-Olds' Understanding of False Belief. *Child Dev.* **1991**, *62*, 83–97. [CrossRef]
32. Sai, L.Y.; Zhao, C.Z.; Heyman, G.D.; Compton, B.J.; Fu, G.Y. Young children's lying and early mental state understanding. *Infant Child Dev.* **2020**, *29*, e2197. [CrossRef]
33. Repacholi, B.M.; Gopnik, A. Early reasoning about desires: Evidence from 14- and 18-month-olds. *Dev. Psychol.* **1997**, *33*, 12–21. [CrossRef] [PubMed]
34. Wellman, H.M.; Woolley, J.D. From simple desires to ordinary beliefs: The early development of everyday psychology. *Cognition* **1990**, *35*, 245–275. [CrossRef] [PubMed]
35. Wellman, H.M.; Bartsch, K. Three-year-olds understand belief: A reply to Perner. *Cognition* **1989**, *33*, 321–326. [CrossRef]
36. Pratt, C.; Bryant, P. Young Children Understand That Looking Leads to Knowing (So Long as They Are Looking into a Single Barrel). *Child Dev.* **1990**, *61*, 973–982. [CrossRef] [PubMed]
37. Perner, J.; Leekam, S.R.; Wimmer, H. Three-year-olds' difficulty with false belief: The case for a conceptual deficit. *Br. J. Dev. Psychol.* **1987**, *5*, 125–137. [CrossRef]
38. Harris, P.L.; Johnson, C.N.; Hutton, D.; Andrews, G.; Cooke, T. Young Children's Theory of Mind and Emotion. *Cogn. Emot.* **1989**, *3*, 379–400. [CrossRef]
39. Harris, P.L.; Donnelly, K.; Guz, G.R.; Pitt-Watson, R. Children's Understanding of the Distinction between Real and Apparent Emotion. *Child Dev.* **1986**, *57*, 895–909. [CrossRef]
40. Fu, G.Y.; Sai, L.Y.; Yuan, F.; Lee, K. Young children's self-benefiting lies and their relation to executive functioning and theory of mind. *Infant Child Dev.* **2018**, *27*, e2051. [CrossRef]
41. Talwar, V.; Crossman, A. Liar, liar… sometimes: Understanding social-environmental influences on the development of lying. *Curr. Opin. Psychol.* **2022**, *47*, 101374. [CrossRef] [PubMed]

behavioral sciences

MDPI

Article

Relations between Video Game Engagement and Social Development in Children: The Mediating Role of Executive Function and Age-Related Moderation

Ke Xu [1,†], Shuliang Geng [1,†], Donghui Dou [2] and Xiaocen Liu [1,*]

[1] College of Preschool Education, Capital Normal University, Beijing 100048, China; 18336930031@163.com (K.X.); 2223102004@cnu.edu.cn (S.G.)
[2] School of Sociology and Psychology, Central University of Finance and Economics, Beijing 100081, China; psychaos@126.com
* Correspondence: cindyliu@cnu.edu.cn
† These authors contributed equally to this work.

Abstract: The global proliferation of video games, particularly among children, has led to growing concerns about the potential impact on children's social development. Executive function is a cognitive ability that plays a crucial role in children's social development, but a child's age constrains its development. To examine the association between video game engagement and children's social development while considering the mediating role of executive function and the moderating role of age, a questionnaire was distributed to a sample of 431 parents. The results revealed a negative relation between video game engagement and social development in children, with executive function found to mediate this relation fully. Additionally, the negative association between video game engagement and executive function became more pronounced as children grew older. In light of these findings, it is advisable to adopt proactive strategies to limit excessive video game use, consider the developmental characteristics of children at different ages, and prioritize the promotion of executive function to facilitate social development among children.

Keywords: child; electronic game; social behavior; executive function; age

Citation: Xu, K.; Geng, S.; Dou, D.; Liu, X. Relations between Video Game Engagement and Social Development in Children: The Mediating Role of Executive Function and Age-Related Moderation. *Behav. Sci.* **2023**, *13*, 833. https://doi.org/10.3390/bs13100833

Academic Editors: Xuechen Ding and Wan Ding

Received: 24 August 2023
Revised: 4 October 2023
Accepted: 8 October 2023
Published: 11 October 2023

1. Introduction

Video games have rapidly emerged as a prevalent facet of children's daily experiences globally. Their appeal to children can be attributed to features such as engaging content, immediate feedback, user interactivity, broad media accessibility, and applicability across a diverse age spectrum [1]. A study by Liu et al., encompassing urban and rural populations in China, revealed that 96.1% of children had encountered video games by the age of six. Alarmingly, within this cohort, 36.3% of children engaged in sessions exceeding an hour, with some sessions surpassing eight continuous hours [2]. Alanko noted that a mere 10% of U.S. children aged over two years remain unexposed to video games. Furthermore, youth between 8 and 17 years reportedly dedicate an average of 1.5 to 2 h daily to such digital pursuits [3].

The term "video games" describes games played on audiovisual devices that follow a particular narrative [4]. In English, "video game" and "electronic game" are often used interchangeably, although the latter encompasses all interactive games played on electronic devices. Given the ubiquity of video games within the realm of electronic games, "video game" has become the predominant term for such digital entertainment in English [5]. Previous research primarily relied on objective metrics, such as duration and frequency, to quantify individuals' interactions with video games [6]. To provide a more nuanced understanding of children's interactions with video games, the metric of "video game engagement" has been proposed. This concept delineates the intensity of individuals'

motivation and cognitive-emotional stimulation during gameplay [7]. Qu et al. expanded on this by categorizing "video game engagement" into four dimensions: interest in the activity, focus during play, challenges in discontinuation, and social disengagement [8].

The Ecological Techno-Microsystem Theory articulates that diverse media environments, encompassing the use of communication, information, and recreation technologies (i.e., the techno-subsystem), act as an immediate system, profoundly impacting multiple facets of children's development, including their social, emotional, physical, and cognitive growth [9]. As a form of new media highly favored by children, video games have long been debated regarding their impact on child development. Some argue that video games may positively affect individuals' cognitive, motivational, emotional, and social development [10,11]. However, evidence suggests that video games, particularly those marketed to young children, can adversely affect academic functioning and child development [12]. In their seminal work, Raventós and Belli shed light on the long-standing biases shaping the perception of video games. They pointed out the historical tendency to focus on the purported negative impact of gaming on youth and society [13]. The authors advocate for a more nuanced, evidence-based understanding of gaming's societal and individual effects. Consequently, elucidating the impact of video gaming on child development is vitally important, particularly in a post-pandemic society grappling with the long-term consequences of substituting technology for face-to-face interactions.

Notably, the COVID-19 pandemic has fueled an uptick in video game engagement. Supporting this observation, Chen et al. observed that pandemic-induced school closures and limited outdoor activities led to heightened video game exposure among children [14]. Similarly, during the peak of these closures, Donati et al. documented a notable surge in children's video game usage [15]. Research by Zhu et al. revealed that in a sample of 2863 children and adolescents, 18% engaged in gaming for over three hours per day [16]. Shoshani et al. corroborated this pattern, finding increased gaming among 1537 Israeli youth during the pandemic, a notably pronounced trend for children with ADHD [17]. Werling et al. assessed shifts in media usage through parental reports at three time points (before the blockade, during the blockade, and within 1–2 months afterward), highlighting a 46% increase in children's media consumption, including video games, during lockdown periods [18]. Given the surge in children's video game engagement during the pandemic, this study aims to investigate its associations with cognitive and social development, especially in a societal context increasingly shaped by technology-driven youth behavior.

1.1. Video Game Engagement and Children's Social Development

"Social development" refers to the unique psychological characteristics of an individual that are formed on a physiological basis as they participate in social life and interactions. This term encompasses adherence to societal norms, emotional stability, social awareness, familial bonds, and peer relationships [19]. Positive social development during childhood is correlated with favorable social adjustment, effective interpersonal interactions, academic success, and cognitive capacity in subsequent stages of life [20,21]. Thus, understanding the determinants influencing children's social development is imperative. Extensive research underscores video games' substantial influence on children's social development [22,23].

The impact of video games on children's social development is a topic of debate. Several studies have suggested that video games foster positive outcomes in children's social growth. For example, Yilmaz and Griffiths posited that the diverse interactions facilitated by pro-social video games bolster the development of children's peer relationships [24]. Concurrently, other scholars have emphasized the role of video games in enhancing social interaction and collaborative efforts [25]. Many of these games feature multiplayer functionality, fostering improved communication and cooperative skills among children [26]. In consonance with this view, Raventós and Belli indicated that gaming environments enable players to forge friendships and establish shared interests, catalyzing the genesis of novel social bonds [13]. Furthermore, certain video games are geared towards bolstering

problem-solving abilities, analytical reasoning, and innovative cognition, all crucial for comprehensive social development [27].

Nonetheless, academic voices are concerned about the ramifications of heightened video game engagement on children's social development [6]. Davis et al. asserted that children deeply immersed in video games often exhibit increased aggressive behaviors and notable social inadequacies [28]. The General Learning Model postulates that individuals deeply engrossed in video games might develop an addiction-like relationship with the medium, consequently impeding their social development [29]. This model suggests that children heavily involved with video games may consistently internalize the game's content and mechanics, leading to cognitive and emotional disturbances, including hostility and indifference [30,31]. Further, Gentile et al., through a biennial longitudinal study, discerned that augmented social challenges and impulsivity were byproducts of children's heightened video game engagement [32]. Thus, excessive video game engagement may negatively correlate with children's social development.

Undoubtedly, the pandemic's influence on individual social development warrants scholarly attention. To contain COVID-19, numerous governmental interventions, such as self-quarantine and social distancing, have been put into place [33,34]. However, the pandemic's far-reaching implications for all demographics, including children, cannot be overlooked. Countries like Germany, China, and Bangladesh have reported increased psychological stress related to health concerns and economic instability [35–37], which inevitably has a downstream impact on children's social development [38]. Additionally, the overwhelming influx of pandemic-related news has heightened anxiety, particularly among children [39]. Nevertheless, contrasting views exist; Allen et al. found minimal changes in children's emotional well-being pre- and post-pandemic when assessed using Rumble's Quest [40].

In this complex landscape, infants and young children born or raised during COVID-19 are of specific concern. Lockdown measures have curtailed their opportunities for conventional social interaction and development [41]. In this restricted environment, their engagement with video games becomes a salient point of inquiry. While some research suggests that video games can offer virtual interactions that teach pro-social behaviors like sharing and cooperation [42], others argue that excessive gaming could discourage real-world social engagement, thus impeding social development [43]. In light of this intricate and multifaceted context, it could be hypothesized that the surge in video game engagement, especially induced by the pandemic, may adversely affect children's social development.

1.2. The Mediating Role of Executive Function

Executive function denotes a higher-order cognitive capacity, facilitating the cohesive and analytical regulation of an individual's cognitive processes and behaviors. This capacity encompasses vital facets such as inhibition, working memory, and cognitive flexibility [44]. These components collectively constitute pivotal constituents within the scaffolding of intricate proficiencies and aptitudes in human development [45,46]. Inhibition is a sophisticated cognitive process that empowers individuals to quell predominant reactions and counteract extraneous interference [47]. Working memory pertains to an individual's proficiency in continuously retaining, manipulating, and modifying the contents held in short-term memory [48]. Cognitive flexibility is the disposition to engage in creative ideation, adopt diverse perspectives, and promptly and adaptively respond to altered contexts [44]. The underpinning of executive function is closely intertwined with the prefrontal cortical region of the cerebral apparatus, proffering a substrate for the governance and impetus of human cognition and comportment. A robust executive function is a prerequisite for ensuring the progression of an individual's mental well-being [49].

As children age and accumulate experience, their executive functions undergo rapid development. Inhibition, for instance, manifests as early as infancy, with its first significant leap occurring in the preschool years and continuing to improve throughout childhood [50].

Research indicated that infants could delay eating times, and the ability to delay eating increases with age. Specifically, 50% of two-year-olds could delay eating for 20 s, 85% of three-year-olds could inhibit the impulse to eat for one minute, and four-year-olds could delay eating for up to five minutes [51]. Luria's tapping test revealed that children between the ages of four and four and a half showed marked improvements in inhibition, with most advances occurring before age six. Older children demonstrated faster response times and higher accuracy rates [52]. Concerning working memory, continuous improvements are observed from infancy through preschool. Perlman found that prefrontal cortex activation during a working memory task increased with age in children aged three to seven [53]. Best posited that individual working memory followed a linear trajectory from ages 4 to 14, stabilizing after 16 [50]. In a parallel vein, Ahmed utilized nationally representative data to exhibit nonlinear growth patterns in working memory performance from ages 3 to 19, with the most rapid growth occurring during childhood [54]. Research on cognitive flexibility suggests that this skill begins to emerge in children around the age of two and gradually develops between the ages of three and five [50]. Buttelmann et al.'s study supports this notion and indicates that cognitive flexibility develops rapidly in preschool and continues to increase into adolescence [55]. By age 12, children's cognitive flexibility levels approximate those of adults [56].

The relation between video games and executive function is a complex and debated topic in psychology. Some studies argued that video games might have positive effects on specific aspects of executive function. For instance, Whitlock et al. discovered that engagement with the massively multiplayer role-playing game "World of Warcraft" enhanced Stroop performance [57]. Similarly, Liu et al. found that video gaming significantly elevated children's inhibition abilities; children who had undergone video game training outperformed their non-trained counterparts on the Go/No-Go task [47]. Even if they no longer engage in gaming, individuals who were gamers before adolescence displayed superior working memory performance, heightened attentional focus, and enhanced information acquisition capabilities [58]. A meta-analysis by Glass et al. revealed that gaming conditions emphasizing the maintenance and rapid switching between multiple information and action sources substantially increased cognitive flexibility [59]. Further research indicates that complex puzzle-based video games, which necessitate strategic planning and reframing, can even augment the thickness of the player's right dorsolateral prefrontal cortex, right hippocampal formation, and bilateral cerebellar cortex [60,61], thereby significantly elevating executive function levels.

Conversely, studies have elucidated that inappropriate exposure to video games could yield detrimental repercussions for children's executive function [62]. Cognitive engagement in video gameplay is the mechanism of acute effects on executive function [63]. A study by Yang et al. unveiled an adverse correlation between the presence of action-oriented content in video games and a facet of executive function related to inhibition in children [64]. Correspondingly, scholarly exploration has indicated that participating in violent video games can modulate prefrontal cortical activity while engaging in cognitive inhibition [65]. Moreover, an escalating degree of addiction to video games corresponds to deteriorating performance in working memory tasks [66]. A systematic review offered empirical evidence that pathological and/or excessive utilization of video games engenders detrimental outcomes for cognitive processes, encompassing inhibition and decision-making [67]. Similarly, research showed that individuals exposed to video games for 3 h per day showed reduced inhibitory control compared with those exposed to video games for a limited amount of time per day. Those overexposed to video games had smaller gray matter volumes and thinner cortex in the ventral medial prefrontal cortex, along with shallower dorsolateral frontal sulci [68]. Hence, it can be logically inferred that excessive engagement with video games may harm children's executive function, highlighting a critical area for further investigation and potential intervention.

Empirical evidence illustrates that heightened levels of executive function play a significant role in children's social development [69]. A study by Hughes and Ensor

found that executive function skills, such as inhibitory control and working memory, were positively associated with theory of mind (ToM) abilities, which involve understanding others' thoughts and feelings [70]. Similarly, Ming et al. found that higher levels of executive function were associated with greater social competence in children [71]. In contrast, children with poorer executive function also experienced increased isolation and less engagement with peers on the playground [72]. Ego Depletion Theory posits that the performance of volitional activities—such as controlling processes, forming choices, initiating behaviors, and overcoming reactions—requires the expenditure of cognitive resources [73]. When a child's executive function is debilitated, the tasks of self-control and regulation necessitate an atypical abundance of resources. A subsequent depletion of these resources may lead to an escalation in the child's aggressive behavior. Empirical studies have further validated that executive function is a significant predictor of aggression levels in children, with children exhibiting deficits in this area being more inclined to demonstrate aggression in social interactions [74]. Given this evidence, it is plausible to hypothesize that engagement with video games is associated with children's social development via the mechanism of executive function.

1.3. The Moderating Role of Age

Video game engagement exhibits a close relation with executive function, and investigating variables that may moderate the association between video game engagement and executive function holds significant value for enhancing children's cognitive development. Among these moderating variables, age has been identified as an essential factor that may influence this relation [50]. Ecological Systems Theory emphasizes the importance of considering the systems and contexts that influence child development, including the role of age. Children's age is a temporal system interacting with other ecological systems to shape their development [75]. Research has shown that children's age relates to their video game engagement and its relation to executive function [76].

Recent evidence demonstrates a developmental trend in video game exposure, where older children engage in playing video games more frequently than their younger counterparts. A study illustrated that children's exposure to video games was infrequent before age two, with average playtime recorded at approximately 20 min per day for children aged 2–3 years. This duration of exposure exhibited a progressive increase with age, with those between 5–8 years playing video games for an average of 40 min daily and those between 8–12 years for approximately 80 min a day [76]. Concordantly, Gentile found that older students were more prone to report excessive video game playing [77]. These convergent findings support the notion that older children engage more in video games than younger children, highlighting the importance of investigating potential implications for cognitive development and executive function.

In addition to the amount of time of video game exposure, children's game genre preferences change throughout their lifespan. The categorization of video games varies across studies due to differing research objectives and target populations. Traditional classifications encompass various game types, from strategy and puzzle games to action/adventure and simulation games [78]. However, these categories often blur, leading researchers to develop customized typologies [79]. For example, Yu and Chan grouped games into four types based on player impact: conventional, exergames, cognitive training, and VR/simulation games [80]. Eichenbaum et al. tailored their classification to the needs of school-age children, identifying five game types: role-playing, action, strategy, music, and puzzles [81]. In the present study, a unique eight-type classification is adopted, specifically designed to align with the age characteristics of young children and the popularity of games. The categories are puzzle games, action games, simulation games, art games, sports games, adventure games, role-playing games, and other games. Video games are dedicated to meeting the needs of individuals, which change throughout the developmental stages as they grow in their abilities. For instance, the cognitive skills required for navigating game challenges are age-dependent; game genres that engage younger children may lose their

appeal to adolescents [82]. Research has found that brain games that include exploration and decision-making elements are more popular with preschoolers [81,83]. Conversely, action-adventure games tend to captivate school-age children [84]. Some research has concluded that action games require players to focus on fast-paced, complex goals and that such a requirement may be too demanding for younger children [81].

Childhood is the optimal time to examine whether and how screen time exposure (such as video gaming) affects executive function development [50,82]. Assessments grounded in cognitive and neurophysiological methodologies reveal that executive function, though initially emerging during the foundational years of life, exhibits a marked trend of continual strengthening and maturation throughout childhood and adolescence [50]. The development of executive function is a dynamic process influenced by both biological maturation and environmental factors [50]. Video game engagement, particularly during the sensitive and formative stages of childhood, introduces a multifaceted environmental factor that can interact with the biological maturation of executive function. As children grow older, their likelihood of engaging with video games tends to increase, introducing a variable that may exert both positive and negative influences on the development of executive function. On the one hand, select video games can pose cognitive challenges that stimulate problem-solving capabilities, potentially contributing to executive function development [83]. Concurrently, specific games—especially those equipped with educational components or engineered for collaborative gameplay—have been associated with enhancements in cognitive performance and the cultivation of social skills [1,85]. On the other hand, excessive exposure to video games, especially those lacking educational value, may be detrimental, hindering the natural progression of executive function [67]. Consequently, a child's age can function as a moderating variable within the connection between video game engagement and executive function, signifying that age could potentially intensify this specific association.

1.4. The Present Study

Literature on the association between video game engagement and children's social development has predominantly focused on direct effects, leaving a critical gap in understanding the underlying mechanisms and moderating factors. Moreover, prior studies have yet to adequately explore how age may amplify the correlation between video game exposure and executive function or how video game engagement may deplete cognitive resources, subsequently affecting social development. Grounded in Ecological Systems Theory, which emphasizes the importance of a child's age, and Ecological Techno-Microsystem Theory, which emphasizes electronic media's role as a microsystem influencing development, the present study sought to fill this gap by constructing a moderated mediation model. The study specifically aims to (1) elucidate the direct correlation: rigorously examine the direct relation between the level of video game engagement and the level of social development in children; (2) clarify the mediating mechanism: evaluate executive function as a potential mediating variable in the linkage between video game engagement and social development in children; and (3) assess age-related moderation: investigate whether the child's age moderates the effect of video game engagement on executive function, and, by extension, social development.

Based on the preceding contextual framework, the present study proposes the following hypotheses, visually articulated in the conceptual model shown in Figure 1: (1) An elevated level of video game engagement in children may be correlated with pronounced difficulties in social development, signifying a negative relation between children's engagement with video games and their social growth; (2) executive function serves as a mediator in the nexus between video game engagement and social development, with an increase in video game engagement corresponding to a decrease in executive function, consequently culminating in diminished social development in children; and (3) children's age could potentially moderate the connection between video game engagement and executive function, intensifying the association between the two.

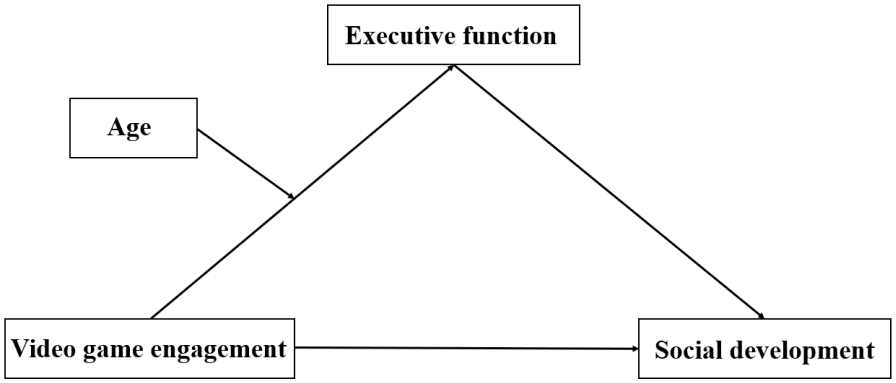

Figure 1. The moderated mediation model.

2. Materials and Methods

2.1. Sample

The present study used convenience sampling, distributing anonymous questionnaires to teachers in various kindergarten and primary schools across Beijing. Teachers, in turn, extended the invitation to complete the questionnaires to parents residing with their children in Beijing. A crucial criterion for inclusion was that the children must have been exposed to video games. The teachers explicitly communicated this requirement during the distribution process. For families with multiple children, parents were instructed to concentrate their responses on a single child engaged in video gaming. The final sample of children comprised 431 participants, with 227 boys (52.7%) and 204 girls (47.3%), spanning ages from 3 to 9.7 years, with a mean age of 5.13 years (SD = 1.24). Of the children, 325 were only children (75.4%), and 106 children (24.6%) had siblings. A total of 313 children lived in cities (72.6%), 82 in towns (19%), and 36 in rural areas (8.4%). Concerning the age of first exposure to video games, 123 children were exposed before the age of 3 (28.5%), 304 between the ages of 3 and 6 (70.6%), and four after the age of 6 (0.9%).

2.2. Measures

2.2.1. Video Game Engagement

The study employed the Video Game Engagement in Children Questionnaire, initially developed by Huang et al. and Qu et al. [8,86]. This questionnaire initially consisted of 20 items but was refined to 19 items across four dimensions after exploratory factor analysis by Qu et al. [8]. The dimensions encompass an interest in the activity, focus during play, challenges in discontinuation, and social disengagement. The questionnaire was scored on a 5-point Likert scale, and scores for the entire questionnaire ranged between 19 and 95 points. Higher total scores on the questionnaire indicate higher levels of engagement in video games. The Cronbach's alpha coefficient of the overall questionnaire was 0.93. Furthermore, the questionnaire incorporated a multiple-choice query to discern the types of games frequently played by children. Options encompassed puzzle games (including card games and board games, among others), action games (including shooting games, fighting games, etc.), simulation games (including business management simulations and vehicle simulations, among others), art games (including music and artistic games, etc.), sports games (including exergames, among others), adventure games (including interactive movies, etc.), role-playing games (including MMORPGs, among others), and other types of games.

2.2.2. Executive Function

The Children's Executive Functioning Inventory (CHEXI), developed by Torrell, was used in this study [45]. The inventory has 24 items divided into three dimensions: inhibition, working memory, and cognitive flexibility [87]. The questionnaire incorporated questions that asked parents about their children's behavioral performance in daily life

scenarios (e.g., "Has difficulty refraining from smiling or laughing in situations where it is inappropriate"). Unlike assessments conducted in a structured laboratory setting, parents' observations offer a unique and credible perspective, as they are based on children's behavior across different scenarios [45]. Participants were instructed to respond to each item using a 5-point reverse scale because all the items in the questionnaire were phrased negatively. In this context, a higher score denoted a more pronounced disagreement with the statement, and a lower score signified more robust agreement. The inventory range of values is from 24 to 120 points. It was hypothesized that an increment in the total score would indicate better executive function development. Additionally, the reliability of the Children's Executive Functioning Inventory was assessed, resulting in a Cronbach's alpha coefficient value of 0.94, suggesting a high level of internal consistency.

2.2.3. Social Development

The Children's Social Development Scale (3rd edition), devised by Chen, was used to assess the social development of children [88]. This scale has been widely applied in China. It comprehensively evaluates children's social development in various dimensions, including adherence to social rules, social cognition, volition, life habits, introversion and extroversion, attachment to family, emotional stability, self-concept, peer relationships, aggression, independence, honesty and fairness, empathy and helpfulness, competitiveness, and self-esteem. The scale consists of 60 items and is scored using a 5-point Likert scale. The total score on the scale spans from 60 to 300. A higher total score indicates better social development in children. In the present study, Cronbach's alpha coefficient for the Social Development Scale was found to be 0.95, indicating good internal consistency.

2.3. Statistical Analysis

Before embarking on inferential analyses, the dataset underwent an initial cleaning process to address missing values, outliers, and inconsistencies. Preliminary analyses utilized descriptive statistics and Chi-square and MANOVA tests to understand the types of games most frequently played by children. The results of the analyses informed the inclusion of a control variable, action game involvement, which indicates whether a child frequently engages in action games.

The Jarque–Bera test for skewness and kurtosis was employed to evaluate each variable's distributional properties. Skewness values ranged from -0.06 to 0.91, and kurtosis values from -0.07 to 1.25. These outcomes confirm the dataset's adherence to the assumptions of normality, meeting the criteria for ensuing inferential analyses, as corroborated by Zhang [89].

The study targets primary variables: video game engagement, executive function, age, and social development. Descriptive statistics and Pearson correlation coefficients were calculated using IBM SPSS Statistics version 23.0. A moderated mediation analysis was conducted using PROCESS (version 4.0) software. This analysis employed a bootstrap method with 5000 resamples, exploring the mediating role of executive function and the moderating role of age in the relation between video game engagement and social development. The control variable, action game involvement, was integrated to account for its potential influence.

3. Results

3.1. Common Method Bias

Using a questionnaire to collect data in this study created a potential susceptibility to common method bias. Following the recommendations of Podsakoff et al. [90], we employed Harman's single-factor test to investigate the presence of such bias. The findings revealed 25 factors with eigenvalues greater than 1. Moreover, the cumulative variance accounted for by the initial factor amounted to 19.02%, a value that fell below the critical threshold of 40% [91]. Hence, it can be inferred that this study is not affected by any significant common method-bias issue.

3.2. Preliminary Analysis

A descriptive analysis concerning the most played types of video games among children revealed an average engagement in 2.71 distinct game categories (*SD* = 1.31, *Minimum* = 1, *Maximum* = 8). A Chi-square analysis substantiated that puzzle games were most prevalent among children, succeeded by action, simulation, art, role-playing, and other game genres. Comparatively, adventure and sports games had a less frequent engagement, $\chi^2 = 642.11$, $p < 0.001$.

Further statistical scrutiny employing MANOVA tests (refer to Table 1) disclosed that children who habitually engage in action games manifested elevated levels of video game engagement (action gamer: *M* = 56.94, *SD* = 13.93; non-action gamer: *M* = 52.76, *SD* = 12.07) and diminished executive function scores (action gamer: *M* = 70.48, *SD* = 14.69; non-action gamer: *M* = 74.70, *SD* = 14.06) compared to their counterparts who rarely indulge in such activities. Age-wise, children who recurrently partake in puzzle games tend to be younger (*M* = 5.07 years, *SD* = 1.19) than those who do not (*M* = 5.45 years, *SD* = 1.40), while the converse holds for action games (action gamer: *M* = 5.30 years, *SD* = 1.27; non-action gamer: *M* = 5.04 years, *SD* = 1.21). No observable disparities were discerned for children who frequently or infrequently engage in other gaming categories regarding their levels of video game engagement, executive function, social development, or age. Consequently, to control for the possible confounding effects of game types on the interrelationships between video game engagement, executive function, social development, and age, whether individuals frequently engage in action games (named action game involvement) was incorporated as a control variable in ensuing model-based analyses.

Table 1. MANOVA analyses evaluating disparities in key variables based on children's inclination to play specific game genres often.

Game Genre	Response		Percent of Cases (*n* = 431)	*F* Value			
	n	Percent		VGE	EF	SD	Age
Puzzle	362	31.05%	83.99%	2.08	0.33	0.52	5.64 *
Action	144	12.35%	33.41%	10.32 ***	8.40 **	2.58	4.02 *
Simulation	139	11.92%	32.25%	0.18	0.74	1.86	0.86
Art	134	11.49%	31.09%	0.22	1.79	3.02	1.11
Sports	39	3.34%	9.05%	0.94	2.08	0.93	1.46
Adventure	91	7.80%	21.11%	1.84	0.75	0.03	0.63
Role-playing	129	11.06%	29.93%	1.323	1.75	0.22	0.08
Other	128	10.98%	29.70%	1.66	3.39	0.00	0.64
Total	1166	100.00%	270.53%				

Notes: VGE = video game engagement, EF = executive function, SD = social development. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.3. Descriptive Statistics and Correlation Analysis

Table 2 presents the means, standard deviations, and correlation analysis results for the primary variables examined in this research. Children's engagement with video games exhibited a negative relation with both their executive function and social development. Conversely, a positive correlation was detected between executive function and social development. Furthermore, children's age positively correlated with their social development.

Table 2. Descriptive statistics and correlations of the main variables.

Variables	*M*	*SD*	1	2	3	4
1. Video game engagement	54.16	12.86	1			
2. Executive function	73.29	14.40	−0.65 **	1		
3. Social development	218.82	24.74	−0.15 **	0.26 **	1	
4. Age	5.13	1.24	0.09	0.05	0.11 *	1

Notes: * $p < 0.05$, ** $p < 0.01$.

3.4. Moderated Mediation Effect Test

PROCESS version 4.0, a statistical tool developed by Hayes [92], was used to examine the mediating role of executive function and the moderating role of children's age in the relation between engagement with video games and social development. A Bootstrap test for confidence intervals was performed on the model to correct for bias, with a replicated sample of 5000 and a confidence interval of 95%.

3.4.1. The Mediating Effect of Executive Function

Based on the findings in Table 2, statistically significant direct relations emerged between video game engagement, executive function, and social development. These outcomes fulfilled the prerequisites for undertaking a mediation analysis. Given that the preliminary analysis suggests a correlation between action game involvement and increased levels of video game engagement in children, which may be associated with diminished executive function, we deemed it crucial to incorporate action game involvement as a control variable. These findings collectively laid the foundation for proceeding with a mediation analysis. To examine the potential relation between children's engagement in video games and their social development through executive function, we opted for Model 4 out of the 76 conventional models put forth by Hayes to conduct mediation effects analysis [92].

The results delineated in Table 3 indicated several significant associations. Firstly, a discernible negative relation was observed between action game involvement and social development ($\beta = -0.10$, $t = -2.13$, $p < 0.05$). Secondly, there was a notable negative association between video game engagement and executive function ($\beta = -0.65$, $t = -17.50$, $p < 0.001$). Lastly, a positive correlation was detected between executive function and social development ($\beta = 0.28$, $t = 4.61$, $p < 0.001$).

Table 3. Test of the mediating effect of executive function.

Result Variable	Predictor Variable	R	R^2	F Value	β	t Value
Social development		0.18	0.03	7.17 ***		
	Action game involvement				−0.10	−2.13 *
	Video game engagement				−0.16	−3.42 ***
Executive function		0.65	0.43	160.35 ***		
	Action game involvement				0.04	1.06
	Video game engagement				−0.65	−17.50 ***
Social development		0.28	0.08	12.09 ***		
	Action game involvement				−0.11	−2.41 *
	Video game engagement				0.02	0.31
	Executive function				0.28	4.61 ***

Notes: The variables in the model had been standardized and substituted into the equation. * $p < 0.05$, *** $p < 0.001$.

In contrast, upon introducing executive function as a mediating variable, the initial correlation between video game engagement and social development ($\beta = -0.16$, $t = -3.42$, $p < 0.001$) no longer retained its significance ($\beta = 0.02$, $t = 0.31$, $p > 0.05$). The findings indicated a significant mediation effect ($ab = -0.35$, 95% CI [−0.53, −0.19]), with executive function acting as a complete mediator between children's video game engagement and social development (Table 4). In other words, children who engage in video games more often are more likely to have impaired executive function, which is detrimental to their social development.

Table 4. Analysis of all effects in a mediated model.

Variables	Effect Size	Boot SE	95% CI
Total effect	−0.32	0.09	[−0.50, −0.13]
Direct effect	0.04	0.12	[−0.20, 0.27]
Mediating effect of executive function	−0.35	0.09	[−0.53, −0.19]

3.4.2. The Moderating Role of Children's Age

Model 7, developed by Hayes [92], was employed to examine the presence of a moderated mediation effect (Table 5). The mediation model introduced children's age as a moderator variable, and action game involvement remains the controlling variable. The interaction term was associated with executive function, exhibiting a negative coefficient and, thus, a substantial negative relation ($\beta = -0.11$, $t = -3.08$, $p < 0.01$). The finding indicated that age moderates the relation between children's video game engagement and executive function. The moderated mediation model is shown in Figure 2.

Table 5. Test of the moderating effect of children's age.

Result Variable	Predictor Variable	*R*	R^2	*F* Value	β	*t* Value
Executive function		0.67	0.45	88.33 ***		
	Action game involvement				0.05	1.27
	Video game engagement				−0.65	−17.96 ***
	Age				0.13	3.57 ***
	Video game engagement × Age				−0.11	−3.08 **

Notes: The variables in the model had been standardized and substituted into the equation. ** $p < 0.01$, *** $p < 0.001$.

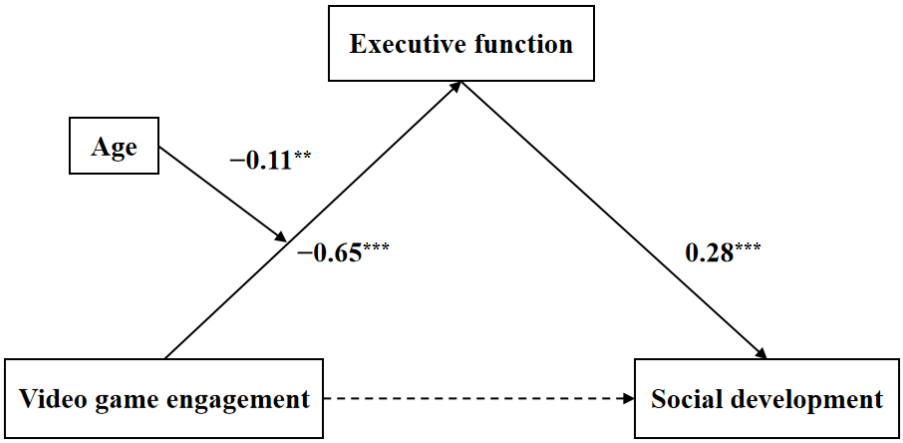

Figure 2. A moderated mediation model with standardized regression coefficients. ** $p < 0.01$, *** $p < 0.001$.

We also conducted a simple slope analysis to illustrate the role of the interaction term (Figure 3). In the context of younger children, video game engagement was negatively associated with executive function ($\beta = -0.55$, $p < 0.001$, 95% CI [−0.65, −0.45]). However, this negative association between video game engagement and executive function became more pronounced in older children ($\beta = -0.76$, $p < 0.001$, 95% CI [−0.86, −0.66]). Importantly, Figure 3 and its associated interpretations should not be taken as a comparison of absolute levels of executive function between younger and older children. Instead, the emphasis is on how the strength of the negative correlation between video game engagement and executive function varies with age, becoming increasingly pronounced as children grow older.

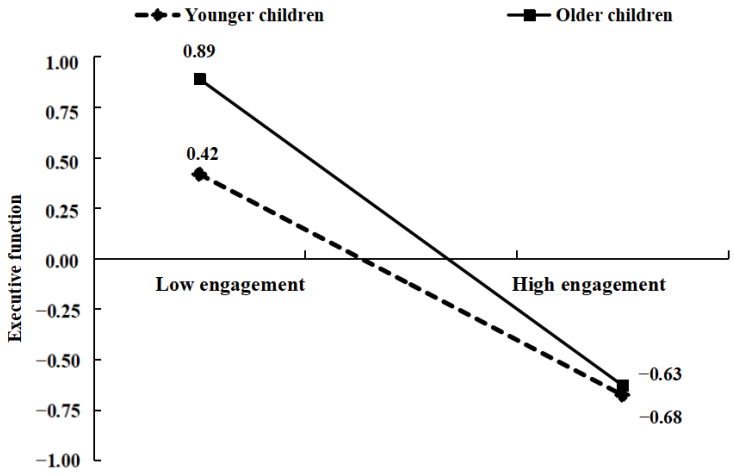

Figure 3. A simple slope for interaction between video game engagement and children's age in executive function.

4. Discussion

In today's media-saturated environment, video games have become a fundamental component of children's daily experiences. However, scholarly perspectives on the implications of video games for children's development remain diverse [5]. A cohort of researchers holds a favorable opinion towards video games, arguing that video games provide opportunities for children's cognitive [93–96], social [97,98] and emotional [99,100] development. Conversely, other scholars have underscored potential detriments, suggesting that video games can adversely influence children's physical health [101,102], academic performance [103,104], and social skills [28,105]. A comprehensive scientometric and knowledge-mapping analysis regarding the impact of video games on child development revealed that contemporary research recognizes video games as a double-edged sword concerning child development [5]. Specifically, this research has elucidated that excessive engagement in video games may harm various dimensions of child development.

4.1. Video Game Engagement and Social Development

This study revealed a negative correlation between video game engagement and social development. Notably, children who engage more in video games exhibit poorer social development. This finding is consistent with Hypothesis 1 of the research. In a systematic review, the authors noted that people engage in video games for several reasons [106]. At the social level, game engagement is associated with relationships. Players are motivated by the need to connect and be approved by friends, and social interaction impacts game engagement [106]. However, as engagement with video games intensifies, the close and enduring connections formed between participants within the gaming environment may create a displacement effect. Such an effect could reduce the quantity and quality of offline communication, resulting in a diminished social circle and difficulties in developing or sustaining social and emotional skills [107,108]. Prior research has consistently observed that children's interest and focus on video games often lead to challenges in disengaging from the games. Such deep engagement with video games diverts time and energy from real-world social interactions, subsequently negatively influencing social development [109].

According to the Reduced Social Cues Theory, the diminution of social cues within online communities can weaken social norms and constraints, giving rise to an online disinhibition effect [110,111]. This phenomenon may cause individuals to express themselves in ways they typically avoid in face-to-face interactions, including heightened aggression and abnormal behaviors [112]. Moreover, prolonged exposure to video games may increase the risk of internet addiction among children, leading to greater investment in gaming and subsequent social avoidance. This misalignment with real-world interactions can result in

diminished socialization and well-being [113]. The influence of violent video games may further compound this issue, contributing to increased aggression in children. Research has demonstrated that even short-term exposure to violent content can elevate perceptions and behaviors related to aggression [105]. Cumulatively, children's engagement with video games can manifest in detrimental ways, affecting emotional states, social cognition, aggression, and self-esteem and significantly impeding their social development.

The COVID-19 pandemic has significantly complicated these dynamics, particularly in China, where stringent social restrictions have existed for extended periods. Measures like school closures and home quarantines have curtailed children's opportunities for physical activities and interpersonal interactions. This has led to increased video game engagement, with studies by Alsaad et al. and Mohan et al. showing a significant rise in the duration of children's video game activities during quarantine [114,115]. Notably, this increase varied by age; children older than 12 months showed a rise in media usage, whereas those younger than 12 months remained relatively stable [116,117].

The pandemic's influence has also been profound on the social development front. Home quarantine has led to various psychological issues in children, including reduced social interactions and emotional well-being [118]. Wise's research revealed that infants born during the pandemic exhibit weaker social skills than those born before [119]. Similarly, a study by Deoni et al. suggests a decline in cognitive abilities among children born during the pandemic relative to those born prior to its onset [120]. The researchers speculate that this decline may be due to the ubiquitous wearing of masks in public places, schools, and daycare centers, which could potentially impact the development of attachment and social-emotional processing skills, thereby affecting their social and emotional development. Furthermore, Teng et al. found that social restrictions increased levels of video game disorders in children, negatively impacting their social and emotional well-being [121]. In line with this, Alsaad et al. reported that 20.4% of children became more introverted, and 14.5% became more aggressive after playing video games during social restrictions [114].

Our study also found that action games significantly increase children's engagement in video games and negatively predict their social development. This finding is supported by other studies indicating that action games can be particularly engrossing due to their rich visual and auditory stimuli, unpredictable actions, and immediate reward mechanisms. However, they can also reduce players' empathy and increase aggressive behavior [122]. Long-term exposure to action games may lead to negative emotional states in slower-paced, less stimulating social environments [123].

4.2. The Mediating Role of Executive Function

Our findings corroborate that executive function serves as a full mediator in the relation between video game engagement and social development, thereby substantiating Hypothesis 2. Specifically, the study identified a negative correlation between reported video game engagement and the level of executive function, revealing that excessive involvement in video games may be associated with impairment in executive function. This impairment in executive function, in turn, is linked to detrimental social development. These insights underscore the importance of measured playtime and diligent supervision, all essential in fostering a child's balanced and healthy development of executive function and socialization.

Video game engagement was negatively associated with children's executive function. Grounded in Reinforcement Sensitivity Theory, this phenomenon can be understood through the behavioral activation system, which orchestrates an individual's behavior in response to rewards, often leading to increased behavioral persistence and impulsivity [124]. Playing video games is perceived as a rewarding behavior, and the brain's intrinsic reward mechanism fuels children's engagement with video games [125–127]. However, when this engagement becomes excessive, it may diminish an individual's inhibition. High levels of play engagement can lead to extended playtime and diminished connectivity within the frontal regions of the brain, resulting in impaired behavioral inhibition [105,128,129].

This perspective aligns with findings from studies on individuals with Internet gaming disorder [126,130], further underscoring the complexity of the relation between video game engagement and executive function. Additionally, children who frequently engage in action games exhibit lower scores in executive function. This observation is partly explained by research from West et al., who found that habitual engagement in action games is associated with reduced gray matter in the hippocampus, a crucial brain area for working memory cognitive functions [131].

The connection between executive function and social development lends credence to the Self-Depletion Theory. This theory posits that when executive function becomes impaired, the individual expends remaining cognitive resources to self-regulate and repair, consequently depleting the reserves that would otherwise be available for social development. Neurological evidence indicates that the prefrontal lobe plays a pivotal role in constraining the level of executive function and individual social development sub-functions, such as emotion regulation, social interaction, and social cognition [132–134]. Therefore, any impairment in executive function is likely to have cascading effects on social development. Conversely, a well-developed executive function furnishes the essential cognitive resources required to participate in intricate social interactions and comprehend others' mental states [70]. In a parallel vein, recent research has corroborated that executive function is indispensable in facilitating adaptive social behavior and meaningful social interactions [135]. These insights serve as a valuable guide for parents, emphasizing the necessity of monitoring and controlling the intensity of their children's engagement with video games. Parents should safeguard their children's overall cognitive and social well-being by taking appropriate measures to avoid children's excessive or prolonged exposure to video games.

4.3. The Moderating Effects of Age

A notable finding from the study is the age-moderated relation between video game engagement and executive function. With increasing age, the negative correlation between engagement in video games and the development of executive function became more pronounced, paralleling the intensification of the adverse outcomes associated with impaired executive function on children's social development. These observations support Hypothesis 3, shedding light on the nuanced interplay between age, video game engagement, and cognitive and social growth. Additionally, our study discovered that younger children prefer puzzle games, while older children are more inclined towards action games. This preference aligns with their developmental stages. Puzzle games, characterized by a slower pace and fewer cognitive demands, are more easily comprehensible and adaptable for younger children. In contrast, school-aged children are drawn to the stimulation that action games provide, often viewing victory or defeat as the sole metric for performance assessment [136]. These games, commonly set in fictional and fantastical worlds, cater to their heightened curiosity [137]. For older children, the preference for action games was reported for their challenging nature and as a means to relax and escape life's worries [137].

Dynamic Systems Theory posits that the development of children's executive function is the product of the interaction between children and their environment [138,139]. Unfavorable environmental conditions during childhood can pose significant risks to future psychological development [140]. Therefore, an increasing number of studies have begun to focus on the role of age in the relation between media use and adverse cognitive development [141]. The age-related intensification of the negative correlation between video gaming and executive function emerges as a complex phenomenon shaped by developmental and neurological considerations. In the period leading up to adolescence, children's engagement with video games tends to increase [76,142], and this pattern is mirrored by a rise in gaming addiction that follows an inverted U-shaped trajectory, reaching a peak during adolescence [143]. This progressive escalation in exposure to video games strengthens the negative association with executive function, creating a more pronounced effect as age advances.

Adding to this complexity is the role of the frontal lobe, a region widely recognized for its crucial contribution to executive function [144]. Long-term exposure to electronic media can impede the typical development of the frontal lobe [63,145]. The neural developmental changes that occur during childhood and adolescence may foster an imbalance between the brain's emotional centers and the executive control mechanisms housed in the frontal lobe [146,147]. This imbalance becomes more prominent as children grow older and can be further exacerbated by excessive engagement with video games.

The study may serve to guide parents and educators in promoting healthy media consumption habits. For example, findings highlight the need to select age-appropriate game content and understand the nuanced interplay between age and video game engagement. This age-related intensification also calls for targeted intervention strategies. Tailoring interventions based on age may lead to the more effective prevention and treatment of gaming addiction and related cognitive impairments.

4.4. Limitations and Suggestions for Future Research

The current research, focused on the connections between video game engagement and social development in children, presents valuable insights but also has limitations that necessitate careful consideration. One such area for improvement is the study's confined sample size. Although participants were drawn from several urbanization levels within Beijing, the generalizability of the findings to other populations may be limited. Future studies should include a broader and more nationally representative sample to overcome this constraint, thereby enhancing the applicability of the results across different sociocultural contexts.

A significant challenge in the current study lies in the absence of a causal experimental or longitudinal follow-up design, hampering the identification of causal associations among the variables. This limitation underscores the importance of adopting experimental or longitudinal methodologies in subsequent investigations, which would provide more concrete evidence of causality and strengthen the validity of the findings.

Furthermore, our Video Game Engagement Questionnaire should be enhanced to meticulously quantify the frequency and duration of children's interactions with various video game genres and content. Prior research has shown that various game categories, such as pro-social and cooperative games, positively affect children's executive function and social development [148,149]. In contrast, our data reveals a negative association between action game involvement and both executive function and social development. Thus, it becomes pivotal for ensuing research to further hone these measurement tools, ensuring an in-depth grasp of the multifaceted influences of video game types on children's developmental trajectories.

In addition to these limitations, other variables could significantly influence the relationship between video game engagement and social development. Ecological factors, such as parenting styles and socioeconomic status, have substantially impacted children's social interactions and video game play [86,150]. Likewise, mental health status and life stress levels interact with video game exposure, potentially offering trauma-repair experiences [151,152]. Thus, future research should aim to incorporate these additional variables as control or moderating factors. This multidimensional approach will enhance the robustness and generalizability of future findings and contribute to a more nuanced understanding of the complex relation between video game engagement and children's social development.

4.5. Implications

Understanding the complex interplay between children's engagement with video games, executive function, age-related factors, and social development is critically important. This study uncovers a negative correlation between unregulated video game exposure and executive function, a critical cognitive precursor for social development.

Further complexity is introduced by the moderating role of age, indicating the necessity of stage-specific interventions.

In a digital milieu, it is impractical to place 'digital natives' in a 'de-electronic gaming vacuum', given that a negligible fraction of children aged 1–13 have never engaged with electronic media [149,153]. Hence, the role of parents in controlling screen time becomes particularly vital, especially in light of evidence that children are dedicating up to 6 h daily to technology [154,155]. Effective parental regulation transcends mere monitoring of the environment and playtime and requires adhering to age-appropriate media consumption guidelines. For example, the American Academy of Pediatrics advocates limiting high-quality media exposure for children aged 2–5 to one hour daily while encouraging parental co-viewing and guidance [156].

As video games have become an integral part of the daily lives of children who are 'digital natives,' parents and educators must consider their role in shaping children's gaming habits [1]. The prudent selection of age-appropriate content constitutes a pivotal aspect of this responsibility. This selection should align with guidelines from reputable organizations such as the Entertainment Software Rating Board (ESRB) while also considering insights into the suitability of games for different age groups, which can be obtained from mobile download platforms like the Apple Store [1]. In this context, the focus should extend beyond merely limiting exposure to action games to a broader strategy aimed at harnessing the potential of video games for positive developmental outcomes.

In conclusion, the intricate factors affecting children's video game engagement require a collaborative, multi-sectoral approach involving educators, parents, and policymakers. Regulatory efforts, such as China's recent limitation on online gaming for minors and the implementation of real-name registration systems, are examples of regulatory strategies that can be deployed.

5. Conclusions

The study illuminated a significant and negative relation between children's engagement with video games and their social development. Executive function emerged as a complete mediator in this relation, elucidating the underlying mechanisms connecting video game engagement and social growth. Additionally, the study discerned a moderating role of children's age on the relation between video game engagement and executive function. Namely, the correlation between video game engagement and executive function intensified with maturation, reflecting a more pronounced connection with age.

Author Contributions: Conceptualization, X.L., K.X. and S.G.; methodology, K.X. and S.G.; software, S.G. and K.X.; validation, X.L., S.G. and K.X.; formal analysis, S.G.; investigation, X.L.; resources, X.L. and D.D.; data curation, K.X. and S.G.; writing—original draft preparation, K.X. and S.G.; writing—review and editing, X.L. and D.D.; visualization, K.X.; supervision, X.L. and D.D.; project administration, X.L.; funding acquisition, X.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by grants from the National Social Science Fund of China (Grant number: 18BSH130), the Beijing Social Science Foundation Project (Grant number: 22GJB017), and the R&D Program of Beijing Municipal Education Commission (Grant number: SZ202310028013).

Institutional Review Board Statement: The execution of this study adhered to the principles outlined in the Declaration of Helsinki and received ethical endorsement from the Institutional Review Board of Capital Normal University (No. 2023030202). The participants' data were scrupulously protected and made anonymous to protect their privacy and anonymity.

Informed Consent Statement: Informed consent was obtained from all individuals actively engaged in this research study.

Data Availability Statement: The dataset of this study is obtainable from the corresponding author, subject to reasonable requests.

Acknowledgments: We extend our profound gratitude to the editors and reviewers for their invaluable expertise and constructive feedback, which has been instrumental in enhancing the rigor and quality of this manuscript. Our sincere gratitude extends to the individuals who willingly participated in this research endeavor as respondents.

Conflicts of Interest: The authors affirm the absence of any conflict of interest that require disclosure.

References

1. Liu, X.; Huang, H.; Huo, M.; Dou, D. Brief Exposure to Two-Player Video Games Stimulates Young Children's Peer Communication and Prosocial Behavior. *J. Psychol. Sci.* **2018**, *41*, 364–370. [CrossRef]
2. Liu, X. Video games are evolving. *Parent. Sci.* **2023**, *41*, 38–41.
3. Alanko, D. The health effects of video games in children and adolescents. *Pediatr. Rev.* **2023**, *44*, 23–32. [CrossRef]
4. Barr, P.; Noble, J.; Biddle, R. Video game values: Human-computer interaction and games. *Interact. Comput.* **2007**, *19*, 180–195. [CrossRef]
5. Liu, X.; Huang, H.; Qu, F.; Dou, D. The Foundations and Frontiers of Research on the Effect of Video Games on Child Development: A Scientometrics and Knowledge-Mapping Analysis Based on CiteSpace. In *Lecture Notes in Computer Science*; Fang, X., Ed.; Springer: Cham, Switzerland, 2021; Volume 12789, pp. 239–257. [CrossRef]
6. Lerida-Ayala, V.; Aguilar-Parra, J.; Collado-Soler, R.; Alferez-Pastor, M.; Fernandez-Campoy, J.; Luque-de la Rosa, A. Internet and Video Games: Causes of Behavioral Disorders in Children and Teenagers. *Children* **2023**, *10*, 86. [CrossRef] [PubMed]
7. Şengün, S. Videogame Engagement: Psychological Frameworks. In *Encyclopedia of Computer Graphics and Games*; Lee, N., Ed.; Springer: Cham, Switzerland, 2018; pp. 1–7. [CrossRef]
8. Qu, F.; Niu, X.; Huang, H.; Liu, X. Exploratory and Confirmatory Factor Analysis of the Chinese Young Children's Video-Gaming Questionnaire. In *Lecture Notes in Computer Science*; Fang, X., Ed.; Springer: Cham, Switzerland, 2021; Volume 12789, pp. 266–278. [CrossRef]
9. Johnson, G. Internet use and child development: The techno-microsystem. *Aust. J. Educ. Dev. Psychol.* **2010**, *10*, 32–43.
10. Granic, I.; Lobel, A.; Engels, R. The benefits of playing video games. *Am. Psychol.* **2014**, *69*, 66–78. [CrossRef]
11. Suziedelyte, A. Media and human capital development: Can video game playing make you smarter? *Econ. Inq.* **2015**, *53*, 1140–1155. [CrossRef]
12. Weis, R.; Cerankosky, B. Effects of video-game ownership on young boys' academic and behavioral functioning: A randomized, controlled study. *Psychol. Sci.* **2021**, *21*, 463–470. [CrossRef]
13. Raventós, C.; Belli, S. *Psychological Outlook on Video Games: An Example of the Long Road to the Invention of Disorders not Associated with Substances*; ICAI Workshops; Universidad Complutense de Madrid: Madrid, Spain, 2019; pp. 360–371.
14. Chen, C.; Chen, I.; Hou, W.; Potenza, M.; O'Brien, K.; Lin, C.; Latner, J. The Relationship Between Children's Problematic Internet-related Behaviors and Psychological Distress During the Onset of the COVID-19 Pandemic: A Longitudinal Study. *J. Addict. Med.* **2022**, *16*, E73–E80. [CrossRef]
15. Donati, M.; Guido, C.; De Meo, G.; Spalice, A.; Sanson, F.; Beccari, C.; Primi, C. Gaming among Children and Adolescents during the COVID-19 Lockdown: The Role of Parents in Time Spent on Video Games and Gaming Disorder Symptoms. *Int. J. Environ. Res. Public Health* **2021**, *18*, 6642. [CrossRef] [PubMed]
16. Zhu, S.; Zhuang, Y.; Lee, P.; Li, J.; Wong, P. Leisure and Problem Gaming Behaviors Among Children and Adolescents During School Closures Caused by COVID-19 in Hong Kong: Quantitative Cross-sectional Survey Study. *Jmir. Serious Games* **2021**, *9*, e26808. [CrossRef]
17. Shoshani, A.; Kor, A. The Mental Health Effects of the COVID-19 Pandemic on Children and Adolescents: Risk and Protective Factors. *Psychol. Trauma* **2022**, *14*, 1365–1373. [CrossRef]
18. Werling, A.; Walitza, S.; Drechsler, R. Impact of the COVID-19 lockdown on screen media use in patients referred for ADHD to child and adolescent psychiatry: An introduction to problematic use of the internet in ADHD and results of a survey. *J. Neural Transm.* **2021**, *128*, 1033–1043. [CrossRef]
19. Chen, H. Compilation and norm-setting of the Children's Social Development Scale (CSDS). *Psychol. Dev. Educ.* **1994**, *4*, 52–63. [CrossRef]
20. Wang, L.; Chen, Y.; Zhang, S.; Rozelle, S. Paths of social-emotional development before 3 years old and child development after 5 years old: Evidence from rural China. *Early Hum. Dev.* **2022**, *165*, 105539. [CrossRef]
21. Guo, Q.; Zhou, J.; Feng, L. Pro-social behavior is predictive of academic success via peer acceptance: A study of Chinese primary school children. *Learn. Individ. Differ.* **2018**, *65*, 187–194. [CrossRef]
22. Wan, A.; Yang, F.; Liu, S.; Feng, W. Research on the Influence of Video Games on Children's Growth in the Era of New Media. In Proceedings of the 5th International Conference on Contemporary Education, Social Sciences and Humanities—Philosophy of Being Human as the Core of Interdisciplinary Research (ICCESSH 2020), Moskva, Russia, 1 September 2020; Atlantis Press: Dordrecht, The Netherlands, 2020; pp. 187–190. [CrossRef]
23. Anderson, C.; Dill, K. Video games and aggressive thoughts, feelings, and behavior in the laboratory and in life. *J. Pers. Soc. Psychol.* **2000**, *78*, 772–790. [CrossRef]

24. Yilmaz, E.; Griffiths, M. Children's social problem-solving skills in playing videogames and traditional games: A systematic review. *Educ. Inf. Technol.* **2023**, *28*, 11679–11712. [CrossRef]
25. Garcia, M.; Rull, V.; Gunawardana, S.; Bias, D.; Chua, R.; Cruz, J.; Fernando Raguro, M.; Lobo Perez, M. Promoting Social Relationships Using a Couch Cooperative Video Game: An Empirical Experiment with Unacquainted Players. *Int. J. Gaming Comput. Mediat. Simul.* **2022**, *14*, 1–18. [CrossRef]
26. Stone, B.; Mills, K.; Saggers, B. Online multiplayer games for the social interactions of children with autism spectrum disorder: A resource for inclusive education. *Int. J. Incl. Educ.* **2019**, *23*, 209–228. [CrossRef]
27. Moffat, D.; Crombie, W.; Shabalina, O. Some Video Games Can Increase the Player's Creativity. *Int. J. Game Based Learn.* **2017**, *7*, 35–46. [CrossRef]
28. Davis, K.; Iosif, A.; Nordahl, C.; Solomon, M.; Krug, M. Video Game Use, Aggression, and Social Impairment in Adolescents with Autism Spectrum Disorder. *J. Autism Dev. Disord.* **2023**, *53*, 3567–3580. [CrossRef] [PubMed]
29. Gentile, D.; Groves, C.; Gentile, J. The general learning model: Unveiling the teaching potential of video games. In *Learning by Playing: Video Gaming in Education*; Blumberg, F., Ed.; Oxford University Press: New York, NY, USA, 2014; pp. 121–142. [CrossRef]
30. Milani, L.; Camisasca, E.; Ionio, C.; Miragoli, S.; Paola, D. Video games use in childhood and adolescence: Social phobia and differential susceptibility to media effects. *Clin. Child Psychol. Psychiatry* **2020**, *25*, 456–470. [CrossRef] [PubMed]
31. Barlett, C.; Harris, R.; Baldassaro, R. Longer you play, the more hostile you feel: Examination of first person shooter video games and aggression during video game play. *Aggress. Behav.* **2007**, *33*, 486–497. [CrossRef] [PubMed]
32. Gentile, D.; Choo, H.; Liau, A.; Sim, T.; Li, D.; Fung, D.; Khoo, A. Pathological Video Game Use Among Youths: A Two-Year Longitudinal Study. *Pediatrics* **2011**, *127*, E319–E329. [CrossRef] [PubMed]
33. Alvarez, E. COVID-19 Concerns Lead to Unusual Bans in Dallas County. Available online: https://www.wfaa.com/article/news/health/coronavirus/covid-19-concerns-lead-to-unusual-bans-in-dallas-county/287-a8a50a42-7e86-4094-82a4-6ca5aeb80e5e. (accessed on 30 March 2020).
34. Siddiqui, S.; Alhamdi, H.; Alghamdi, H. Recent Chronology of COVID-19 Pandemic. *Front. Public Health* **2022**, *10*, 778037. [CrossRef] [PubMed]
35. Huang, Y.; Zhao, N. Generalized anxiety disorder, depressive symptoms and sleep quality during COVID-19 outbreak in China: A web-based cross-sectional survey. *Psychiatry Res.* **2020**, *288*, 112954. [CrossRef]
36. Huebener, M.; Waights, S.; Spiess, C.; Siegel, N.; Wagner, G. Parental well-being in times of Covid-19 in Germany. *Rev. Econ. Househ.* **2021**, *19*, 91–122. [CrossRef]
37. Islam, D.; Bodrud-Doza, M.; Khan, R.; Haque, M.; Mamun, M. Exploring COVID-19 stress and its factors in Bangladesh: A perception-based study. *Heliyon* **2020**, *6*, e04399. [CrossRef]
38. Dillmann, J.; Sensoy, O.; Schwarzer, G. Parental perceived stress and its consequences on early social-emotional child development during COVID-19 pandemic. *J. Early Child. Res.* **2022**, *20*, 524–538. [CrossRef]
39. Morelli, M.; Graziano, F.; Chirumbolo, A.; Baiocco, R.; Longobardi, E.; Trumello, C.; Babore, A.; Cattelino, E. Parental Mediation of COVID-19 News and Children's Emotion Regulation during Lockdown. *J. Child Fam. Stud.* **2022**, *31*, 1522–1534. [CrossRef]
40. Allen, J.; Homel, R.; McGee, T.; Freiberg, K. Child well-being before and after the 2020 COVID-19 lockdowns in three Australian states. *Aust. J. Soc. Issues* **2023**, *58*, 41–69. [CrossRef]
41. Perez, A.; Goebel, A.; Stuhrmann, L.; Schepanski, S.; Singer, D.; Bindt, C.; Mudra, S. Born Under COVID-19 Pandemic Conditions: Infant Regulatory Problems and Maternal Mental Health at 7 Months Postpartum. *Front. Psychol.* **2022**, *12*, 805543. [CrossRef] [PubMed]
42. Li, Y.; Deng, T.; Kanske, P. Affective empathy mediates the positive effect of prosocial video games on young children's sharing behavior. *Cogn. Dev.* **2023**, *67*, 101343. [CrossRef]
43. Stockdale, L.; Coyne, S. Video game addiction in emerging adulthood: Cross-sectional evidence of pathology in video game addicts as compared to matched healthy controls. *J. Affect. Disord.* **2018**, *25*, 265–272. [CrossRef] [PubMed]
44. Diamond, A. Executive functions. *Annu. Rev. Psychol.* **2013**, *64*, 135–168. [CrossRef]
45. Thorell, L.; Nyberg, L. The childhood executive functioning inventory (CHEXI): A new rating instrument for parents and teachers. *Dev. Neuropsychol.* **2008**, *33*, 536–552. [CrossRef] [PubMed]
46. Barkley, R. *ADHD and the Nature of Self-Control*; The Guilford Press: New York, NY, USA, 1997.
47. Liu, X.; Liao, M.; Dou, D. Video Game Playing Enhances Young Children's Inhibitory Control. In *Lecture Notes in Computer Science*; Fang, X., Ed.; Springer: Cham, Switzerland, 2019; Volume 11595, pp. 141–153. [CrossRef]
48. Baddeley, A. Working memory: Theories, models, and controversies. *Annu. Rev. Psychol.* **2012**, *63*, 1–29. [CrossRef]
49. Ameis, S.; Haltigan, J.; Lyon, R.; Sawyer, A.; Mirenda, P.; Kerns, C.; Smith, I.; Vaillancourt, T.; Volden, J.; Waddell, C.; et al. Middle-childhood executive functioning mediates associations between early-childhood autism symptoms and adolescent mental health, academic and functional outcomes in autistic children. *J. Child. Psychol. Psychiatry* **2022**, *63*, 553–562. [CrossRef]
50. Best, J.; Miller, P. A developmental perspective on executive function. *Child Dev.* **2010**, *81*, 1641–1660. [CrossRef] [PubMed]
51. Garon, N.; Bryson, S.; Smith, I. Executive function in preschoolers: A review using an integrative framework. *Psychol. Bull.* **2008**, *134*, 31–60. [CrossRef]
52. Diamond, A.; Taylor, C. Development of an aspect of executive control: Development of the abilities to remember what I said and to "do as I say, not as I do". *Dev. Psychobiol.* **1996**, *29*, 315–334. [CrossRef]

53. Perlman, S.; Huppert, T.; Luna, B. Functional Near-Infrared Spectroscopy Evidence for Development of Prefrontal Engagement in Working Memory in Early Through Middle Childhood. *Cereb. Cortex.* **2016**, *26*, 2790–2799. [CrossRef] [PubMed]
54. Ahmed, S.; Ellis, A.; Ward, K.; Chaku, N.; Davis-Kean, P. Working memory development from early childhood to adolescence using two nationally representative samples. *Dev. Psychol.* **2022**, *58*, 1962–1973. [CrossRef]
55. Buttelmann, F.; Karbach, J. Development and plasticity of cognitive flexibility in early and middle childhood. *Front. Psychol.* **2017**, *8*, 1040. [CrossRef]
56. Pennequin, V.; Sorel, O.; Fontaine, R. Motor planning between 4 and 7 years of age: Changes linked to executive functions. *Brain Cogn.* **2010**, *74*, 107–111. [CrossRef] [PubMed]
57. Whitlock, L.; McLaughlin, A.; Allaire, J. Individual differences in response to cognitive training: Using a multi-modal, attentionally demanding game-based intervention for older adults. *Comput. Hum. Behav.* **2012**, *28*, 1091–1096. [CrossRef]
58. Palaus, M.; Viejo-Sobera, R.; Redolar-Ripoll, D.; Marrón, E. Cognitive Enhancement via Neuromodulation and Video Games: Synergistic Effects? *Front. Hum. Neurosci.* **2020**, *14*, 235. [CrossRef]
59. Glass, B.; Maddox, W.; Love, B. Real-time strategy game training: Emergence of a cognitive flexibility trait. *PLoS ONE* **2013**, *8*, e70350. [CrossRef]
60. Oei, A.; Patterson, M. Playing a puzzle video game with changing requirements improves executive functions. *Comput. Hum. Behav.* **2014**, *37*, 216–228. [CrossRef]
61. Kühn, S.; Gleich, T.; Lorenz, R.; Lindenberger, U.; Gallinat, J. Playing Super Mario induces structural brain plasticity: Gray matter changes resulting from training with a commercial video game. *Mol. Psychiatry* **2013**, *19*, 265–271. [CrossRef]
62. McHarg, G.; Ribner, A.; Devine, R.; Hughes, C. Screen Time and Executive Function in Toddlerhood: A Longitudinal Study. *Front. Psychol.* **2020**, *11*, 570392. [CrossRef] [PubMed]
63. Flynn, R.; Richert, R. Cognitive, not physical, engagement in video gaming influences executive functioning. *J. Cogn. Dev.* **2018**, *19*, 1–20. [CrossRef]
64. Yang, X.; Wang, Z.; Qiu, X.; Zhu, L. The Relation between Electronic Game Play and Executive Function among Preschoolers. *J. Child. Fam. Stud.* **2020**, *29*, 2868–2878. [CrossRef]
65. Hummer, T.; Kronenberger, W.; Wang, Y.; Mathews, V. Decreased prefrontal activity during a cognitive inhibition task following violent video game play: A multi-week randomized trial. *Psychol. Pop. Media. Cult.* **2019**, *8*, 63–75. [CrossRef]
66. Farchakh, Y.; Haddad, C.; Sacre, H.; Obeid, S.; Salameh, P.; Hallit, S. Video gaming addiction and its association with memory, attention and learning skills in Lebanese children. *Child Adolesc. Psychiatry Ment. Health* **2020**, *14*, 46. [CrossRef] [PubMed]
67. Nuyens, F.; Kuss, D.; Lopez-Fernandez, O.; Griffiths, M. The experimental analysis of problematic video gaming and cognitive skills: A systematic review. *J. Ther. Comport. Cogn.* **2017**, *27*, 110–117. [CrossRef]
68. He, Q.; Turel, O.; Wei, L.; Bechara, A. Structural brain differences associated with extensive massively-multiplayer video gaming. *Brain Imaging Behav.* **2020**, *15*, 364–374. [CrossRef]
69. Van Lier, P.; Deater-Deckard, K. Children's Elementary School Social Experience and Executive Functions Development: Introduction to a Special Section. *J. Abnorm. Child Psychol.* **2016**, *44*, 1–6. [CrossRef]
70. Hughes, C.; Ensor, R. Executive function and theory of mind: Predictive relations from ages 2 to 4. *Dev. Psychol.* **2007**, *43*, 1447–1459. [CrossRef]
71. Ming, H.; Zhang, F.; Jiang, Y.; Ren, Y.; Huang, S. Family socio-economic status and children's executive function: The moderating effects of parental subjective socio-economic status and children's subjective social mobility. *Br. J. Psychol.* **2021**, *112*, 720–740. [CrossRef] [PubMed]
72. Freeman, L.; Locke, J.; Rotheram-Fuller, E.; Mandell, D. Brief Report: Examining Executive and Social Functioning in Elementary-Aged Children with Autism. *J. Autism Dev. Disord.* **2017**, *47*, 1890–1895. [CrossRef] [PubMed]
73. Baumeister, R.; Muraven, M.; Tice, D. Ego depletion: A resource model of volition, self-regulation, and controlled processing. *Soc. Cogn.* **2000**, *18*, 130–150. [CrossRef]
74. Medeiros, W.; Torro-Alves, N.; Malloy-Diniz, L.; Minervino, C. Executive Functions in Children Who Experience Bullying Situations. *Front. Psychol.* **2016**, *7*, 1197. [CrossRef]
75. Bronfenbrenner, U. Ecological systems theory. In *Encyclopedia of Psychology*; Kazdin, A., Ed.; Oxford University Press: Oxford, UK, 2000; Volume 3, pp. 129–133.
76. Blumberg, F.; Deater-Deckard, K.; Calvert, S.; Flynn, R.; Green, C.; Arnold, D.; Brooks, P. Digital games as a context for children's cognitive development: Research recommendations and policy considerations. *Soc. Policy Rep.* **2019**, *32*, 1–33. [CrossRef]
77. Gentile, D. Pathological video-game use among youth ages 8 to 18: A national study. *Psychol. Sci.* **2009**, *20*, 594–602. [CrossRef]
78. Lucas, K.; Sherry, J. Sex Differences in Video Game Play: A Communication-Based Explanation. *Commun. Res.* **2004**, *31*, 499–523. [CrossRef]
79. Peever, N.; Johnson, D.; Gardner, J. Personality & video game genre preferences. In Proceedings of the 8th Australasian Conference on Interactive Entertainment: Playing the System (IE '12), Sydney, Australia, 21 July 2020; Association for Computing Machinery: New York, NY, USA, 2020. [CrossRef]
80. Yu, R.; Chan, A. Meta-analysis of the effects of game types and devices on older adults-video game interaction: Implications for video game training on cognition. *Appl. Ergon.* **2021**, *96*, 103477. [CrossRef]
81. Eichenbaum, A.; Kattner, F.; Bradford, D.; Gentile, D.; Choo, H.; Chen, V.; Khoo, A.; Green, C. The Role of Game Genres and the Development of Internet Gaming Disorder in School-Aged Children. *J Addict. Behav. Ther. Rehabil.* **2015**, *4*, 1000141. [CrossRef]

82. Bustamante, J.; Fernández-Castilla, B.; Alcaraz-Iborra, M. Relation between executive functions and screen time exposure in under 6 year-olds: A meta-analysis. *Comput. Hum. Behav.* **2023**, *145*, 107739. [CrossRef]
83. Arbianingsih; Rustina, Y.; Krianto, T.; Ayubi, D. Developing a health education game for preschoolers: What should we consider? *Enferm. Clin.* **2018**, *28*, 1–4. [CrossRef]
84. Hamlen, K. Relationships between computer and video game play and creativity among upper elementary school students. *J. Educ. Comput. Res.* **2009**, *40*, 1–21. [CrossRef]
85. Fissler, P.; Kolassa, I.; Schrader, C. Educational games for brain health: Revealing their unexplored potential through a neurocognitive approach. *Front. Psychol.* **2015**, *6*, 1056. [CrossRef]
86. Huang, H.; Zhou, Y.; Qu, F.; Liu, X. The Role of Parenting Styles and Parents' Involvement in Young Children's Videogames Use. In *Lecture Notes in Computer Science*; Fang, X., Ed.; Springer: Cham, Switzerland, 2020; Volume 12211, pp. 282–294. [CrossRef]
87. Fan, L.; Zhan, M.; Qing, W.; Gao, T.; Wang, M. The Short-Term Impact of Animation on the Executive Function of Children Aged 4 to 7. *Int. J. Environ. Res. Public Health* **2021**, *8*, 8616. [CrossRef] [PubMed]
88. Zhang, X.; Wang, X.; Chen, H. Social development characteristics of 3–7 year old children in northern China. *J. Inn. Mong. Norm. Univ.* **2006**, *19*, 43–46.
89. Zhang, M.; Hu, Y.; Hu, Y. The Influences of Socioeconomic Status on Parental Educational Expectations: Mediating and Moderating Effects. *Sustainability* **2023**, *15*, 12308. [CrossRef]
90. Podsakoff, P.; MacKenzie, S.; Lee, J.; Podsakoff, N. Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J. Appl. Psychol.* **2003**, *88*, 879–903. [CrossRef]
91. Tang, D.; Wen, Z. Statistical approaches for testing common method bias: Problems and suggestions. *J. Psychol. Sci.* **2020**, *43*, 215–223. [CrossRef]
92. Hayes, A. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*, 2nd ed.; The Guilford Press: New York, NY, USA, 2018.
93. Blumberg, F.; Altschuler, E.; Almonte, D.; Mileaf, M. The impact of recreational video game play on children's and adolescents' cognition. *New Dir. Child Adolesc. Dev.* **2013**, *139*, 41–50. [CrossRef]
94. Shams, T.; Foussias, G.; Zawadzki, J.; Marshe, V.; Siddiqui, I.; Muller, D.; Wong, A. The Effects of Video Games on Cognition and Brain Structure: Potential Implications for Neuropsychiatric Disorders. *Curr. Psychiatry Rep.* **2015**, *17*, 71. [CrossRef]
95. Novak, E.; Tassell, J. Using video game play to improve education-majors' mathematical performance: An experimental study. *Comput. Hum. Behav.* **2015**, *53*, 124–130. [CrossRef]
96. Chaarani, B.; Ortigara, J.; Yuan, D.; Loso, H.; Potter, A.; Garavan, H. Association of Video Gaming with Cognitive Performance Among Children. *JAMA Netw. Open* **2022**, *5*, e2235721. [CrossRef]
97. Milajerdi, H.; Ordooiazar, F.; Dewey, D. Is active video gaming associated with improvements in social behaviors in children with neurodevelopmental disorders: A systematic review. *Child Neuropsychol.* **2023**, *29*, 1–27. [CrossRef]
98. Harrington, B.; O'Connell, M. Video games as virtual teachers: Prosocial video game use by children and adolescents from different socioeconomic groups is associated with increased empathy and prosocial behaviour. *Comput. Hum. Behav.* **2016**, *63*, 650–658. [CrossRef]
99. Shoshani, A.; Braverman, S.; Meirow, G. Video games and close relations: Attachment and empathy as predictors of children's and adolescents' video game social play and socio-emotional functioning. *Comput. Hum. Behav.* **2021**, *114*, 106578. [CrossRef]
100. David, O.; Predatu, R.; Cardos, R. A pilot study of the REThink online video game applied for coaching emotional understanding in children and adolescents in the therapeutic video game environment: The feeling better resources game. *J. Evid. Based Psychother.* **2018**, *18*, 57–67. [CrossRef]
101. Rechichi, C.; De Moja, G.; Aragona, P. Video Game Vision Syndrome: A New Clinical Picture in Children? *J. Pediatr. Ophthalmol. Strabismus* **2017**, *54*, 346–355. [CrossRef]
102. Kohorst, M.; Warad, D.; Rao, A.; Rodriguez, V. Obesity, sedentary lifestyle, and video games: The new thrombophilia cocktail in adolescents. *Pediatr. Blood Cancer* **2018**, *65*, e27041. [CrossRef]
103. Ferguson, C. Do Angry Birds Make for Angry Children? A Meta-Analysis of Video Game Influences on Children's and Adolescents' Aggression, Mental Health, Prosocial Behavior, and Academic Performance. *Perspect. Psychol. Sci.* **2015**, *10*, 646–666. [CrossRef]
104. Khalil, S.; Sultana, F.; Alim, F.; Muzammil, K.; Nasir, N.; ul Hassan, A.; Mahmood, S. Impact of Playing Violent Video Games Among School Going Children. *Indian J. Community Health* **2019**, *31*, 331–337. [CrossRef]
105. Zhang, Q.; Cao, Y.; Tian, J. Effects of Violent Video Games on Aggressive Cognition and Aggressive Behavior. *Cyberpsychol. Behav. Soc. Netw.* **2021**, *24*, 5–10. [CrossRef]
106. Silpasuwanchai, C.; Ren, X. A quick look at game engagement theories. In *The Wiley Handbook of Human Computer Interaction*; Norman, K., Kirakowski, J., Eds.; John Wiley & Sons Ltd: Hoboken, USA, 2018; Volume 2, pp. 657–679. [CrossRef]
107. Kowert, R.; Oldmeadow, J. (A)Social reputation: Exploring the relationship between online video game involvement and social competence. *Comput. Hum. Behav.* **2013**, *29*, 1872–1878. [CrossRef]
108. Shen, C.; Williams, D. Unpacking Time Online: Connecting Internet and Massively Multiplayer Online Game Use with Psychosocial Well-Being. *Commun. Res.* **2011**, *38*, 123–149. [CrossRef]
109. Lobel, A.; Engels, R.; Stone, L.; Burk, W.; Granic, I. Video Gaming and Children's Psychosocial Wellbeing: A Longitudinal Study. *J. Youth Adolesc.* **2017**, *46*, 884–897. [CrossRef]

110. Kiesler, S.; Siegel, J.; McGuire, T. Social psychological aspects of computer-mediated communication. *Am. Psychol.* **1984**, *39*, 1123–1134. [CrossRef]
111. Siegel, J.; Dubrovsky, V.; Kiesler, S.; McGuire, T. Group processes in computer-mediated communication. *Organ. Behav. Hum. Decis. Process.* **1986**, *37*, 157–187. [CrossRef]
112. Suler, J. The online disinhibition effect. *Cyberpsychol. Behav.* **2004**, *7*, 321–326. [CrossRef]
113. Lemmens, J.; Valkenburg, P.; Peter, J. Psychosocial causes and consequences of pathological gaming. *Comput. Hum. Behav.* **2011**, *27*, 144–152. [CrossRef]
114. Alsaad, A.; Alabdulmuhsin, F.; Alamer, Z.; Alhammad, Z.; Al-Jamaan, K.; Al-sultan, Y. Impact of the COVID-19 pandemic quarantine on gaming behavior among children and adolescents in the Eastern Province of Saudi Arabia. *Int. J. Med. Dev. Ctries.* **2021**, *5*, 1007–1014. [CrossRef]
115. Mohan, A.; Sen, P.; Shah, C.; Jain, E.; Jain, S. Prevalence and risk factor assessment of digital eye strain among children using online e-learning during the COVID-19 pandemic: Digital eye strain among kids (DESK study-1). *Indian J. Ophthalmol.* **2021**, *69*, 140–144. [CrossRef]
116. Aguilar-Farias, N.; Toledo-Vargas, M.; Miranda-Marquez, S.; Cortinez-O'Ryan, A.; Cristi-Montero, C.; Rodriguez-Rodriguez, F.; Martino-Fuentealba, P.; Okely, A.; Cruz, B. Sociodemographic Predictors of Changes in Physical Activity, Screen Time, and Sleep among Toddlers and Preschoolers in Chile during the COVID-19 Pandemic. *Int. J. Environ. Res. Public Health* **2020**, *18*, 176. [CrossRef]
117. Pedrotti, B.; Mallmann, M.; Almeida, C.; Marques, F.; Vescovi, G.; Riter, H.; Almeida, M.; Pieta, M.; Frizzo, G. Infants' and toddlers' digital media use and mothers' mental health: A comparative study before and during the COVID-19 pandemic. *Infant Ment. Health J.* **2022**, *43*, 24–35. [CrossRef] [PubMed]
118. Wang, G.; Zhang, Y.; Zhao, J.; Zhang, J.; Jiang, F. Mitigate the effects of home confinement on children during the COVID-19 outbreak. *Lancet* **2020**, *395*, 945–947. [CrossRef]
119. Wise, J. Covid-19: Babies born during the pandemic show slight development delays. *BMJ* **2022**, *376*, o29. [CrossRef]
120. Deoni, S.; Beauchemin, J.; Volpe, A.; Dâ Sa, V. Impact of the COVID-19 Pandemic on Early Child Cognitive Development: Initial Findings in a Longitudinal Observational Study of Child Health. *medRxiv* **2021**. [CrossRef]
121. Teng, Z.; Pontes, H.; Nie, Q.; Griffiths, M.; Guo, C. Depression and anxiety symptoms associated with internet gaming disorder before and during the COVID-19 pandemic: A longitudinal study. *J. Behav. Addict.* **2021**, *10*, 169–180. [CrossRef] [PubMed]
122. Basgul, S.; Bekar, B.; Luş, M. Associations between Computer Game Addiction and Attention Deficit and Hyperactivity Disorder-An Emprical Study. *Addicta Turk. J. Addict.* **2020**, *7*, 122–128. [CrossRef]
123. Bavelier, D.; Green, C.; Han, D.; Renshaw, P.; Merzenich, M.; Gentile, D. Brains on video games. *Nat. Rev. Neurosci.* **2011**, *12*, 763–768. [CrossRef] [PubMed]
124. Heym, N.; Lawrence, C. The role of Gray's revised RST in the P–psychopathy continuum: The relationships of psychoticism with a lack of fear and anxiety, and increased impulsivity. *Pers. Individ. Differ.* **2010**, *49*, 874–879. [CrossRef]
125. Oprea, D.; Moldovan, M.; Chirija, R.; Bolos, A. Behavioural addictions and the role of dopamine. *Bull. Integr. Psychiatry* **2021**, *27*, 63–70. [CrossRef]
126. Dong, G.; Potenza, M. A cognitive-behavioral model of Internet gaming disorder: Theoretical underpinnings and clinical implications. *J. Psychiatr. Res.* **2014**, *58*, 7–11. [CrossRef]
127. Leung, L. Net-generation attributes and seductive properties of the internet as predictors of online activities and internet addiction. *Cyberpsychol. Behav. Soc. Netw.* **2004**, *7*, 333–348. [CrossRef] [PubMed]
128. Saunders, J.; Hao, W.; Long, J.; King, D.; Mann, K.; Fauth-Bühler, M.; Rumpf, H.; Bowden-Jones, H.; Rahimi-Movaghar, A.; Chung, T.; et al. Gaming disorder: Its delineation as an important condition for diagnosis, management, and prevention. *J. Behav. Addict.* **2017**, *6*, 271–279. [CrossRef] [PubMed]
129. Seah, M.; Cairns, P. From immersion to addiction in videogames. In Proceedings of the 22nd British HCI Group Annual Conference on People and Computers: Culture, Creativity, Interaction, Liverpool, UK, 1–5 September 2008; Volume 1, pp. 55–63.
130. Dong, G.; Zhou, H.; Zhao, X. Male Internet addicts show impaired executive control ability: Evidence from a color-word Stroop task. *Neurosci. Lett.* **2011**, *499*, 114–118. [CrossRef] [PubMed]
131. West, G.; Konishi, K.; Diarra, M.; Benady-Chorney, J.; Drisdelle, B.; Dahman, L.; Sodums, D.; Lepore, F.; Jolicoeur, P.; Bohbot, V. Impact of video games on plasticity of the hippocampus. *Mol. Psychiatry* **2018**, *23*, 1566–1574. [CrossRef]
132. Kuga, N.; Abe, R.; Takano, K.; Ikegaya, Y.; Sasaki, T. Prefrontal-amygdalar oscillations related to social behavior in mice. *eLife* **2022**, *11*, e78428. [CrossRef]
133. Jobson, D.; Hase, Y.; Clarkson, A.; Kalaria, R. The role of the medial prefrontal cortex in cognition, ageing and dementia. *Brain Commun.* **2021**, *3*, fcab125. [CrossRef]
134. Forbes, C.; Grafman, J. The role of the human prefrontal cortex in social cognition and moral judgment. *Annu. Rev. Neurosci.* **2010**, *33*, 299–324. [CrossRef]
135. Frazier, T.; Crowley, E.; Shih, A.; Vasudevan, V.; Karpur, A.; Uljarevic, M.; Cai, R. Associations between executive functioning, challenging behavior, and quality of life in children and adolescents with and without neurodevelopmental conditions. *Front. Psychol.* **2022**, *13*, 1022700. [CrossRef]
136. Eglesz, D.; Fekete, I.; Kiss, O.; Izsó, L. Computer games are fun? On professional games and players' motivations. *EMI Educ. Media. Int.* **2005**, *42*, 117–124. [CrossRef]

137. Nogueira, M.; Faria, H.; Vitorino, A.; Silva, F.; Neto, S. Addictive Video Game Use: An Emerging Pediatric Problem? *Acta Med. Port.* **2019**, *32*, 183–188. [CrossRef] [PubMed]
138. Soltani Kouhbanani, S.; Arabi, S. Home executive function environment and executive functions in children: The mediating role of brain electrical activity. *Curr. Psychol.* **2023**, *42*, 7081–7089. [CrossRef]
139. Barkley, R. The executive functions and self-regulation: An evolutionary neuropsychological perspective. *Neuropsychol. Rev.* **2001**, *11*, 1–29. [CrossRef] [PubMed]
140. Heim, C.; Nemeroff, C. The role of childhood trauma in the neurobiology of mood and anxiety disorders: Preclinical and clinical studies. *Biol. Psychiatry* **2001**, *49*, 1023–1039. [CrossRef]
141. Vedechkina, M.; Borgonovi, F. A Review of Evidence on the Role of Digital Technology in Shaping Attention and Cognitive Control in Children. *Front. Psychol.* **2021**, *12*, 611155. [CrossRef]
142. Twenge, J.; Martin, G.; Spitzberg, B. Trends in U.S. Adolescents' media use, 1976–2016: The rise of digital media, the decline of TV, and the (near) demise of print. *Psychol. Pop. Media Cult.* **2019**, *8*, 329–345. [CrossRef]
143. King, D.; Delfabbro, P.; Perales, J.; Deleuze, J.; Király, O.; Krossbakken, E.; Billieux, J. Maladaptive player-game relationships in problematic gaming and gaming disorder: A systematic review. *Clin. Psychol. Rev.* **2019**, *73*, 101777. [CrossRef]
144. Yeh, Z.; Tsai, M.; Tsai, M.; Lo, C.; Wang, K. The relationship between theory of mind and the executive functions: Evidence from patients with frontal lobe damage. *Appl. Neuropsychol. Adult* **2017**, *24*, 342–349. [CrossRef] [PubMed]
145. Sinvani, R.; Darel, D.; Ektilat, F.; Segal, L.; Gilboa, Y. The relationship between executive functions and naturalistic use of screen-based activities in children. *Child Neuropsychol.* **2023**, *29*, 787–794. [CrossRef]
146. Hammond, C.; Mayes, L.; Potenza, M. Neurobiology of adolescent substance use and addictive behaviors: Treatment implications. *Adolesc. Med. State Art Rev.* **2014**, *25*, 15–32. [CrossRef]
147. Sturman, D.; Moghaddam, B. The neurobiology of adolescence: Changes in brain architecture, functional dynamics, and behavioral tendencies. *Neurosci. Biobehav. Rev.* **2011**, *35*, 1704–1712. [CrossRef] [PubMed]
148. Best, J. Exergaming immediately enhances children's executive function. *Dev. Psychol.* **2012**, *48*, 1501–1510. [CrossRef] [PubMed]
149. Liu, X.; He, Q.; Dou, D. The effects of two-player cooperative video/traditional games on peer communication and the prosocial behavior of young children. *J. Psychol. Sci.* **2021**, *44*, 567–574. [CrossRef]
150. Carson, V.; Spence, J.; Cutumisu, N.; Cargill, L. Association between neighborhood socioeconomic status and screen time among pre-school children: A cross-sectional study. *BMC Public Health* **2010**, *10*, 367. [CrossRef] [PubMed]
151. Reinecke, L. Games at work: The recreational use of computer games during working hours. *Cyberpsychol. Behav.* **2009**, *12*, 461–465. [CrossRef]
152. Hemenover, S.; Bowman, N. Video games, emotion, and emotion regulation: Expanding the scope. *Ann. Int. Commun. Assoc.* **2018**, *42*, 125–143. [CrossRef]
153. Geng, S.; Xu, K.; Liu, X. Association between Electronic Media Use and Internalizing Problems: The Mediating Effect of Parent–Child Conflict and Moderating Effect of Children's Age. *Behav. Sci.* **2023**, *13*, 694. [CrossRef]
154. Hiniker, A.; Schoenebeck, S.; Kientz, J. Not at the Dinner Table: Parents' and Children's Perspectives on Family Technology Rules. In Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing, San Francisco, CA, USA, 27 February–2 March 2016; pp. 1376–1389. [CrossRef]
155. Kabadayi, A. Investigating the effects of preschoolers' computer use based on their parental opinions. *Distance Educ. Ukr. Innov. Norm. Leg. Pedagog. Asp.* **2021**, *1*, 28–30. [CrossRef]
156. Council on Communications and Media. Media and Young Minds. *Pediatrics* **2016**, *138*, e20162591. [CrossRef] [PubMed]

behavioral sciences

MDPI

Article

How Trait Gratitude Influences Adolescent Subjective Well-Being? Parallel–Serial Mediating Effects of Meaning in Life and Self-Control

Yulin Li [1], Sige Liu [2], Dan Li [2,*] and Huazhan Yin [2,*]

[1] School of Business Administration, Hunan University of Finance and Economics, Changsha 410205, China; liyulin@hufe.edu.cn
[2] School of Education, Hunan Normal University, Changsha 410081, China; lsg15116263182@163.com
* Correspondence: lidan@hunnu.edu.cn (D.L.); yhz1979@sina.com (H.Y.); Tel.: +86-0731-8887-2513 (D.L.); +86-0731-8887-2513 (H.Y.)

Abstract: The relationship between trait gratitude and subjective well-being is well documented in the literature. Recently, growing attention has been given to examining which factors are determinants in the relationship. However, there are no studies to present a comprehensive model of how meaning in life and self-control jointly play a role in this relationship. This study investigated parallel and serial mediation of the presence of meaning, the search for meaning, and self-control in the relationship between trait gratitude and subjective well-being. A total of 764 adolescents (M_{age} = 14.10, SD = 1.43, 48.43% males) from three middle schools in China completed a six-item measures of gratitude questionnaire form, a meaning in life questionnaire, a middle school students' self-control ability questionnaire, and a satisfaction with life scale. The study revealed that trait gratitude affected the presence of meaning and subsequently affected subjective well-being. In addition, trait gratitude affected self-control through the presence of meaning and the search for meaning, and it subsequently affected subjective well-being. Therefore, the presence of meaning, the search for meaning, and self-control played an important role in the positive effects of trait gratitude on adolescent subjective well-being. The findings were in line with the intrinsic and extrinsic goal theory of gratitude and provided new insight to inform the improvement of adolescent subjective well-being in the future.

Keywords: trait gratitude; presence of meaning; search for meaning; self-control; subjective well-being; parallel–serial multiple mediation analysis

Citation: Li, Y.; Liu, S.; Li, D.; Yin, H. How Trait Gratitude Influences Adolescent Subjective Well-Being? Parallel–Serial Mediating Effects of Meaning in Life and Self-Control. *Behav. Sci.* **2023**, *13*, 902. https://doi.org/10.3390/bs13110902

Academic Editors: Xuechen Ding and Wan Ding

Received: 28 July 2023
Revised: 23 October 2023
Accepted: 31 October 2023
Published: 1 November 2023

1. Introduction

Subjective well-being (SWB) is a crucial predictor of mental health, as it comprehensively assesses the self-perception of the quality of an individual's life and reflects their social functioning and adaptation abilities [1]. Traditionally, SWB has referred to an individual's overall assessment of their quality of life based on self-established standards, including two primary components: emotional and cognitive dimensions [2,3]. A higher level of SWB has been found to be a significant predictor of better physical health, stronger social relationships, and superior academic or work performance, while lower SWB was positively correlated with a higher incidence of problem behaviors, including Internet addiction, aggression, and emotional distress (i.e., depression, anxiety) [4–6].

In previous studies, the intrinsic and extrinsic goal theory explained the effect of gratitude on materialism and life satisfaction [7,8]. According to the theory of personality trait, trait gratitude is considered a positive personality trait that has a positive effect on subjective well-being [1,9]. As a crucial emotional trait of gratitude, trait gratitude refers to a life orientation that takes notice of the positive and appreciates it [10]. The intrinsic and extrinsic goal theory of gratitude also suggests that gratitude can enhance an individual's SWB by promoting the satisfaction of their intrinsic needs [11]. Adolescents'

trait gratitude has been found to have a positive correlation with SWB in cross-sectional studies [12–14]. Meanwhile, longitudinal studies have also supported the notion that trait gratitude serves as a predictor of SWB [15,16]. Moreover, intervention studies targeting trait gratitude have affirmed that enhancing an individual's level of trait gratitude can lead to a significant improvement in their SWB [10,17]. Adolescence is marked by significant physical, cognitive, social, and affective transformations attributable to rapid growth and maturation [18]. Within this age cohort, the development of trait gratitude demonstrates a consistent amelioration with advancing years [12]. In contrast to their senior counterparts, students in their early academic years tend to exhibit lower levels of trait gratitude [19]. Hence, within the scope of this study, examining the relationship between trait gratitude and subjective well-being, and the latent mediation variables among lower grades (age range = 12–17 years; mean age = 14.10 $\pm$ 1.43 years), will furnish fresh insights into the happiness experienced during this phase of life. Accordingly, we hypothesize that:

H1. *Trait gratitude has a positive correlation with subjective well-being.*

How does trait gratitude influence subjective well-being? The internal and external goal theory of gratitude posits that gratitude has the potential to foster the pursuit of intrinsic aspirations while diminishing the inclination toward extrinsic or materialistic objectives [12]. That is, a disposition towards gratitude has the potential to stimulate individuals' meaningful internal objectives such as finding purpose in life, and it motivates them to strive towards these goals, ultimately enhancing their well-being [12]. Meaning in life (MiL) encompasses the subjective understanding, recognition, or perception of the purpose and significance of one's existence, as well as an awareness of one's life's mission, purpose, and primary objectives [20]. Gratitude, as a substantial influencer of MiL, facilitates the acquisition of this sense of purpose [21,22]. For example, individuals who routinely document moments of gratitude demonstrate higher levels of MiL [23]. Prior studies have additionally shown that MiL significantly impacts subjective well-being, surpassing mere correlation [24–26].

Nevertheless, MiL encompasses two dimensions: the presence of meaning, which pertains to whether individuals perceive their lives as significant in a cognitive sense, and the search for meaning, which is a motivational component related to the desire to comprehend the significance of one's existence. In terms of the presence of meaning, trait gratitude displays a positive correlation [27]. A disposition of gratitude fosters an intensified sense of significance in life, deriving from its independence from external objects and reliance on perceived value and importance. Those who experience gratitude are more inclined to discern the value of tasks, invest greater effort towards intrinsic goals, and consequently experience a heightened sense of the presence of meaning. Seligman [28] explained that well-being emanates from a life infused with purpose and meaning. Individuals possessing higher levels of meaningfulness not only experience greater happiness but also exhibit reduced susceptibility to depression and anxiety. Scholars have consistently discerned a robust positive correlation between the presence of meaning and subjective well-being [29]. In essence, individuals who acknowledge the presence of meaning tend to experience heightened positivity, including greater well-being and increased life satisfaction. As for the search for meaning, trait gratitude demonstrates a positive correlation [27]. However, the relationship between the search for meaning and subjective well-being has yielded inconsistent findings, potentially attributable to cultural divergences. Chinese individuals are predominantly shaped by Confucian cultural thoughts, which underscore a sense of duty in the world and promote a transcendent spirit in the face of setbacks. In the process of pursuing the meaning of life, it is an active and enjoyable attitude. Therefore, Chinese people tend to have higher levels of positive emotions such as subjective well-being when seeking meaning [25]. According to meaning management theory, people acquire the art of living a fulfilling life through the exploration and creation of meaning in their lives [30].

To sum up, trait gratitude exerts a positive influence on MiL, which stands as a pivotal influencing factor of subjective well-being. Therefore, we assume that:

H2. *The meaning in life plays a mediating role between trait gratitude and SWB.*

Additionally, *the intrinsic and extrinsic goal theory of gratitude* posits that a grateful life orientation contributes to enhancing resistance to external temptation, improving the ability to manage and control one's life, ultimately leading individuals to greater satisfaction with their lives [12,31]. Self-control refers to the ability to overcome impulses, habits, or automatic responses and regulate one's thoughts, emotions, and behaviors in order to achieve goals or adapt to external environments [32]. The literature suggests that positive emotions can enhance self-control. For instance, Dickens and DeSteno [33] found that gratitude could enhance self-control rather than inhibit it. That was because being grateful could enhance the inclination to relinquish current interests and pursue long-term goals, which necessitates suppressing impulsive responses to short-term objectives. Meanwhile, individuals with greater self-control are more likely to be well-adjusted and satisfied with their lives, as well as to achieve greater success and better psychological regulation [23,34–36]. The broaden-and-build theory postulates that positive emotions not only broaden one's experiential scope but also foster the accumulation of valuable resources [37]. Consequently, this positive feedback loop culminates in an elevated sense of well-being. The theory of perceived control also posits that individuals with a heightened sense of control experience greater autonomy and well-being, while the absence of control may precipitate psychological distress such as depression [38]. In conclusion, the cultivation of gratitude may enhance the ability to exercise self-control and thereby contribute to elevated levels of well-being. In this regard, we assume that:

H3. *Self-control plays a mediating role between trait gratitude and SWB.*

Individuals who perceive their lives as imbued with meaning and value are more inclined to cultivate a robust internal drive for regulating their external behaviors and performances. This inclination leads them to transcend mere instinctual and impulsive modes of living [39]. The cognitive-affective system theory of personality [40] posits that personality traits (such as self-control) are structured according to three categories of social-cognitive factors: beliefs about control, values and aspirations, and strategies and competencies. A lucid and steadfast sense of meaning in life molds the objectives individuals pursue and the methodologies they employ in achieving them. This, in turn, delineates the focal point of self-control and provides it with impetus [41,42]. This implies that a sense of meaning in life serves as a motivator for individuals to adeptly regulate their emotions and behavioral patterns, all the while significantly enhancing their self-control [43]. However, individuals lacking MiL tend to be more susceptible to impulsive instincts. Recent studies have also indicated that MiL has a positive impact on self-control [44,45]. Individuals who possess a sense of meaning in life are better equipped to regulate their own behavior and emotional patterns. As an important psychological mechanism, self-control ability can be strengthened through increased MiL. Life meaning is a comprehensive set of values that provides guidance and motivation for adolescents to exercise self-discipline. Consequently, a heightened sense of the presence of meaning is expected to be associated with enhanced self-control [44]. As for the search for meaning, scholars have observed that individuals endowed with a sense of purpose and clear direction are inclined to tackle tasks with a sense of gravity, aligning their actions with their overarching life objectives through the reinforcement of self-discipline [46,47]. In sum, individuals' self-control is influenced by their meaning in life. Therefore, our last hypothesis is that:

H4. *Meaning in life and self-control mediate the relationship between trait gratitude and SWB.*

2. Materials and Methods

2.1. Participants

A total of 764 Chinese adolescent students participated in the study. After omitting participants with incomplete data (i.e., missing values), in the data analysis, 737 valid questionnaires were obtained, including 357 (48.43%) males and 380 females (51.56%). They ranged in age from 12 to 17 years, with a mean age of 14.10 (SD = 1.43) years.

The current investigation obtained ethical clearance from the Research Ethics Committee at the primary author's institution and adhered rigorously to the principles delineated in the Declaration of Helsinki. Informed consent was obtained from school authorities, parents or legal guardians, and the participating students.

2.2. Instruments

Gratitude Questionnaire Six-Item Form (GQ-6). The Chinese version [48] of the 6-item self-report measure evaluates one's propensity to experience gratitude (e.g., "Throughout my life, I am grateful for so many things") [49]. A 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used. Higher scores indicated a greater trait gratitude level. Confirmatory factor-analytic results showed that the one-factor model fitted the data acceptably: χ^2/df = 3.85, SRMR = 0.02, TLI = 0.97, CFI = 0.99, RMSEA = 0.06. In the current study, Cronbach's alpha coefficient was 0.651.

Meaning in Life Questionnaire (MLQ). The Chinese version of the MLQ [50] was used to evaluate MiL. The MLQ had two dimensions: the *presence of meaning* (e.g., "There is a clear purpose to my life") and the *search for meaning* (e.g., "I am seeking something that will make my life more meaningful"), each with five items (Steger et al., 2009). A 7-point Likert scale ranging from 1 (absolutely false) to 7 (absolutely true) was used. The two dimensions were combined to generate a comprehensive global score. Higher scores indicated greater MiL. Confirmatory factor-analytic results indicated that the two-factor model fitted the data acceptably: χ^2/df = 4.53, SRMR = 0.04, TLI = 0.94, CFI = 0.96, RMSEA = 0.07. The Cronbach's alpha coefficient of the *presence of meaning* and the *search for meaning* in the present study were 0.805, 0.825.

Middle School Students' Self-control Ability Questionnaire. This 36-item self-report measure evaluates one's self-control [51]. A 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used. The questionnaire consisted of three dimensions: *the control over emotion* (e.g., "I get nervous when I take exams") with eleven items, *the control over behavior* (e.g., "I have cheated in exams more than once") with fifteen items, and *the control over thinking process* (e.g., "I'm easily influenced by the outside world") with ten items. The three dimensions were combined to generate a comprehensive global score. Higher scores indicated a greater self-control. Confirmatory factor-analytic results indicated that the three-factor model fitted the data acceptably: χ^2/df = 2.47, SRMR = 0.04, TLI = 0.90, CFI = 0.91, RMSEA = 0.04. In this study, Cronbach's alpha coefficient was 0.899.

Satisfaction with Life Scale (SWLS). The SWLS was used to assess the cognitive domain of subjective well-being [52] and measure individuals' evaluations on how contented they were with their lives [53]. The scale included five items (e.g., "My life roughly conforms to my ideal"). A 7-point Likert scale (strongly disagree to strongly agree) was used to rate the statements. Higher scores signified greater SWB. Confirmatory factor-analytic results indicated that the single-factor model fitted the data acceptably: χ^2/df = 3.85, SRMR = 0.02, TLI = 0.97, CFI = 0.99, RMSEA = 0.06. In this study, Cronbach's alpha coefficient was 0.846.

2.3. Data Analysis

In the present study, data were analyzed using SPSS 21.0. The correlational analysis was carried out to determine the interrelationships among the variables. Mediation analyses of the relationship between trait gratitude, SWB, *the presence of meaning*, *the search for meaning*, and self-control were performed using the PROCESS version 3.3 procedure (Model 80) [54] in SPSS 21.0. Indirect effects were considered significant if the confidence intervals did

not contain a value of 0, and the indirect effects standard errors were estimated using the bootstrap method with 95% confidence intervals (with 5000 samples) [54].

3. Results

3.1. Common Method Biases

In this study, some items of the questionnaires were reversely scored. In reference to previous studies [55,56], possible method biases were controlled in the testing procedure. The Harman single-factor test was used to conduct a statistical analysis of common method biases. The results showed that there were thirteen factors with characteristic roots greater than 1. The cumulative variation explained by the first factor accounted for 19.21%, which was less than 40%. Therefore, it could be concluded that there were no serious common method biases.

3.2. Descriptive Statistics and Correlations

The descriptive data and correlational coefficients are shown in Table 1. Correlational analyses demonstrate that SWB was positively correlated with trait gratitude, the *presence of meaning*, *the search for meaning*, and self-control. Trait gratitude was positively correlated with the *presence of meaning*, *the search for meaning*, and self-control. Furthermore, self-control was strongly associated with the *presence of meaning* and the *search for meaning*.

Table 1. Descriptive statistics and correlations among variables.

Variables	*M*	*SD*	1	2	3	4	5
1. Trait gratitude	30.49	5.94	1				
2. Presence of meaning	20.20	6.42	0.331 ***	1			
3. Search for meaning	24.36	6.03	0.333 ***	0.348 ***	1		
4. Self-control	111.99	20.46	0.194 ***	0.424 ***	0.260 ***	1	
5. Subjective well-being	20.35	7.08	0.284 ***	0.402 ***	0.205 ***	0.332 ***	1

Note: *M* = mean; *SD* = standard deviation. *** $p < 0.001$.

3.3. Hypothesis Testing

To test the parallel–serial mediation model between trait gratitude and subjective well-being, the PROCESS macro model 80 was adopted. As shown in Table 2, in stage 1, we examined the overall impact of trait gratitude on subjective well-being (H1). Trait gratitude was directly positively predicted SWB ($\beta = 0.284$, $p < 0.001$). In stages 2, 3, and 5, we scrutinized the mediating roles of both the presence of meaning and the search for meaning in the relationship between trait gratitude and SWB (H2). Trait gratitude was used as a predictor of the presence of meaning and the search for meaning ($\beta = 0.311$, $p < 0.001$; $\beta = 0.320$, $p < 0.001$), but only the presence of meaning ($\beta = 0.268$, $p < 0.001$) positively predicted SWB. In stages 4 and 5, we probed into the mediating role of self-control in the association between trait gratitude and subjective well-being (H3). Self-control positively predicted SWB ($\beta = 0.177$, $p < 0.001$), but trait gratitude did not positively predict self-control. In stages 2, 3, 4, and 5, we explored the serial mediating roles of meaning in life and self-control in the relationship between trait gratitude and subjective well-being (H4). Trait gratitude ($\beta = 0.162$, $p < 0.\ 001$), the presence of meaning ($\beta = 0.268$, $p < 0.001$), and self-control ($\beta = 0.177$, $p < 0.001$) all positively predicted SWB. See Figure 1 for details.

Table 3 shows the indirect effects of the *presence of meaning*, *the search for meaning*, and self-control. As shown, the total indirect effects of trait gratitude on SWB were significant ($\beta = 0.124$, CI = [0.081, 0.172]), accounting for 43.32% of total effects. Furthermore, there are three significant indirect effects of the parallel–serial multiple mediation. Firstly, the *presence of meaning* mediated the association between trait gratitude and SWB ($\beta = 0.083$, CI = [0.050, 0.121]), accounting for 29.08% of the total effects. The results partly confirmed hypothesis 2. Secondly, the result showed that trait gratitude affected SWB via the *presence of meaning* and then self-control (i.e., serial mediating effect) ($\beta = 0.020$, CI = [0.010, 0.034]), explaining 7.05% of the total effects (i.e., serial mediating effect). Thirdly, trait gratitude

influenced SWB through the *search for meaning* and then self-control (i.e., serial mediating effect) (β = 0.006, CI = [0.009, 0.013]), explaining 2.09% of the total effects. Hypothesis 4 was confirmed.

Table 2. Regression analysis.

Predictor Variables	Stage 1: SWB		Stage 2: Presence of Meaning		Stage 3: Search for Meaning		Stage 4: Self-Control		Stage 5: SWB	
	β	*t*	β	*t*	β	*t*	β	*t*	β	*t*
Trait gratitude	0.284	7.850 ***	0.311	8.164 ***	0.320	8.401 ***	0.042	1.066	0.162	4.162 ***
Presence of meaning							0.368	9.130 ***	0.268	6.210 ***
Search for meaning							0.106	2.626 **	0.022	0.551
Self-control									0.177	4.315 ***
R^2	0.080		0.100		0.105		0.189		0.212	
F	61.624 ***		66.653 ***		70.580 ***		46.290 ***		40.040 ***	

Note: ** $p < 0.01$, *** $p < 0.001$.

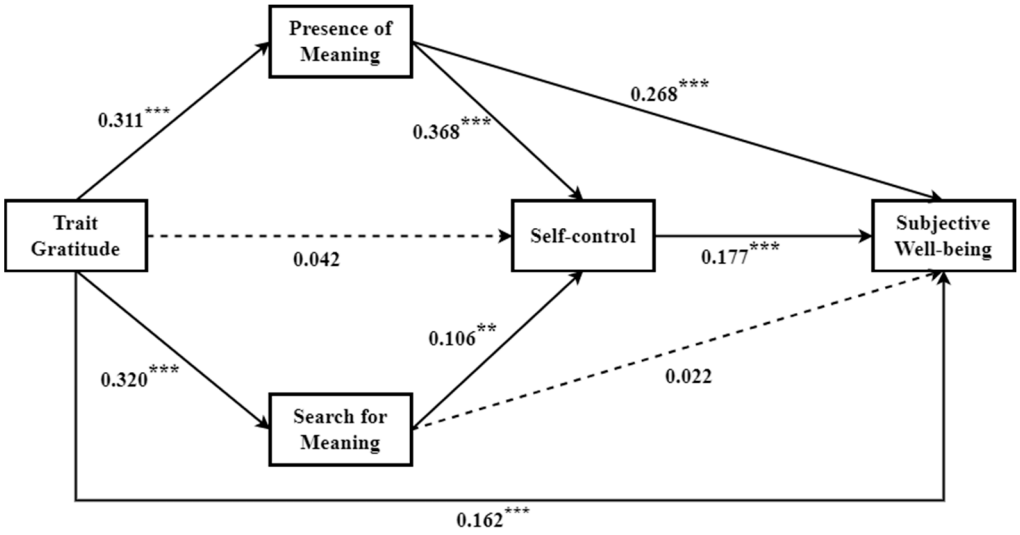

Figure 1. Parallel–serial multiple mediation model. ** $p < 0.01$, *** $p < 0.001$.

Table 3. The indirect effects through the *presence of meaning*, *the search for meaning* and self-control.

	Effect	Boot SE	95% CI	Relative Mediating Effects
Total indirect effects	0.124	0.023	[0.081, 0.172] [a]	43.32%
Trait gratitude → Presence of meaning → SWB	0.083	0.018	[0.050, 0.121] [a]	29.08%
Trait gratitude → Search for meaning → SWB	0.007	0.015	[−0.023, 0.037]	
Trait gratitude → Self-control → SWB	0.007	0.008	[−0.007, 0.025]	
Trait gratitude → Presence of meaning → Self-control → SWB	0.020	0.006	[0.010, 0.034] [a]	7.05%
Trait gratitude → Search for meaning → Self-control → SWB	0.006	0.003	[0.009, 0.013] [a]	2.09%

Note: CI = bootstrapping confidence interval. [a] CI does not include zero.

4. Discussion

The current research proposes a parallel–serial mediation model that accounts for both direct and indirect effects between gratitude and SWB. Firstly, our findings support hypothesis 1, that higher levels of trait gratitude are positively associated with greater subjective well-being, in line with the *intrinsic–extrinsic goal theory of gratitude*. Additionally, these results replicate previous research indicating that grateful adolescents are more likely to experience a high quality of life [13,14]. Moreover, it could be inferred from the *broaden-*

and-build theory [37] that gratitude can expand individuals' cognitive flexibility and foster positive and enduring social and psychological resources, thereby promoting their SWB.

Secondly, the findings partially support hypothesis 2, that trait gratitude is positively associated with adolescent SWB through the mediation of MiL, which verifies *the intrinsic and extrinsic goal theory* again. As predicted, expressing gratitude may lead individuals to recognize the significance of their lives and subsequently enhance their levels of life satisfaction, which is consistent with the findings proposed by previous studies [21,27]. Trait gratitude enhances the perception of meaning in life by promoting the savoring of positive experiences and by strengthening social bonds, thereby providing a sense of purpose and connection [21,57]. At the same time, the linkage of gratitude to optimism, resilience, and openness to experiences motivates the desire to explore new possibilities and discover new sources of meaning and purpose [58–60]. In essence, the appreciative mindset cultivated through gratitude reveals existing meaning in one's circumstances, while also inspiring the search for meaning by orientating individuals towards potential and growth [61,62]. Through this dual pathway of enhancing present meaning and motivating the search for meaning, the character strength of gratitude positively influences both the presence of, and the search for, meaning in life. This phenomenon may be observed in both Eastern and Western cultural contexts. Studies conducted in both Japanese and American cohorts have discovered that higher levels of gratitude are associated with adaptive psychological traits and heightened well-being, while lower levels of gratitude are linked to negative psychological processes and compromised emotional well-being [63]. Additionally, a disposition towards gratitude increases the likelihood of adopting positive coping mechanisms and social support, thus ameliorating psychological well-being in both the United States [64] and China [65]. This implies that the robust psychological benefits engendered by a disposition of gratitude may be consistent across diverse cultures [63]. Meanwhile, we found that both the *presence of meaning* and the *search for meaning* were positively correlated with well-being indices among Chinese students, which is consistent with previous meta-analyses [25,29]. However, the mediation role between trait gratitude and SWB is played solely by the *presence of meaning*, possibly due to its cognitive nature in contrast to the motivational aspect of *searching for meaning* [20,52]. This indicates that adolescents who possess a disposition of gratitude may be more likely to experience a heightened sense of purpose and exhibit better psychological adaptation. This indicates that grateful adolescents who experience a higher *presence of meaning* are more likely to exhibit better psychological adaptation, suggesting that the impact of trait gratitude on adolescent life satisfaction is primarily mediated by cognitive mechanisms. The findings are consistent with Watkins' [66] proposition that grateful individuals tend to identify and amplify positive aspects of events, as well as reinterpret the meanings embedded in these situations, thereby enhancing their self-understanding and sense of meaning. Moreover, for Chinese individuals, life itself, to a considerable extent, embodies meaning; they do not require a distinct objective or mission to derive significance from life [67]. Through wholeheartedly embracing all life experiences, the Chinese may transcend the confines of the self, establishing profound connections and resonance with the entire universe. Such an outlook might compensate for the seemingly limited presence of religious beliefs among the Chinese, providing a pathway to transcendence akin to what religious beliefs offer in other cultures [67]. Therefore, higher levels of gratitude could enhance students' well-being by raising the extent to which they realize the meaning in their lives.

Thirdly, this study has confirmed hypothesis 4, that both MiL and self-control serve as serial mediators in the relationship between trait gratitude and SWB among adolescents, which is consistent with *the intrinsic and extrinsic goal theory of gratitude* [11]. The findings suggest that grateful individuals experience greater happiness by enhancing their sense of life purpose and self-regulation. The possible reason is that grateful individuals are more likely to perceive the meaning of life, abandon immediate interests, and pursue long-term interests. During the process, individuals must assess multiple options and determine the most effective approach to their self-regulation abilities [68]. Adolescents

who exhibit higher levels of self-control tend to employ more effective strategies in pursuit of personal goals [69], resulting in greater well-being and life satisfaction [1]. Consistent in part with previous studies [70], this study further demonstrates that not only the *presence of meaning* but also the *search for meaning* can facilitate students' self-control improvement. The cognitive component of MiL exerts a greater influence than the motivational component, indicating that adolescents with high levels of meaningfulness possess clearer inner goals that drive them to regulate their thoughts, emotions, and behaviors in order to appreciate the value of life. Thus, trait gratitude may be a distal factor in SWB, while existential meaning and especially self-control are important proximal factors in SWB.

Last but not least, we opt to discuss hypothesis 3 after hypothesis 4, as our findings do not offer direct support for hypothesis 3. In other words, self-control does not appear to mediate the relationship between trait gratitude and SWB. However, this outcome does not negate the role of self-control in the influence of trait gratitude on subjective well-being. We ascertain that, when combined with the results of hypothesis 4, the influence of trait gratitude on self-control is entirely mediated by the presence of meaning and the search for meaning. This outcome underscores that the impact of trait gratitude on self-control is not direct, but rather mediated through other intermediary factors. Moreover, self-control significantly and positively predicts SWB. Individuals with a strong sense of self-control are more likely to exhibit stable emotions and higher self-efficacy when faced with stressful life events [58]. According to the psychological resilience theory, individuals with high psychological resilience possess more flexible cognition and richer coping strategies [71]. These abilities help reduce negative emotions and enhance positive emotions, and they thus predict an individual's SWB. Therefore, the results indicate that individuals with high trait gratitude tend to possess stronger self-control, and those who perceive greater control over their lives are more likely to experience higher levels of SWB.

Enhancing SWB among adolescents is crucial, as it may act as a protective factor against clinical distress. This study investigates the determinants of SWB through the lens of goal-setting and attainment. Adolescents who exhibit gratitude are more likely to perceive meaning and inner goals by expanding their cognitive horizons and regulating their thoughts and behaviors towards achieving these objectives, thereby experiencing a profound sense of happiness. This implies that parents and educators have the potential to enhance adolescents' subjective well-being by adopting the following perspectives. First, gratitude interventions, such as keeping a gratitude journal or practicing "naikan" meditation, could be effective means for adolescents to elevate their level of SWB. Second, career-planning guidance is a viable option, as there is ample evidence to suggest that it can enhance one's sense of purpose in life. By cultivating this sense of purpose, adolescents are better equipped to identify and pursue their goals. Finally, parents and teachers can impart self-management, self-monitoring, and self-regulation techniques and strategies to students.

In summary, we broaden the scope of gratitude inquiry, moving beyond transient emotional states to encompass enduring personality traits. Our study delves into trait gratitude and its correlation with SWB. We pinpoint 'meaning in life' and 'self-control' as pivotal mediators, illuminating how trait gratitude can foster subjective well-being. This research elevates our comprehension of gratitude by clarifying the mechanisms through which individual disparities in grateful disposition can yield enduring subjective well-being. In essence, our emphasis on trait gratitude, SWB, and the role of 'meaning in life' and 'self-control' as distinctive mediators represents a significant extension of prior research and constitutes a substantial empirical contribution to the field.

Some limitations should be considered. Firstly, due to its cross-sectional nature, this study cannot establish causal relationships between trait gratitude and SWB with absolute certainty [16]. Therefore, future research employing longitudinal designs and experimental methods is necessary to validate these findings. Secondly, this study relies on self-reported questionnaires, which may be subject to response bias from participants, including social desirability effects [72,73]. Therefore, future research should incorporate a more diverse

range of data collection methods, such as behavioral observation, interviews, or evaluations from parents and teachers. Finally, it is imperative to note that the homogeneity of our sample population, composed predominantly of early adolescents, may impose limitations on the generalizability of our research findings. Consequently, future studies should aim to encompass larger and more diverse samples drawn from various age groups and regions.

5. Conclusions

The current study has posited that adolescents who possess high levels of trait gratitude are more likely to experience greater life satisfaction. *The presence of meaning* has been found to partially mediate the relationship between trait gratitude and SWB, indicating that grateful students may have a heightened sense of purpose in life and consequently experience higher levels of SWB. Additionally, the *presence of meaning*, *the search for meaning*, and self-control have been identified as parallel–serial mediators between trait gratitude and SWB. Grateful students are specifically motivated to utilize their self-control abilities in pursuit of their goals by searching for, and perceiving, the meaning of life, resulting in increased well-being and fulfillment. In summary, the current research has made a significant contribution by providing new insights into the literature. It demonstrates that the presence of meaning, the search for meaning, and self-control independently and cumulatively mediate the relationship between trait gratitude and SWB.

Author Contributions: Concept and design: Y.L. and D.L.; data collection and analysis: Y.L. and S.L.; drafting of the article: Y.L. and S.L.; article writing: Y.L. and D.L.; study supervision: H.Y. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Hunan education scientific "thirteen five" planning project (grant number: XJK20AXL01) and the Scientific Research Project of Hunan education department: "Research on Zen mental health education thought and its modern value" (project number: 17C0278).

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of Hunan Normal University (protocol code 2022495).

Informed Consent Statement: Informed consent was obtained from all parent(s) of subjects involved in the study. Written informed consent has been obtained from the students to publish this paper.

Data Availability Statement: The datasets that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Diener, E. Subjective well-being. *Psychol. Bull.* **1984**, *95*, 542. [CrossRef]
2. Diener, E. Assessing subjective well-being: Progress and opportunities. *Soc. Indic. Res.* **1994**, *31*, 103–157. [CrossRef]
3. Diener, E.; Wirtz, D.; Tov, W.; Kim-Prieto, C.; Choi, D.; Oishi, S.; Biswas-Diener, R. New well-being measures: Short scales to assess flourishing and positive and negative feelings. *Soc. Indic. Res.* **2010**, *97*, 143–156. [CrossRef]
4. Agbaria, Q.; Bdier, D. The role of social support and subjective well-being as predictors of internet addiction among Israeli-Palestinian college students in Israel. *Int. J. Ment. Health Addict.* **2021**, *19*, 1889–1902. [CrossRef]
5. Burns, R.A.; Anstey, K.J.; Windsor, T.D. Subjective well-being mediates the effects of resilience and mastery on depression and anxiety in a large community sample of young and middle-aged adults. *Aust. N. Z. J. Psychiatry* **2011**, *45*, 240–248. [CrossRef] [PubMed]
6. Deng, Y.; Xiang, R.; Zhu, Y.; Li, Y.; Yu, S.; Liu, X. Counting blessings and sharing gratitude in a Chinese prisoner sample: Effects of gratitude-based interventions on subjective well-being and aggression. *J. Posit. Psychol.* **2019**, *14*, 303–311. [CrossRef]
7. Lambert, N.M.; Fincham, F.D.; Stillman, T.F.; Dean, L.R. More gratitude, less materialism: The mediating role of life satisfaction. *J. Posit. Psychol.* **2009**, *4*, 32–42. [CrossRef]
8. Ma, L.K.; Tunney, R.J.; Ferguson, E. Does gratitude enhance prosociality? A meta-analytic review. *Psychol. Bull.* **2017**, *143*, 601. [CrossRef]
9. Lin, C.-C. A higher-order gratitude uniquely predicts subjective well-being: Incremental validity above the personality and a single gratitude. *Soc. Indic. Res.* **2014**, *119*, 909–924. [CrossRef]

10. Wood, A.M.; Froh, J.J.; Geraghty, A.W. Gratitude and well-being: A review and theoretical integration. *Clin. Psychol. Rev.* **2010**, *30*, 890–905. [CrossRef]
11. La Guardia, J.G.; Ryan, R.M.; Couchman, C.E.; Deci, E.L. Within-person variation in security of attachment: A self-determination theory perspective on attachment, need fulfillment, and well-being. *J. Pers. Soc. Psychol.* **2000**, *79*, 367. [CrossRef] [PubMed]
12. Bono, G.; Duffy, T.; Moreno, S. Gratitude in School: Benefits to Students and Schools. In *Handbook of Positive Psychology in Schools*; Routledge: Oxford, UK, 2022; pp. 118–134.
13. Kong, F.; Yang, K.; Yan, W.; Li, X. How does trait gratitude relate to subjective well-being in Chinese adolescents? The mediating role of resilience and social support. *J. Happiness Stud.* **2021**, *22*, 1611–1622. [CrossRef]
14. Wang, Y. College students' trait gratitude and subjective well-being mediated by basic psychological needs. *Soc. Behav. Personal. Int. J.* **2020**, *48*, 1–10. [CrossRef]
15. Unanue, W.; Gomez Mella, M.E.; Cortez, D.A.; Bravo, D.; Araya-Véliz, C.; Unanue, J.; Van Den Broeck, A. The reciprocal relationship between gratitude and life satisfaction: Evidence from two longitudinal field studies. *Front. Psychol.* **2019**, *10*, 2480. [CrossRef] [PubMed]
16. Yang, K.; Yan, W.; Jia, N.; Wang, Q.; Kong, F. Longitudinal relationship between trait gratitude and subjective well-being in adolescents: Evidence from the bi-factor model. *J. Posit. Psychol.* **2021**, *16*, 802–810. [CrossRef]
17. Watkins, P.C.; Emmons, R.A.; McCullough, M.E. Gratitude and Subjective Well-Being. In *Scientific Concepts Behind Happiness, Kindness, and Empathy in Contemporary Society*; IGI Global: Hershey, PA, USA, 2004; pp. 167–192.
18. National Academies of Sciences, Engineering and Medicine. *The Promise of Adolescence: Realizing Opportunity for All Youth*; Academic Press: Cambridge, MA, USA, 2019.
19. Kashdan, T.B.; Mishra, A.; Breen, W.E.; Froh, J.J. Gender differences in gratitude: Examining appraisals, narratives, the willingness to express emotions, and changes in psychological needs. *J. Pers.* **2009**, *77*, 691–730. [CrossRef] [PubMed]
20. Steger, M.F. Meaning in Life. In *The Oxford Handbook of Positive Psychology*; Lopez, S.J., Snyder, C.R., Eds.; Oxford University Press: Oxford, UK, 2009; pp. 679–687. ISBN 978-0-19-518724-3.
21. Kleiman, E.M.; Adams, L.M.; Kashdan, T.B.; Riskind, J.H. Gratitude and grit indirectly reduce risk of suicidal ideations by enhancing meaning in life: Evidence for a mediated moderation model. *J. Res. Personal.* **2013**, *47*, 539–546. [CrossRef]
22. Liu, Y.; Zhang, S.; Liu, L.; Liu, H. Gratitude and the meaning of life-the multiple mediating modes of perceived social support and sense of belonging. *Chin. J. Spec. Educ.* **2016**, *197*, 79–83+96.
23. Tangney, J.P.; Baumeister, R.F.; Boone, A.L. High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *J. Pers.* **2004**, *72*, 271–324. [CrossRef]
24. Doğan, T.; Sapmaz, F.; Tel, F.D.; Sapmaz, S.; Temizel, S. Meaning in life and subjective well-being among Turkish university students. *Procedia-Soc. Behav. Sci.* **2012**, *55*, 612–617. [CrossRef]
25. Jin, Y.; He, M.; Li, J. The relationship between meaning in life and subjective well-being in China: A meta-analysis. *Adv. Psychol. Sci.* **2016**, *24*, 1854. [CrossRef]
26. Steger, M.F.; Oishi, S.; Kashdan, T.B. Meaning in life across the life span: Levels and correlates of meaning in life from emerging adulthood to older adulthood. *J. Posit. Psychol.* **2009**, *4*, 43–52. [CrossRef]
27. Datu, J.A.D.; Mateo, N.J. Gratitude and life satisfaction among Filipino adolescents: The mediating role of meaning in life. *Int. J. Adv. Couns.* **2015**, *37*, 198–206. [CrossRef]
28. Seligman, M.E. *Authentic Happiness: Using the New Positive Psychology to Realize Your Potential for Lasting Fulfillment*; Simon and Schuster: New York, NY, USA, 2002.
29. Li, J.-B.; Dou, K.; Liang, Y. The relationship between presence of meaning, search for meaning, and subjective well-being: A three-level meta-analysis based on the meaning in life questionnaire. *J. Happiness Stud.* **2021**, *22*, 467–489. [CrossRef]
30. Wong, P.T. Meaning Management Theory and Death Acceptance. In *Existential and Spiritual Issues in Death Attitudes*; Psychology Press: London, UK, 2008; pp. 65–87.
31. Yu, C.-F.; Zhang, W.; Li, D.-P.; Xiao, J.-T. Gratitude and its relationship with well-being. *Adv. Psychol. Sci.* **2010**, *18*, 1110.
32. De Ridder, D.T.; Lensvelt-Mulders, G.; Finkenauer, C.; Stok, F.M.; Baumeister, R.F. Taking stock of self-control: A meta-analysis of how trait self-control relates to a wide range of behaviors. *Personal. Soc. Psychol. Rev.* **2012**, *16*, 76–99. [CrossRef]
33. Dickens, L.; DeSteno, D. The grateful are patient: Heightened daily gratitude is associated with attenuated temporal discounting. *Emotion* **2016**, *16*, 421. [CrossRef]
34. Cheung, T.T.; Gillebaart, M.; Kroese, F.; De Ridder, D. Why are people with high self-control happier? The effect of trait self-control on happiness as mediated by regulatory focus. *Front. Psychol.* **2014**, *5*, 722. [CrossRef]
35. Galla, B.M.; Duckworth, A.L. More than resisting temptation: Beneficial habits mediate the relationship between self-control and positive life outcomes. *J. Pers. Soc. Psychol.* **2015**, *109*, 508. [CrossRef]
36. Hofmann, W.; Luhmann, M.; Fisher, R.R.; Vohs, K.D.; Baumeister, R.F. Yes, but are they happy? Effects of trait self-control on affective well-being and life satisfaction. *J. Pers.* **2014**, *82*, 265–277. [CrossRef]
37. Fredrickson, B.L.; Branigan, C. Positive emotions broaden the scope of attention and thought-action repertoires. *Cogn. Emot.* **2005**, *19*, 313–332. [CrossRef]
38. Guo, X.; Guo, Y. Perceived control in the social context. *Adv. Psychol. Sci.* **2012**, *20*, 1860–1868. [CrossRef]
39. Yek, M.H.; Olendzki, N.; Kekecs, Z.; Patterson, V.; Elkins, G. Presence of meaning in life and search for meaning in life and relationship to health anxiety. *Psychol. Rep.* **2017**, *120*, 383–390. [CrossRef] [PubMed]

40. Mischel, W.; Shoda, Y. A cognitive-affective system theory of personality: Reconceptualizing situations, dispositions, dynamics, and invariance in personality structure. *Psychol. Rev.* **1995**, *102*, 246. [CrossRef]
41. Li, J.-B.; Salcuni, S.; Delvecchio, E. Meaning in life, self-control and psychological distress among adolescents: A cross-national study. *Psychiatry Res.* **2019**, *272*, 122–129. [CrossRef] [PubMed]
42. Tamir, M.; Mauss, I.B. Social Cognitive Factors in Emotion Regulation: Implications for Well-Being. In *Emotion Regulation and Well-Being*; Springer: Berlin/Heidelberg, Germany, 2011; pp. 31–47.
43. Schnell, T.; Krampe, H. Meaning in life and self-control buffer stress in times of COVID-19: Moderating and mediating effects with regard to mental distress. *Front. Psychiatry* **2020**, *11*, 983. [CrossRef]
44. Li, J.-B.; Willems, Y.E.; Stok, F.M.; Deković, M.; Bartels, M.; Finkenauer, C. Parenting and self-control across early to late adolescence: A three-level meta-analysis. *Perspect. Psychol. Sci.* **2019**, *14*, 967–1005. [CrossRef] [PubMed]
45. Zhang, X.; Qin, J.; Huang, W. Self-control mediates the relationship between the meaning in life and the mobile phone addiction tendency of Chinese college students. *Stud. Psychol. Behav.* **2019**, *17*, 536.
46. Hedlund, D.E. Personal Meaning: The Problem of Educating for Wisdom. *Pers. Guid. J.* **1977**, *55*, 602–604. [CrossRef]
47. MacKenzie, M.J.; Baumeister, R.F. Meaning in Life: Nature, Needs, and Myths. In *Meaning in Positive Existential Psychology*; Springer: Berlin/Heidelberg, Germany, 2014; pp. 25–37.
48. Yu, C.; Zhang, W.; Zeng, Y.; Ye, T.; Li, Y.; Wang, Z. Relationship between adolescents' gratitude and problem behavior: The mediating role of school connectedness. *Psychol. Dev. Educ.* **2011**, *27*, 425–433. [CrossRef]
49. McCullough, M.E.; Emmons, R.A.; Tsang, J.-A. The grateful disposition: A conceptual and empirical topography. *J. Pers. Soc. Psychol.* **2002**, *82*, 112. [CrossRef]
50. Wang, X. Psychometric evaluation of the meaning in life questionnaire in Chinese middle school students. *Chin. J. Clin. Psychol.* **2013**, *21*, 763–767. [CrossRef]
51. Wang, H.; Lu, J. The compilation of the middle school students' self-control ability questionnaire. *J. Psychol. Sci.* **2004**, *27*, 1477–1482. [CrossRef]
52. Diener, E.D.; Emmons, R.A.; Larsen, R.J.; Griffin, S. The satisfaction with life scale. *J. Pers. Assess.* **1985**, *49*, 71–75. [CrossRef] [PubMed]
53. Chen, M.; Huang, S.; Wu, Q. Relationship between academic self-efficacy and Internet gaming disorder of college students: Mediating effect of subjective well-being. *China J. Health Psychol.* **2022**, *30*, 718–723. [CrossRef]
54. Hayes, A.F. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*; Guilford Publications: New York, NY, USA, 2017.
55. Cao, G.; Zhang, L.; Deng, J.; Yin, H. Bullying victimization and suicidal ideation among adolescents: The mediating role of psychological suzhi and the moderating role of perceived school climate. *Curr. Psychol.* **2022**, *42*, 17454–17464. [CrossRef]
56. Deng, J.; Zhang, L.; Cao, G.; Yin, H. Effects of adolescent academic stress on sleep quality: Mediating effect of negative affect and moderating role of peer relationships. *Curr. Psychol.* **2023**, *42*, 4381–4390. [CrossRef]
57. Emmons, R.A.; Stern, R. Gratitude as a psychotherapeutic intervention. *J. Clin. Psychol.* **2013**, *69*, 846–855. [CrossRef]
58. Buddelmeyer, H.; Powdthavee, N. Can having internal locus of control insure against negative shocks? Psychological evidence from panel data. *J. Econ. Behav. Organ.* **2016**, *122*, 88–109. [CrossRef]
59. Kumar, S.A.; Edwards, M.E.; Grandgenett, H.M.; Scherer, L.L.; DiLillo, D.; Jaffe, A.E. Does gratitude promote resilience during a pandemic? An examination of mental health and positivity at the onset of COVID-19. *J. Happiness Stud.* **2022**, *23*, 3463–3483. [CrossRef]
60. Szcześniak, M.; Rodzeń, W.; Malinowska, A.; Kroplewski, Z. Big five personality traits and gratitude: The role of emotional intelligence. *Psychol. Res. Behav. Manag.* **2020**, *13*, 977–988. [CrossRef] [PubMed]
61. Emmons, R.A.; Mishra, A. Why gratitude enhances well-being: What we know, what we need to know. *Des. Posit. Psychol. Tak. Stock Mov. Forw.* **2011**, *248*, 262.
62. Wong, P.T. Positive psychology 2.0: Towards a balanced interactive model of the good life. *Can. Psychol. Can.* **2011**, *52*, 69. [CrossRef]
63. Srirangarajan, T.; Oshio, A.; Yamaguchi, A.; Akutsu, S. Cross-cultural Nomological network of gratitude: Findings from midlife in the United States (MIDUS) and Japan (MIDJA). *Front. Psychol.* **2020**, *11*, 571. [CrossRef]
64. Lin, C.-C.; Yeh, Y. How gratitude influences well-being: A structural equation modeling approach. *Soc. Indic. Res.* **2014**, *118*, 205–217. [CrossRef]
65. Kong, F.; Ding, K.; Zhao, J. The relationships among gratitude, self-esteem, social support and life satisfaction among undergraduate students. *J. Happiness Stud.* **2015**, *16*, 477–489. [CrossRef]
66. Watkins, P.C. *Gratitude and The Good Life: Toward a Psychology of Appreciation*; Springer: Berlin/Heidelberg, Germany, 2013.
67. Zhang, H.; Sang, Z.; Chan, D.K.-S.; Teng, F.; Liu, M.; Yu, S.; Tian, Y. Sources of meaning in life among Chinese university students. *J. Happiness Stud.* **2016**, *17*, 1473–1492. [CrossRef]
68. Vazeou-Nieuwenhuis, A.; Orehek, E.; Scheier, M.F. The meaning of action: Do self-regulatory processes contribute to a purposeful life? *Personal. Individ. Differ.* **2017**, *116*, 115–122. [CrossRef]
69. Duckworth, A.L.; Grant, H.; Loew, B.; Oettingen, G.; Gollwitzer, P.M. Self-regulation strategies improve self-discipline in adolescents: Benefits of mental contrasting and implementation intentions. *Educ. Psychol.* **2011**, *31*, 17–26. [CrossRef]

70. Shi, Y.; Ma, C. The effect of trait anxiety on academic achievement of middle school students: The mediating role of meaning in life and self-control. *Chin. J. Spec. Educ.* **2021**, *85*, 77–84.
71. Tugade, M.M.; Fredrickson, B.L.; Feldman Barrett, L. Psychological resilience and positive emotional granularity: Examining the benefits of positive emotions on coping and health. *J. Pers.* **2004**, *72*, 1161–1190. [CrossRef] [PubMed]
72. Paulhus, D.L. Two-component models of socially desirable responding. *J. Pers. Soc. Psychol.* **1984**, *46*, 598. [CrossRef]
73. Wu, D.; Chen, S.; Chen, Y.; Li, D.; Yin, H. The impact of peer victimization on Chinese left-behind adolescent suicidal ideation: The mediating role of psychological suzhi and the moderating role of family cohesion. *Child Abuse Negl.* **2023**, *141*, 106235. [CrossRef] [PubMed]

MDPI
St. Alban-Anlage 66
4052 Basel
Switzerland
www.mdpi.com

Behavioral Sciences Editorial Office
E-mail: behavsci@mdpi.com
www.mdpi.com/journal/behavsci

Academic Open
Access Publishing

mdpi.com

ISBN 978-3-7258-0155-8