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The Causes, Counseling and Prevention Strategies for Maladaptive and Deviant Behaviors in Schools

Edited by
Jian-Hong Ye, Mei-Yen Chen and Yu-Feng Wu

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Preface

Governments, organizations, and schools worldwide are committed to creating a safe and friendly campus environment to ensure the high-quality holistic development of students and cultivate good mental and physical health. Therefore, it is essential to explore issues related to the causes of maladaptive and deviant behaviors, as well as counseling and prevention strategies in the school context. The theme of "The Causes, Counseling, and Prevention Strategies for Maladaptive and Deviant Behaviors in Schools" encompasses several research topics worth considering, including exploration of student engagement, investigation into the impact of stress on academic performance, examination of addictive behaviors, exploration of vulnerable student groups, and discussion of adolescent maladaptive behaviors, among others. It is hoped that readers engaging with this reprint will further explore the causes, consequences, and effective intervention measures for maladaptive and deviant behaviors in schools from different theoretical perspectives within the field of psychology. This may include positive psychology, health psychology, educational psychology, counseling psychology, applied psychology, and various other branches of psychology.

Jian-Hong Ye, Mei-Yen Chen, and Yu-Feng Wu
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Editorial

The Causes, Counseling, and Prevention Strategies for Maladaptive and Deviant Behaviors in Schools

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Governments, organizations, and schools around the world are committed to creating a safe and friendly campus environment to ensure students' high-quality comprehensive development and to cultivate positive mental and physical health states. At the same time, good health and well-being are one of the United Nations sustainable development goals [1]. However, issues such as bullying, truancy, violence, discrimination, and addictive behaviors persist widely in schools around the world. Due to the presence of maladaptive and deviant behaviors among students, educators have been focusing on these issues for the past few decades. However, with the rapid development of internet technology, the impact of school-related incidents has expanded from offline to online and even a mix of online and offline issues. It has become a globally significant public health issue. Maladaptive and deviant behaviors are just factual outcomes; the process of their occurrence and their subsequent effects are also extremely important. Therefore, exploring issues such as the causes of maladaptive and deviant behaviors in the school context, as well as counseling and prevention strategies, is necessary. Moreover, with the global pandemic of COVID-19 during 2020–2023, under the normal pandemic prevention and control, a series of strict student management regulations in colleges and universities could have easily introduced a negative emotional experience [2]. Educational institutions worldwide have undergone changes in their regular routines, affecting both faculty and students. This has resulted in heightened psychological burdens and stress. In addition, psychological depression and anxiety have a negative impact on people's physical health and daily life [3]. Such circumstances may give rise to latent issues stemming from various direct or indirect factors. As a result, psychological health education, resilience education, and education on overcoming setbacks have received special attention.

In the theme of "The Causes, Counseling, and Prevention Strategies for Maladaptive and Deviant Behaviors in Schools," there are many research topics worth referencing, including exploration of student engagement, such as the multidimensional model of adolescent school enjoyment; the relationship between student shyness and academic involvement in music; occupational identity and adaptability of engineering students in China; and students' perceptions of their social participation. Exploration of the impact of stress on academic performance has included a case study on factors influencing secondary school mathematics grades. Exploration of addictive behaviors has included examination of the impact of stress on smartphone addiction) and the effects of short video addiction on students. Exploration of vulnerable student groups has included studies on the impact of parental marital conflict, family socioeconomic status, and depressive symptoms among mobile children) and the perspectives of traumatized children on their life experiences. Additionally, research also includes exploration of adolescent maladaptive behaviors, such as model validation of problem behavior among adolescents, the relationship between

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harsh parenting and aggressive behavior among male adolescent offenders, and the health-related behaviors and socio-psychological characteristics of smoking adolescents in Korea. Furthermore, some studies have explored issues that also deserve considerable attention, including understanding the role of parent–child relationships in the personality development of Chinese middle school students, the impact of self-flexibility on interpersonal relationship issues among nursing college students, and a literature review of the long-term social withdrawal (hikikomori) phenomenon. These studies have filled the gaps in related research topics, helping people better understand some situations within the teacher and student communities. However, despite numerous studies reviewing or confirming factors or models related to maladaptive and deviant behaviors in schools, cultural differences among countries, regions, and ethnicities, as well as the evolving landscape over time, and technological advancements may lead to variations or the need for updated knowledge regarding many of the established research findings.

Specifically, despite the efforts of educational practitioners to intervene and prevent them, adverse events continue to persist. Moreover, countries and regions worldwide are also committed to relevant research efforts. However, until the issues of maladaptive and deviant behaviors are eradicated, it is necessary to continue in-depth research using various methods such as experimental design, quasi-experimental design, quantitative research, qualitative research, mixed methods, literature reviews, and so on. This will involve continued exploration of the fundamental causes and impacts of maladaptive and deviant behaviors, as well as an examination of the effectiveness of various intervention measures over time. Additionally, the models proposed by theories related to maladaptive and deviant behaviors are not fixed. They can be discussed and enhanced through innovation, construction, development, expansion, and integration of different research models, considering the mechanisms of positive and negative processes in various contexts. At the same time, it is important to explore or develop localized theories, models, variables, measurement tools, etc., according to the culture of the country and the region. Furthermore, teachers and institutional managers also need to adjust theoretical models more effectively and put them into practice based on student characteristics, topics, curriculum content, course context, and class schedules.

Additionally, while media use may be beneficial in certain aspects, there is increasing concern over the potentially negative consequences arising from its excessive use [4]. The reason for this consequence may be due to the influence of societal values or cognitive gaps, as students do not realize that this is an addictive behavior [5]. Therefore, issues related to new media addictions such as video addiction, short video addiction, social media addiction, gaming addiction, and so on continue to be topics of ongoing concern, with relevant research continually evolving. However, there is still an urgent need to continue expanding related research because the issues related to addictive behaviors require more effective intervention methods for prevention and improvement. The negative impacts on adolescents have not been fully explored, and approaching the topic from the perspectives of digital literacy or media literacy could be promising research directions.

Furthermore, leadership has traditionally been considered a key factor in crisis management and the enhancement of well-being. Moreover, different leadership styles are associated with the psychological well-being of followers; however, little is known about the relative strength of the relationship between different leadership styles and the psychological well-being of followers [6]. Therefore, exploring leadership as a means to improve or resolve maladaptive and deviant behaviors will also be an important research direction. Future research could delve into the various leadership styles and capabilities of teachers or students, exploring how they can improve maladaptive and deviant behaviors or enhance psychological health and well-being.

Bullying among adolescents is associated with different mental health issues for the victim and perpetrator [7]. Psychological counseling and guidance for both aggressors and victims among students are important research topics. In addition to traditional psychological research, many experts believe that with the maturity of generative artificial intelligence

functions, it is possible for artificial intelligence to accompany humans and achieve conversational functions such as listening, chatting, and counseling. However, research on the relationship between artificial intelligence and maladaptive and deviant behaviors is currently quite limited. Existing articles are often opinion papers, and so research based on data or text is urgently needed. In the context of the digital transformation, there are many emerging technologies that have also been found to be useful in enhancing counseling, as well as mental health and well-being, and all of these practical experiences are worth exploring in a systematic way.

Certainly, mechanisms for prevention and intervention in more severe deviant behaviors such as bullying, truancy, violence, discrimination, crime, underage smoking, and underage sexual behaviors also need to be continuously emphasized and explored. Simultaneously, negative variables such as addiction, aggression, anxiety, avoidance, conflict, cognitive bias, depression, excessive cognitive reflection, evasion, fatigue, fear, hostility, involution (neijuan), laziness, loneliness, rejection, selfishness, silence, stress, withdrawal, and worry should also continue to be discussed. Engagement, gratitude, fairness, flow, hope, kindness, meaning, mindfulness, moral sense, perceived value, positive mindset, relationships, respect, resilience, self-efficacy, self-regulation, sense of happiness (well-being), socio-emotional skills, social support, trust, and other relatively neutral and positive variables can also be explored for their impact mechanisms alongside the negative variables. In summary, ongoing research in the above aspects in the future will contribute to detailed and up-to-date explanations of the measures adopted by governments, organizations, educators, and communities globally to address and prevent maladaptive and deviant behavior in schools. Therefore, we encourage scholars interested in this research topic to explore the causes, consequences, and effective intervention measures for maladaptive and deviant behaviors in schools from different theoretical perspectives within the field of psychology, such as positive psychology, health psychology, educational psychology, counseling psychology, applied psychology, and others.

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Article

A Case Study of Factors That Affect Secondary School Mathematics Achievement: Teacher-Parent Support, Stress Levels, and Students' Well-Being

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Abstract: Psychology is one of the numerous factors that influences students' mathematics achievement, but studies on the influence of psychology on student mathematics achievement are still limited. This study analyzes key factors affecting mathematics achievement through teacher-parent support, stress, and students' well-being in learning mathematics. Data was collected via online questionnaires. Participants of the study are 531 students studying at five secondary schools in Bandung, Indonesia. The data were analyzed using the structural equations modeling approach using SMART-PLS 3.0 software. The results showed that interest in learning was the most significant factor affecting students' mathematics achievement. Moreover, teachers have a more substantial effect than parents' support, which does not significantly reduce the students' stress levels. The academic and emotional support of teachers and parents reduces students' stress levels while increasing their feelings and interest in learning mathematics. This study provides essential results for school teachers and parents to improve students' mathematics achievement at the secondary school level.

Keywords: student stress; mathematics performance; learning interest; teachers-parents support

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1. Introduction

Students' achievement is defined by the extent to which predetermined learning goals are obtained, and it is usually measured through test scores and ongoing assessments [1]. Several preliminary studies used the Grade Point Average (GPA) to analyze students' academic achievements [2,3], while this study interpreted it as an indicator of the knowledge and understanding level of the mathematics material. It is a complex score influenced by learning media, environment, teaching methods, parental support, and personal factors [4,5]. The learning approach teachers use toward mathematics achievement has also been explored [6,7], along with the relationship between parenting style and students' achievement [8,9]. Most studies only used a simple linear relationship to analyze its effect on students' achievement [10,11]. Meanwhile, this study developed a new model from a psychological perspective to analyze factors strongly related to students' mathematics achievements by adding predictors of well-being and stress levels.

Psychological factors that influence students' mathematics achievements emotionally and academically are supported from parents and teachers. These factors definitely affect their well-being [12,13], interest in learning [14,15], and mathematics achievement [16]. The way teachers and parents support the students is a psychological construct that represents their standard strategies for teaching children [17,18]. This support is a phenomenon that is recognized and analyzed professionally to determine its effect on the students' positive and negative behavior, subjective well-being, and learning achievement. Unfortunately,

parents and teachers in Indonesia are unaware of the importance of providing academic assistance to students [19,20], hence, the majority depend more on learning models [21,22].

Mathematics mastery, inseparable from everyday activities, plays an essential role in human life [23]. However, its achievements in Indonesia are still far from expectations, as Indonesia is ranked 63 out of 70 countries according to the 2015 PISA [24]. The situation is even more worrying when students are afraid of this subject with the idea that it is difficult [25]. Therefore, the Indonesian government implemented numerous strategies to increase students' interest in learning mathematics and acquire more achievements [22,26]. These include increasing technology-based learning media and teachers training to improve pedagogical and technological skills [27,28]. A few program extension plans have also been implemented to encourage teachers and parents to provide emotional and academic support [29,30]. Therefore, this study aims to investigate the predictors that affect students' mathematics achievements from a psychological perspective. It also examines the predictors of parents and teachers support for students' well-being, interest in learning mathematics, stress levels, and achievements.

Finally, this research has the expectations to contribute to providing theoretical and practical implications. Theoretically, this study will help increase knowledge and literature on research related to student mathematics achievement, especially from the aspects of parent and teacher support, stress levels, and student well-being. Practically, the results of this study can be used by teachers and parents to improve student mathematics achievement at the secondary school level.

2. Literature Review

This section discusses various theories underlying the study and the formulation of proposed hypotheses. It starts with an elaboration of teacher-parent support in academic and emotional matters, followed by an explanation of stress and well-being theory related to mathematics learning.

2.1. Teacher-Parent Support Model

Empirical studies have examined the relationship between teacher and parent support and student well-being. According to preliminary studies, teacher and parent support have numerous benefits that significantly affect student achievement and emotions [29,31,32]. Meanwhile, limited studies have combined their support regarding student stress, interest in learning, and achievement. This study showed that regardless of where the support comes from, it will always positively affect overall student well-being. However, a model is needed to determine students' well-being, interest in learning, and achievement at the secondary school level.

2.2. Teachers' Academic and Emotional Support

Several existing studies show that teachers' support for students has a high relationship with psychological well-being. Ma et al. also stated that teachers' support can foster student academic achievement and enjoyment [33]. Abdullah et al. reported that during the pandemic, teachers' emotional and academic supports have a significant determination on the learning performances of undergraduate students [18]. Therefore, it can be concluded that teachers' academic support also plays an important role in student emotions. Most students in Indonesia stay at school from 7 a.m. to 5 p.m., where they are accompanied and supported by teachers. Therefore, implementing the role of teachers as mentors to assist students academically and emotionally through fair treatment and provision of rewards helps to increase their well-being and reduce stress. It is important to investigate the novel relationship between teachers' academic and emotional support of whether or not determine mathematics learning achievements.

2.3. Parents' Support

Studies on parents' support generally analyze the relationship between parents and students' psychological well-being [34,35]. A study by Geng et al. (2022) and Yuill and Martin (2016) found that parental support, directly and indirectly, affects students' physical health. Mata [29,36] stated that parental support for students at K-9 levels significantly affected their motivation and achievement. The interview results with low-socioeconomic-status children illustrated that support from parents is essential [8]. In detail, students' physical changes can be explained by the amount of support provided by the parents. This implies that physical complaints increase in children who lack parental support and vice versa. On the other hand, students who lack parental support from childhood experience health problems and depression as they approach adulthood [37,38]. Similarly, several studies have been conducted on parental support and its relationship to students' problems, perceived stress, well-being, achievement, and burnout [17].

In the context of this study, most Indonesian parents work hard to earn money, thereby leaving their children with their grandparents, older siblings, or teachers. These circumstances make parents unable to understand what children feel and need. Therefore, whether parent support has a direct effect on improving students' well-being, decreasing stress, and increasing interest in learning mathematics and achievement needs to be examined.

2.4. Stress and Well-Being and Mathematics Learning

There is increased stress for secondary school students in Indonesia due to demands from parents, schools, and teachers and achieving the best results. Moreover, students' difficulty in carrying out school assignments, exams, task deadlines, and others, also cause stress [39,40]. Stress is the body's response to environmental pressures or demands that can have positive or negative effects on a person (Bajaj et al., 2022; Choi Young-Jun and Hyosung, 2021) [41,42]. Some external factors of demand are friends, situations, learning environment, and people around students [18,43]. Stress is a natural feeling that helps individuals to deal with problems or challenges. Thoughts, motivations, and goals are internal factors. As a result of stress, a person responds physiologically and psychologically to various demands [44].

Most parents in Indonesia expect their children to have good mathematics achievements, while few assist. Several studies show that the higher the level of stress experienced by a person, the lower their achievement and well-being [45,46].

2.5. Interest in Learning Mathematics

Interest in learning plays a vital role in mathematics teaching activities [47,48]. When people feel pressured to do something, such as in the context of students learning and doing exercises to develop their mathematical knowledge, their interest increases. Interest is divided into two senses, namely situational and individual [14]. Situational interest is an affectionate response caused by environmental stimuli, such as technology-based learning media unfamiliar to students, and does not last long [49]. Individual interest arises from one's perception and knowledge of content, which extends the response rate. Several factors have a relationship with students' interest in learning mathematics. The first is confidence, which is the most important factor, where students should believe that the effort made is capable of improving their mathematical abilities [50,51]. The second is depression, which is a major cause of a lack of interest in learning [52,53]. The third is fear of failure, which is ineffective and causes irregularity in learning and working. The last is an unsupportive environment and a lack of facilities, which prevents students from learning efficiently. It can be concluded that many factors affect students' interest when learning mathematics. Therefore, an empirical study is needed to prove these potential factors.

According to preliminary studies, the level of interest affects students' learning motivation [15,54], self-efficacy [55], self-regulation, and overall outcomes [56,57]. Students need to learn and analyze the relationship between stress and teacher and parent support,

especially in mathematics. This study also analyzes how interest in learning mathematics as a mediator affects students' mathematics achievement.

The research model was constructed based on the literature review shown in Figure 1. It comprises three dependent variables, namely, parents and teachers' academic and teachers' emotional support. These three variables directly influence students' well-being, interest in learning, stress, and mathematics achievement. The independent variable is students' mathematics achievement.

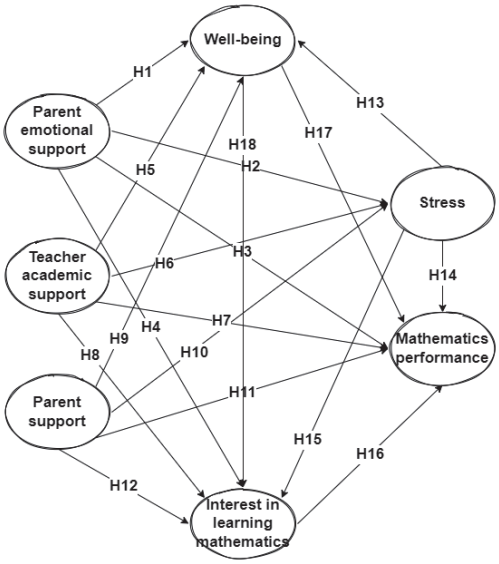

Figure 1. Initial hypotheses that are expected to affect students' mathematics achievement.

2.6. Purpose of the Study

This study aims to determine the relationship between teacher-parent support, stress levels, and student well-being on students' mathematics achievement. Based on the study objectives, the research hypotheses can be stated as follows:

Hypothesis 1 (H1). *Parents emotional support significantly and positively affects students' well-being.*

Hypothesis 2 (H2). *Parents emotional support significantly and negatively affects students' stress.*

Hypothesis 3 (H3). *Parents emotional support significantly and positively affects students' mathematics achievements.*

Hypothesis 4 (H4). *Parents' emotional support has a significant and positive effect on interest in learning mathematics.*

Hypothesis 5 (H5). *Teachers' academic support significantly and positively affects students' well-being.*

Hypothesis 6 (H6). *Teachers' academic support significantly and negatively affects students' stress.*

Hypothesis 7 (H7). *Teachers' academic support significantly and positively affects students' mathematics achievements.*

Hypothesis 8 (H8). *Teachers' academic support significantly and positively affects an interest in learning mathematics.*

Hypothesis 9 (H9). *Parents' support has a significant and positive effect on students' well-being.*

Hypothesis 10 (H10). *Parents' support has a significant and negative effect on students' stress.*

Hypothesis 11 (H11). *Parents' support significantly and positively affects students' mathematics achievements.*

Hypothesis 12 (H12). *Parents' support significantly and positively affects an interest in learning mathematics.*

Hypothesis 13 (H13). *Stress has a significant and negative effect on students' well-being.*

Hypothesis 14 (H14). *Stress has a significant and negative effect on students' mathematics achievements.*

Hypothesis 15 (H15). *Stress has a significant and negative effect on interest in learning mathematics.*

Hypothesis 16 (H16). *Interest in learning mathematics significantly and positively affects students' achievements.*

Hypothesis 17 (H17). *Well-being has a significant and positive effect on students' mathematics achievements.*

Hypothesis 18 (H18). *Well-being has a significant and positive effect on students' interest in learning mathematics.*

3. Methodology

This research includes quantitative research, using correlational research methods with survey questionnaires. Correlational research is widely used by researchers for testing two or more variables without the researcher controlling any of them [58,59], with data collected from several secondary school students in Bandung, Indonesia, on mathematics achievement variables. Data was collected from 543 respondents from August to September 2022. After obtaining approval from the teachers at the school, an online questionnaire was given to students. Before its distribution, the contents were explained to the students, who were expected to fill it out honestly for confidential purposes without coercion. Respondent data were only used for research purposes, and students were not mandated to fill out the online questionnaire.

After the initial analysis, only 531 respondents comprising 174 male and 357 female students completed the questionnaire with valid data for statistical processing. Of the 531 respondents, 99 were 7th grade students, while the remaining 159 and 293 were 8th and 9th grade students. Furthermore, 220 and 311 students came from private and public junior high schools, as shown in Table 1.

Table 1. Descriptive statistics of students in this study.

Measure	Items	N	Percentage
Gender	male	174	32.77%
	female	357	67.23%
Class	7	99	18.64%
	8	159	29.94%
	9	293	55.18%
School Type	Public school	311	58.57%
	Private school	220	41.43%
Total		531	100%

3.1. Instruments

The instrument in this study was an online questionnaire divided into two parts. The first contains the basic information about participants, and the second is associated with the questions related to factors that can affect students' mathematics achievement at the secondary school level. The questionnaire items use a 5-point Likert scale from 1 strongly disagree to 5 strongly agree, which indicates how much students agree with the statements. The original questionnaire has seven latent variables obtained from the literature review. The latent variables include three items on interest in learning variables, 4 on mathematics learning achievement, 4 on well-being, 3 on teachers' emotional support, 3 on teachers' academic support, and 4 on parents' support variables, culminating in 23 items (see Appendix A).

3.2. Data Analysis

The data were analyzed using SPSS 22 and smart PLS 3.0 software, which is suitable for testing hypotheses and helping new research models. Furthermore, The partial least square method structural equation model (PLS-SEM), which is a nonparametric approach, can be used to test many variables and path relationships simultaneously [60,61]. More specifically, it is used to visualize and explain the variance that exists in endogenous variables. This software is widely used to test theories that are predicted from the results of a literature review [61]. Several studies consider the PLS-SEM technique more flexible and accurate for quantifying measurement models [62,63]. This software makes it easy for respondents to be processed without considering the number of samples and the data normality and heterogeneity [64,65]. According to [66], with the PLS-SEM approach, the minimum sample should not be less than 52. In the first step, this study used SPSS software to analyze the statistical data from respondents descriptively. Descriptive statistics is a crucial step in quantitative research used to describe and summarize all respondent information in detail. Meanwhile, SMART PLS is used for data processing and distribution by looking at construct measurements, discriminant validity, and structural relationships between constructs [63]. Data reliability is also used to determine whether the questionnaire items measure the same construct. According to [67], the CR value should be greater than 0.7 to get satisfactory results. Furthermore, Ref. [68] stated that a reliable indicator's statistical reliability value should be greater than 0.6. At the convergent validity analysis stage, external factor loadings should be greater than 0.5 with an AVE value above 0.5. Furthermore, Hair et al. [66] stated that questionnaire items are good estimators when the outer loading is greater than 0.5. Then, the HTMT value was tested to determine the correlation between constructs and analyze discriminant validity [69]. Previous studies suggested the HTMT value should not be higher than 0.9, with better performance at less than 0.85.

4. Results

This study was conducted to determine whether mathematics teachers' and parents' support affects secondary school students' achievement and well-being. This section divides the data processing results using smart PLS software into several parts. The first descriptively analyzes the statistics of the research data and then tests the measurement model, and the last evaluates the structural model to determine the relationship between latent variables.

4.1. Descriptive Statistics

The descriptive statistics data in Table 2 shows that the lowest and highest items are 2.793 and 4.333, with an overall average above 3.2. Furthermore, the lowest kurtosis value of -0.910 is owned by the stress questionnaire item 2, while the highest at 1.500 is possessed by the test questionnaire item 1. According to several studies, the kurtosis and skewness values range between -7 to 7 and -2 to 2, respectively [70,71]. Table 2 also shows that

the lowest and highest values of −1.024 and 0.467 are owned by items PS2 and stress 3. Therefore, all data items used in this study have acceptable skewness and kurtosis values.

Table 2. Descriptive statistics in detail.

Item	Mean	Median	Min	Max	Standard Deviation	Kurtosis	Skewness
INT1	3.627	4.000	1.000	5.000	0.821	0.879	−0.893
INT2	3.874	4.000	1.000	5.000	0.757	1.603	−0.933
INT3	3.488	4.000	1.000	5.000	0.822	0.244	−0.502
INT4	3.505	4.000	1.000	5.000	0.789	0.407	−0.511
OUT1	3.569	4.000	1.000	5.000	0.894	−0.043	−0.485
OUT2	3.808	4.000	1.000	5.000	0.737	1.174	−0.670
OUT3	3.574	4.000	1.000	5.000	0.814	0.489	−0.483
OUT4	3.650	4.000	1.000	5.000	0.768	0.410	−0.411
WB1	3.616	4.000	1.000	5.000	0.878	0.332	−0.590
WB2	3.576	4.000	1.000	5.000	0.823	0.845	−0.804
WB3	3.245	3.000	1.000	5.000	0.917	−0.475	−0.342
TES1	4.296	4.000	1.000	5.000	0.676	1.500	−0.880
TES2	4.333	4.000	2.000	5.000	0.601	0.512	−0.510
TES3	4.275	4.000	2.000	5.000	0.655	0.789	−0.679
TAS1	4.301	4.000	1.000	5.000	0.672	1.347	−1.004
TAS3	3.906	4.000	1.000	5.000	0.751	1.920	−0.888
PS2	4.002	4.000	1.000	5.000	0.811	1.697	−1.024
PS3	3.930	4.000	1.000	5.000	0.879	0.558	−0.814
STRESS1	3.497	4.000	1.000	5.000	1.058	−0.747	−0.284
STRES2	3.271	3.000	1.000	5.000	1.094	−0.910	−0.007
STRES3	2.793	3.000	1.000	5.000	1.015	−0.234	0.467

4.2. Measurement Model Results

The first step in the measurement model analysis is to analyze the content validity. The questionnaire of this research (provided in Appendix A) was developed from the literature, and it has relatively good content validity. Furthermore, convergent validity was analyzed by evaluating the loading values, CR, AVE, and Cronbach alpha. Two questionnaire items were excluded because they have a loading factor of less than 0.7, namely, PS1 (0.69) and TAS2 (0.36). Table 3 shows a loading factor with CA and CR values more than 0.7 and AVE above 0.5 according to the recommended standard [72]. By [73] analyzing the *Rho-A* value in Table 3, it is inevitable that the construct in this study does not have a problem with composite reliability.

4.3. Discriminant Validity

Discriminant validity can be tested in two ways. The first is to evaluate the Fornell and Larcker values by determining the AVE square root in each latent variable [68]. The result shows that the bolded diagonal should be greater than the value of the latent variable owned by other constructs shown in Table 4. Several studies suggest that the discriminant validity test needs to be strengthened by looking at the HTMT value [74,75], which is considered to have a better benchmark. The HTMT value in Table 5 shows that all constructs are less than 0.90, which shows that the model meets the requirements of good discriminant validity.

Table 3. Data for testing the measurement model and collinearity problems.

Latens Construct	Indicators	Loadings	CA	RHO-A	CR	AVE	VIF
Interest in learning	INT1	0.812	0.789	0.794	0.864	0.614	1.708
	INT2	0.779					1.605
	INT3	0.824					1.761
	INT4	0.714					1.410
Student mathematics achievement	OUT1	0.703	0.764	0.772	0.850	0.586	1.363
	OUT2	0.776					1.548
	OUT3	0.803					1.548
	OUT4	0.777					1.584
Parent support	PS2	0.847	0.726	0.731	0.808	0.678	1.146
	PS3	0.799					1.146
stress	STRES2	0.911	0.829	0.832	0.899	0.747	2.665
	STRES3	0.807					1.570
	STRES1	0.873					2.325
Teacher academic support	TAS1	0.849	0.763	0.766	0.821	0.696	1.182
	TAS3	0.819					1.182
Teacher emotional support	TES1	0.872	0.885	0.886	0.929	0.813	2.075
	TES2	0.913					2.970
	TES3	0.920					3.073
Well-being	WB1	0.868	0.794	0.797	0.880	0.710	2.020
	WB2	0.874					2.037
	WB3	0.782					1.418

Table 4. Discriminant validity test (Fornell–Larcker).

	Interest in L	Achievements	Parent SUP	Stress	Teacher ACA SUP	Teacher EMO SUP	Well-Being
Interest in L	**0.783**						
Achievements	0.710	**0.766**					
Parent SUP	0.345	0.384	**0.823**				
Stress	−0.447	−0.396	−0.185	**0.865**			
Teacher ACA SUP	0.485	0.471	0.348	−0.254	**0.834**		
Teacher EMO SUP	0.400	0.350	0.342	−0.278	0.539	**0.902**	
Well-being	0.707	0.621	0.307	−0.427	0.397	0.336	**0.843**

Table 5. HTMT.

	Interest in L	Achievements	Parent SUP	Stress	Teacher ACA SUP	Teacher EMO SUP	Well-Being
Interest in L							
Achievements	0.810						
Parent SUP	0.539	0.606					
Stress	0.548	0.493	0.274				
Teacher ACA SUP	0.729	0.718	0.639	0.367			
Teacher EMO SUP	0.480	0.424	0.495	0.324	0.756		
Well-being	0.888	0.792	0.479	0.529	0.592	0.400	

The next stage is to check whether each item has a collinearity problem by analyzing the VIF value [76]. The recommended VIF value is less than 5 [77], and the highest obtained in this study was 3.073. Therefore, it can be ascertained that none of the items have collinearity-related problems.

4.4. Measurement R2 and Q2

The coefficient determination value (Table 6), commonly known as R2, is used as a reference to assess whether a model can explain an event properly [78]. The main objective of this research is to determine the effects of a mathematics teachers' and parents' support, stress, and well-being on students' mathematics achievements. The determination coefficient values of 0.25, 0.5, and 0.7 are the limits that describe the quality of the model: weak, medium, and strong [79,80]. It also explains factors related to students' mathematics achievement up to 56.4 percent. At the same time, this model can also explain 57.6 percent of the factors influencing students' interest in learning mathematics, with a fairly strong determination coefficient.

Table 6. Coefficient determination.

	R Square	R Square Adjusted
Interest in L	0.576	0.572
Achievement	0.564	0.559
Stress	0.097	0.092
Well-being	0.297	0.291

4.5. Model Fit

The fit model in PLS-SEM can be analyzed from the Standardized Root Mean Square Residual (SRMR) and Normed Fit Index (NFI) values [81,82]. *SRMR* shows differences between relationships, which is considered a good fit measure in research models using PLS-SEM [62]. Values of 0.1 and 0.09 are recommended as good *SRMR*, while an *NFI* value below 1 is defined as a good fit [83]. The results of the fit model in this study can be seen in Table 7, which shows that this model has a good fit and meets the recommended fit model criteria.

Table 7. Model fit.

	Saturated Model	Estimated Model
SRMR	0.067	0.067
NFI	0.736	0.736

4.6. Hypotheses Testing

The 5000 resampling bootstrapping technique was used to test the hypothesis in this study [84], with the results shown in Figure 2 and Table 8. A relationship is significant if the p value is less than 0.05. Of the 18 initial hypotheses, 14 were supported, and 4 were unsupported. Surprisingly, teachers' emotional support was found to have no significant relationship with students' well-being ($\beta = 0.076$, $t = 1.478$, $p = 0.140$), mathematics achievement ($\beta = -0.025$, $t = 0.676$, $p = 0.499$), and interest ($\beta = 0.060$, $t = 1.087$, $p = 0.277$). However, teachers' emotional support has a significant direct relationship to reducing stress ($\beta = -0.182$, $t = 3.445$, $p = 0.001$). Factors influencing students' mathematics achievements and interest in learning are the learning media used, teaching techniques, and classroom situation. Teachers' emotional support is not significant enough to increase students' interest in learning mathematics and achievement. However, teachers' emotional support is needed to reduce their stress levels while studying. This study found that stress significantly reduced well-being ($\beta = -0.323$, $t = 6.156$, $p = 0.000$), interest in learning ($\beta = -0.145$, $t = 4.243$, $p = 0.000$), and students' mathematics achievement ($\beta = -0.063$, $t = 1.858$,

$p = 0.043$). Teachers' academic support in this study significantly increased well-being (β = 0.225, t = 4.519, $p = 0.000$), mathematics achievement (β = 0.132, t = 3.151, $p = 0.002$), and interest in learning (β = 0.180, t = 2.633, $p = 0.008$) with decrease in stress (β = −0.129, t = 2.066, $p = 0.039$). Parents' support significantly affects students' well-being (β = 0.143, t = 3.224, $p = 0.001$), mathematics achievement (β = 0.120, t = 3.111, $p = 0.002$), and interest in learning (β = 0.072, t = 2.401, $p = 0.016$), but insignificantly reduces stress (β = −0.078, t = 1.438, $p = 0.151$). Furthermore, the well-being feelings felt by students significantly affected mathematics achievement (β = 0.198, t = 4.005, $p = 0.000$) and interest (β = 0.531, t = 12.464, $p = 0.000$). Finally, interest in learning is the biggest significant factor positively affecting students' mathematics achievement (β = 0.446, t = 4.005, $p = 0.000$).

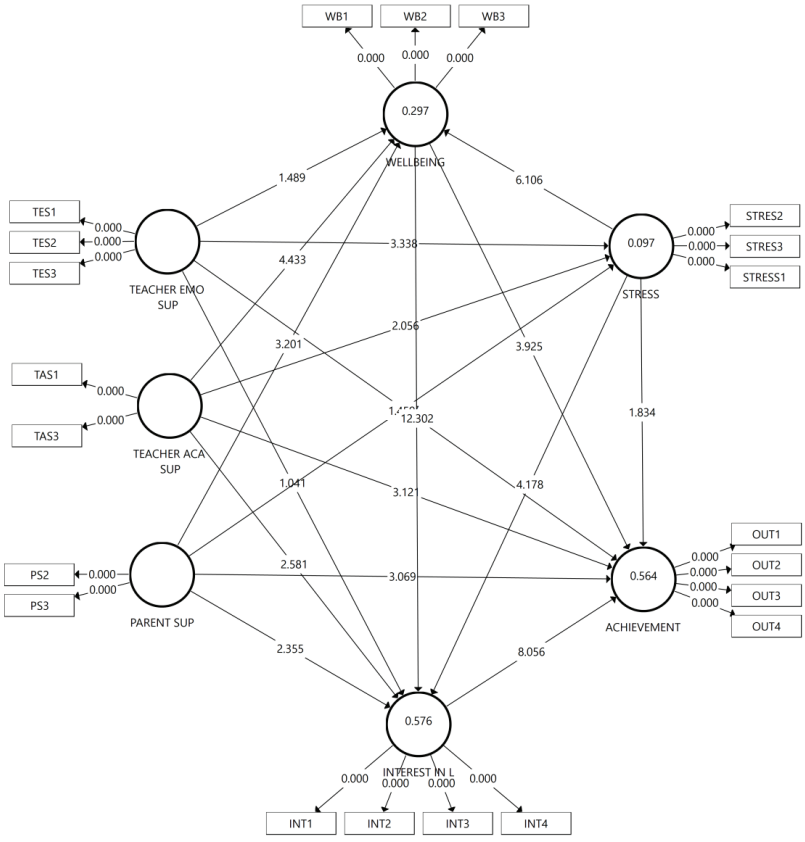

Figure 2. Final model with R square, *p*, and *t* values.

The path model is divided into three types of effects, direct, indirect, and combined effects. According to [85], effect sizes of 0.1, 0.3, and above 0.5 are considered small, medium, and large. Table 9 shows the standardized direct, indirect, and total effects in detail, with their significance calculated using the 5000 resamplings bootstrapping technique.

The most dominant factors in increasing students' interest in learning mathematics are their well-being during teaching activities and teachers' academic support, with a total effect of 0.531 and 0.340. This proves that it is important to evaluate the well-being of students and teachers. Furthermore, it should be noted that the stress level students feel when learning mathematics also greatly affects their interest by −0.316.

Table 8. The final results of hypotheses testing, the value of T statistics, and the *p* value.

	Hypothesis	β	Sample Mean	Standard Deviation (STDEV)	T Statistics	*p* Values	Interpretation
H1	Teacher emotional support → well-being	0.076	0.074	0.051	1.478	0.140	Not supported
H2	Teacher emotional support → stress	−0.182	−0.185	0.053	3.445	0.001	Supported
H3	Teacher emotional support → achievements	−0.025	−0.028	0.037	0.676	0.499	Not supported
H4	Teacher emotional support → interest in learning	0.060	0.065	0.055	1.087	0.277	Not supported
H5	Teacher academic support → well-being	0.225	0.227	0.050	4.519	0.000	Supported
H6	Teacher academic support → stress	−0.129	−0.126	0.062	2.066	0.039	Supported
H7	Teacher academic support → achievements	0.132	0.134	0.042	3.151	0.002	Supported
H8	Teacher academic support → interest in learning	0.180	0.175	0.068	2.633	0.008	Supported
H9	Parent support → well-being	0.143	0.144	0.044	3.224	0.001	Supported
H10	Parent support → stress	−0.078	−0.079	0.054	1.438	0.151	Not supported
H11	Parent support → achievements	0.120	0.120	0.039	3.111	0.002	Supported
H12	Parent support → interest in learning	0.072	0.071	0.030	2.401	0.016	Supported
H13	Stress → well-being	−0.323	−0.323	0.052	6.156	0.000	Supported
H14	Stress → achievements	−0.063	−0.062	0.034	1.858	0.043	Supported
H15	Stress → interest in learning	−0.145	−0.145	0.034	4.243	0.000	Supported
H16	Interest in learning → achievements	0.446	0.448	0.055	8.123	0.000	Supported
H17	Well-being → achievements	0.198	0.197	0.049	4.005	0.000	Supported
H18	Well-being → interest in learning	0.531	0.532	0.043	12.464	0.000	Supported

Table 9. The direct, indirect, and total effect of the research model.

Result	Factor	Direct Effect	Indirect Effect	Total Effect
Interest in learning	Parent Support	0.072	0.101	0.173
	Stress	−0.145	−0.171	−0.316
	Teacher Academic Support	0.180	0.160	0.340
	Teacher Emotional Support	0.060	0.098	0.158
	Well-being	0.531		0.531
Stress	Parent Sup	−0.078		−0.078
	Teacher Academic Support	−0.129		−0.129
	Teacher Emotional Support	−0.182		−0.182
Student mathematics achievement	Interest in Learning	0.446		0.446
	Parent Support	0.120	0.115	0.235
	Stress	−0.063	−0.205	−0.268
	Teacher Aca Sup	0.132	0.212	0.344
	Teacher Emo Sup	−0.025	0.109	0.084
	Well-being	0.198	0.237	0.435

Furthermore, teachers' academic and emotional support significantly reduces stress levels when students learn mathematics. Finally, the factors with the highest total effect are students' interest in learning mathematics, followed by the feeling of well-being, teachers' academic support, and parents' support. Their effect values are 0.446, 0.435, 0.344, and 0.235, respectively. The stress factor has an effect of −0.268 on students' mathematics achievement.

5. Discussion and Implications

This study was conducted to determine the factors that psychologically influence students' mathematics achievement. It also examines whether mathematics teachers' and parents' support directly influences students' achievement and indirectly affects stress, well-being, and learning interest. The research model was developed, modified, and evaluated using empirical data from the existing teacher-parent support model [18]. These findings may help to explain the role of teachers and parents in students' stress levels, well-being, interest, and mathematics achievement.

The result showed that students' well-being was not affected by teachers' emotional support (H1) but by parents' (H5) and teachers' academic (H9) support. This explains why students' feelings of well-being in Indonesia are still fully dependent on their parents. The study showed that 1 out of 3 students (39%) with low well-being rarely or never talk about their problems and possess a low level of communication to share their feelings daily. This study provides new knowledge which enables parents to change roles as friends or siblings to support their child's well-being. It enables them to communicate positively and pay attention to their children's problems. It also inspires teachers to support students in various activities at school and pay more attention to them, which positively affects their achievement [86,87].

Meanwhile, this study also found that parents' support did not significantly reduce students' stress levels when learning mathematics (H10). Students felt that academic teaching (H2) and emotional (H6) support can reduce their stress levels when learning mathematics. They felt that the stress caused by mathematics lessons is more effective when conveyed to teachers at school. This finding provides suggestions for teachers to understand that students have diverse abilities. Therefore, varying learning approaches and models are needed to support them in mathematics lessons while simultaneously reducing the stress level caused by learning it in the classroom. The use of technology-based learning media can reduce students' stress levels. Several studies have shown that using ICT in the classroom improves students' soft skills [88–90]. However, teachers may need more time to understand students' individual characters in order to provide appropriate support.

Based on the factors related to students' interest in learning mathematics, the study found that teacher academic support (H8), parent support (H12) and stress level factors (H15) significantly have a relationship with learning interest. Meanwhile, the emotional support provided by the teachers does not significantly affect students' interest in learning. Several preliminary studies also found that students' stress levels reduce interest in learning [91]. This is because those who feel stressed are usually excessively anxious, therefore, they lose their sense of interest. Moreover, secondary school students tend to avoid stress rather than tackle it, which makes the role of teachers and parents very important. Parents can support students by creating a comfortable learning atmosphere and providing adequate support learning materials within and outside the school. Meanwhile, teachers can select attractive learning media and provide easy learning methods capable of increasing students' interest in learning mathematics [92].

The latest findings are factors related to students' mathematics achievement, including teaching academic support (H7), parent support (H11), stress levels (H14), interest in learning (H15), and well-being (H17). However, well-being is not the main factor that significantly affects students' mathematics achievement. This is explained by the fact that schools focus more on cognitive and academic performance. Adler stated that teaching students about well-being increases their academic achievement. These findings are appro-

priate to the results of a meta-analysis [93] which showed a relationship between well-being and students' achievement, which only had a small effect. The stress level can also reduce student achievement, when increased.

This study provides several theoretical and practical implications. Firstly, it modifies and develops a research model from the teacher-parent support model by adding additional predictors and strengthening explanation power. Secondly, it provides theoretical implications for exploring the relationship between mathematics teachers' and parents' support on students' stress levels, well-being, learning interest, and mathematics achievement to fulfill the conceptual framework, especially in mathematics education, for developing countries such as Indonesia. It is necessary to understand that teacher and parental support at school and home has the same effect on students' well-being, reduces stress, and increases interest in learning. This opens up new knowledge for parents to support children both academically and emotionally.

This study provides a deeper understanding of the factors that affect students' mathematics achievement in developing countries, especially Indonesia. The results educate parents, teachers, schools, and students about the importance of teachers' support for students while studying mathematics. This is because it increases their well-being and reduces stress levels despite the difficulty attached to learning this subject. It also indicates that students' mathematics achievement depends not only on the learning media and the teachers' teaching abilities but on the used educational technologies and the drill-and-practice of mathematical tasks as well. However, it is also associated with the psychological factors, namely, stress, well-being, interest in learning, and parental support.

Therefore, there are several vital points associated with this study. Firstly, the parents' role is essential to students' mathematics achievement, learning interest, and stress levels. Parents should set aside time to assist their children because it increases their self-confidence and motivation to learn, improving mathematics achievement. Students do not need parents to be able to teach or answer existing mathematics material, but parental support is important. Secondly, school mathematics teachers need to understand the importance of psychological support for students [94,95]. For instance, K-12 students consider support from people in their environment very important [96,97].

Students are not usually able to independently motivate themselves, hence, they are easily stressed. Furthermore, due to their varying abilities, it would be imperative for mathematics teachers to provide academic support to benefit the emotional and educational support of those with lower abilities. Thirdly, schools can provide briefings or training for teachers and parents on the importance of maintaining students' interest in learning and the need to encourage them academically and emotionally continuously. Students' growth, development, and achievement depend not only on the teachers at the school but is the task of both teachers and parents.

6. Conclusions

In conclusion, this study was conducted to determine whether teacher and parent support are related to students' achievement, stress levels, and interest in learning mathematics in Indonesia. Initial hypotheses were developed based on literature reviews and modification of the current teacher-parent support model. This study developed and validated a model to significantly increase students' mathematics achievement at the secondary school level. The model provides new ideas and knowledge that are important and need to be implemented in Indonesia, significantly changing parents' perspectives of students. Furthermore, it analyzed students' well-being, which is essential in increasing their interest in learning mathematics and achieving success. Reducing stress levels and increasing feelings of well-being affect students' mathematics achievement. Therefore, teachers should not only master how to teach mathematics but also need to have some knowledge of students' psychology.

The results also showed that students in Indonesia have high enthusiasm for their parents and teachers to reduce their stress levels with an increase in overall well-being while

learning mathematics. They also think that their mathematics achievement is influenced by the academic and emotional support provided by teachers and parents at home. However, more efforts are needed to improve teachers' abilities to support students psychologically successfully. This discovery is a new step and attitude that requires more effort from parents and teachers. This study opens up initial knowledge about the importance of teacher and parent support for students' mathematics achievement. Further studies need to be conducted to support the results of this study.

7. Limitations

Although this study provides several implications and contributes to the mathematics education field, it has some limitations that can be a starting point and recommendations for further research. For instance, it uses a correlational design, which makes it prone to bias when data collection is analyzed. Furthermore, it was only conducted at the secondary school level, hence, future studies need to test the developed models. Although the results need to be interpreted carefully, they cannot be generalized because the sample used in this study was less than 500 secondary school students in West Java, Indonesia. Therefore, further studies need to be conducted using a larger scale of respondents to prove the findings and determine the comparative narrative between countries.

This study also recommends the development of new research models at other education levels. Similar and different effects on other subjects need to be further investigated. Several factors related to the stress and well-being model may also be added to the research model to investigate whether they relate to students' mathematics achievement.

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Appendix A. Questionnaire Items

Construct	Indonesian Version Question-Naire	English Version Questionnaire
Interest in learning mathematics	Saya suka belajar materi matematika	I like to study mathematics.
	Saya penasaran dengan ilmu matematika	I'm curious about mathematics.
	Saya suka menganalisis dan memecahkan masalah matematika	I like analyzing and solving mathematics-related problems.
	Saya suka mengaplikasikan ilmu matematika yang sudah saya pelajari di sekolah pada kehidupan sehari hari	I like to apply the mathematics that I have learned at school in my daily life.

Construct	Indonesian Version Question-Naire	English Version Questionnaire
Mathematics learning achievement	Saya mendapatkan nilai yang memuaskan pada pelajaran matematika	I get good grades in mathematics.
	Saya dapat mengerjakan Sebagian besar soal soal matematika yang diberikan oleh guru	I can finish most of the mathematics problems given by the teachers.
	Saya merasa pengetahuan saya tentang matematika meningkat secara bertahap	I feel my knowledge of mathematics is increasing gradually.
	Saya tidak mudah lupa dengan materi matematika yang sudah dipelajari di sekolah	I do not easily forget the mathematics material that I have learned at school.
Well-being	Belajar matematika membuat saya mempunyai lebih percaya diri	Learning mathematics makes me have more confidence.
	Secara keseluruhan, saya merasa percaya diri dan positif saat saya belajar matematika	Overall, I feel confident and positive when I study mathematics.
	Saya senang bermain dengan angka dan rumus matematika	I like to play with numbers and mathematics formulas.
Teachers emotional support	Guru kami mendorong kami agar tidak patah semangat saat kami mengerjakan latihan dan pr matematika	Our teachers encourage us not to get discouraged when we do mathematics exercises and homework.
	Guru kami selalu memberikan kami motivasi untuk mencapai nilai matematika yang lebih baik lagi	Our teachers always motivate us to achieve better mathematics scores.
	Guru kami selalu memberikan kami semangat saat belajar matematika	Our teachers always make us excited when learning mathematics.
Teachers academic support	Ketika saya mendapat kesulitan belajar matematika, guru membantu saya mencari jalan keluar	When I experience difficulty while learning mathematics, my teachers help me find a solution.
	Ketika saya mudah mengerti, guru memberikan saya soal matematika yang lebih sulit	When I understand the topic taught quickly, the teachers give me more complex problems to solve.
	guru saya memberikan kesempatan untuk mengerjakan soal matematika menurut ide dan cara saya sendiri	My teachers allow me to work on mathematics problems according to my ideas and ways.
Parents support	Orang tua ikut membantu saya saat belajar matematika di rumah	My parents help me when I study mathematics at home.
	orang tua saya selalu memberikan semangat dan motivasi untuk saya belajar matematika	My parents always make me excited and motivated to learn mathematics.
	Overall, orang tua saya mendorong saya untuk mendapat nilai tinggi di pelajaran matematika	Overall, my parents encouraged me to get high marks in mathematics.
Stress	Belajar matematika membuat saya lelah	Studying mathematics makes me tired.
	PR matematika membuat saya stress	Mathematics homework stresses me out.
	Saya tidak semangat belajar saat pelajaran matematika	I'm not enthusiastic about studying in mathematics class.

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Effects of Ego-Resiliency on Interpersonal Problems among Nursing Students: The Mediating Effects of Aggression

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Abstract: (1) Background: Despite that nursing college students are more diverse than those in other majors, many nurses experience interpersonal problems and difficulties in the process of forming relationships and contacting various people. The purpose of this study is to understand the mediating effects of aggression on the process of ego-resilience in interpersonal problems in nursing college students. (2) Methods: The subjects of this study were 182 nursing college students attending university in D metropolitan city. Data were collected from 23 October to 9 November 2018. The measurements were carried out using the Ego-Resiliency Scale, the Aggression Questionnaire—Korean Version (AQ-K), and the short form of the KIIP Complex Scale (KIIP-SC). Data were analyzed using descriptive statistics, t-tests, and ANOVA. The methods of Baron and Kenny were used to verify the significance of the mediating effect. (3) Results: There were significant correlations among ego-resiliency, aggression, and interpersonal problems. Aggression had a partial mediating effect on the relationship between ego-resiliency and interpersonal problems, and aggression was explained to a level of 23%. (4) Conclusions: To lower interpersonal problems among nursing students, it is necessary to develop education and programs to improve ego-resiliency and to control aggression.

Keywords: nursing students; psychological resilience; aggression; interpersonal relations; mediating

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1. Introduction

The period in which students attend college is an intermediate stage in the transition from childhood to adulthood [1]. Adolescents are classified as those under the age of 18, human beings are defined as beings in the environment, and the socio-cultural environment is said to have a great influence on personality development [1]. The period during which students attend college represents the end of adolescence, the maturity of adolescent development tasks, and the beginning of adult development tasks. The stage of adult development is in the sixth psychosocial development stage, and the main development task is intimacy versus isolation [2]. At this time, individuals strive to form intimate relationships with people other than family members, form satisfactory interpersonal relationships, and lay the foundation for personal maturity. Failure to successfully form intimate interpersonal relationships increases isolation and affects later developmental stages [1,2].

Students entering college live in diverse student groups, actively experience interactions that create new relationships, and grow into mature adults. In particular, nursing college students go to hospitals, public health centers, and industries and therefore meet more diverse people than college students from other majors due to their clinical practice. Interpersonal relationships, formed based on these experiences, are an important competency in becoming a nurse, communicating with the people faced in the medical field, and identifying and solving health problems [3]. In addition, it helps to work in a continuous relationship with doctors, medical cooperation departments, and nursing

patients, forming complex relationships [4]. As such, it is important for nursing college students to experience and maintain positive interpersonal relationships as they become nurses after graduation and perform nursing tasks with people of various classes.

However, despite that nursing college students are more diverse than those in other majors, many nurses experience interpersonal problems and difficulties in the process of forming relationships and contacting various people. Nurses were found to be impacted by interpersonal difficulties and conflicts in peer indifference, careless words and attitudes [5], and friction with their bosses [6]. In addition, it has been reported in previous studies that interpersonal problems are a direct cause of nurse turnover, and that various programs and education are needed in schools to adapt to this aspect of hospital life [7]. As such, it is important to identify and manage interpersonal problems among nursing students so that they can form and maintain positive interpersonal relationships as future nurses.

Interpersonal problems include difficulties forming and maintaining satisfactory interpersonal relationships or an inability to cope with negative interpersonal relationships [8]. Humans experience happiness through sustaining, growing, and maintaining harmonious relationships in many forms of interpersonal relationships, but experiencing interpersonal problems and conflict situations with others leads to difficulties in adaptation and psychological discomfort [9]. Likewise, nursing college students can improve their satisfaction with clinical practice, reduce stress in clinical practice, and promote adaptation to college life by improving their interpersonal skills [10–12]. On the other hand, if it is difficult for them to form positive interpersonal relationships due to interpersonal problems, they will later experience difficulties, conflicts, and a loss of self-confidence when they become a nurse [7]. Therefore, intervention is needed to identify and reduce interpersonal problems.

Ego-resiliency is a variable related to interpersonal problems. Ego-resiliency refers to someone's ability to control conflicts by themselves without showing behavioral or emotional problems in stressful, adverse, and threatening environments [13]. It is also the ability to successfully cope with stress and anxiety in an unpredictable situation, and to flexibly adjust and recover according to a given situation [14].

According to previous studies, ego-resiliency helps to cope and adapt successfully to stressful situations, such as interpersonal problems in college life [15]. In particular, previous studies with nursing college students confirmed that nursing college students' ego-resiliency and success in interpersonal relationships were positively correlated [3] and that ego-resiliency had a positive effect on solving difficulties and problems in interpersonal relationships [16]. Meanwhile, the higher the aggression, the more difficult it is to maintain interpersonal relations [17,18] and the more difficult it is to overcome social difficulties [19]. In some studies, college students' aggression has a partial mediating effect and affects interpersonal problems [20].

Most previous studies have reported on ego-resiliency and interpersonal problems [15, 16,21], ego-resiliency and aggression [17,18], aggression and interpersonal problems [19,20], and mediating effects of aggression [8,19,20]. However, this is not enough to understand the mediating effect of aggression between ego-resiliency and interpersonal relationship problems, so it was necessary to verify it through this study. For this reason, this study aims to analyze aggression as a parameter to grasp the effect of ego-resiliency on interpersonal problems in nursing college students.

Therefore, this study was conducted to investigate the mediating effect of aggression on the self-resilience of nursing college students in the context of interpersonal problems. The specific purpose is as follows: We identify the general characteristics, ego-resiliency, aggression, and interpersonal problems of nursing college students, whereby ego-resiliency, aggression, and interpersonal problems are identified according to the general characteristics. We identify the correlations among ego-resiliency, aggression, and interpersonal problems. Finally, we grasp the mediating effect of aggression on the effects of ego-resiliency and interpersonal problems. In addition, the results are intended to be used as basic data in the development of nursing interventions to prevent interpersonal problems in the future by identifying interpersonal problems in nursing college students early.

2. Materials and Methods

2.1. Research Design

This study was a descriptive correlation study intended to grasp the relationship between ego-resiliency and interpersonal problems among nursing students and to confirm the mediating effect of aggression.

2.2. Subjects

For the subjects of this study, the researcher conveniently selected two places in D city. The subjects were nursing college students attending school who voluntarily answered the questionnaire. The sample size was calculated using the G-Power 3.1.9.2 Program, a sample size calculation program. Considering the conditions of an effect size of 0.15, significance level of 0.05, power of 0.95, and predictor of 9 required for multiple regression analysis, a minimum of 166 subjects were required. The survey was conducted on a total of 189 people considering the potential dropout rate. In total, 7 subjects did not respond to the questionnaire, so the recovery rate was 96.3%, and 182 responses were used as the final analysis data.

2.3. Instruments

2.3.1. Ego-Resiliency

The Ego-Resiliency Scale [22] by Block and Kremen, developed by Yoo and modified with supplemented tools [23], was used. A total of 14 questions were measured on a 5-point Likert scale based on the evidence that a 4-point scale tool or a 5-point scale reflects the response to neutrality and can provide high-reliability results [24]. The higher the score, the higher the ego-resiliency. Cronbach's α in Block and Kremen's study was 0.76 [22], and Cronbach's α in Yoo's study was 0.67 [23]. In this study, Cronbach's α was 0.82.

2.3.2. Aggression (Aggression Questionnaire—Korean Version (AQ-K))

The Aggression Questionnaire (AQ) [25], developed by Buss and Perry, was translated into a Korean version by Seo and Kwon [26], which was used in this study. In total, there are 27 questions composed of 4 sub-areas: physical aggression, verbal aggression, anger, and hostility. The higher the score on the 5-point Likert scale, the higher the aggression. In Buss and Perry's study, Cronbach's α was 0.89 [25], and in Seo and Kwon's study, Cronbach's α was 0.86 [26]. In this study, Cronbach's α was 0.91.

2.3.3. Interpersonal Problems (Short Form of the KIIP Complex Scale (KIIP-SC))

The short form of the KIIP Complex Scale (KIIP-SC), developed and shortened by Horowitz et al. [27] and reconstituted by Alden, Wiggins, and Pincus as the Korean version of Hong Kong's Inventory of Interpersonal Problems (IIP) [28], was used [29]. The 40 questions comprise 8 sub-domains: control dominance, self-centeredness, apathy, social restraint, non-assertiveness, over-compliance, self-sacrifice, and over-involvement. The higher the score on the 5-point Likert scale, the greater the interpersonal relationship problems. Cronbach's α in Hong et al.'s study was 0.89 [29], and Cronbach's α in this study was 0.93.

2.4. Data Collection

Data were collected from 23 October to 9 November 2018. We visited a university in D metropolitan city and explained the research purpose, necessity, data collection method, and procedure to nursing college students attending school, and then we began the research by seeking cooperation. Of the total 189 subjects, 182 subjects were included, with 7 responses excluded due to insufficient data. The questionnaire was prepared and collected immediately after distribution, and the time required to complete the questionnaire was about 15 min.

2.5. Data Analysis

The data collected for this study were analyzed statistically using IBM SPSS Statistics 24.0. The general characteristics, ego-resiliency, aggression, and interpersonal problems among nursing college students—the study subjects—were analyzed using technical statistics. Ego-resiliency, aggression, and interpersonal problems according to the general characteristics were analyzed by *t*-test and ANOVA. The correlations among ego-resiliency, aggression, and interpersonal problems among nursing college students were analyzed using Pearson's correlation coefficient. The mediating effect of aggression on the relationship between ego-resiliency and interpersonal problems among nursing students was verified through the procedures of Baron and Kenny. The steps of Baron and Kenny's hierarchical regression are as follows [30]: First, the significance between independent variables and parameters is tested. Second, the significance between independent and dependent variables is tested. Third, the significance among the independent variable, the parameter, and the dependent variable is tested. Fourth, the β value between the independent variable and the dependent variable and the β value among the independent variable, the parameter, and the dependent variable are compared. In this comparison, if the absolute value of the β value among the independent variable, the parameter, and the dependent variable is smaller, there is a partial mediating effect.

2.6. Ethical Considerations

This study was approved by the E-University Institutional Review Board (EU18-93). To ensure confidentiality, each questionnaire was distributed, filled out, and immediately sealed. During the questionnaire response, it was explained that the questionnaire could be abandoned and that answers would not be used for any purpose other than research.

3. Results

3.1. General Characteristics of the Subjects

The general characteristics of the subjects in this study are as follows. The proportion of female students in the nursing college was 82.4%, those in the fourth grade accounted for 33.0%, the third grade accounted for 26.4%, the second grade accounted for 24.7%, and the first grade accounted for 15.9%. Most subjects had no religion (61.5%), and most had two siblings (66.5%). Most of the subjects' fathers (53.3%) and mothers (51.1%) were educated to an undergraduate level (Table 1).

Table 1. General characteristics of the subjects.

			(*N* = 182)
Variable	**Categories**	***n***	**%**
Gender	Female	150	82.4
	Male	32	17.6
Grade	1	29	15.9
	2	45	24.7
	3	48	26.4
	4	60	33.0
Religion	No	112	61.5
	Yes	70	38.5
Number of Siblings	1	19	10.4
	2	121	66.5
	≥3	42	23.1
Education level (father)	≤High school	60	33.0
	Undergraduate	97	53.3
	≥Graduate	25	13.7
Education level (mother)	≤High school	80	44.0
	Undergraduate	93	51.1
	≥Graduate	9	4.9
Economic status	High	56	30.8
	Middle	112	61.5
	Low	14	7.7

3.2. Descriptive Statistics Regarding Ego-Resiliency, Aggression, and Interpersonal Problems

The descriptive statistics regarding ego-resiliency, aggression, and interpersonal problems, which are the variables of this study, are as follows (Table 2). The score for ego-resiliency was 3.38 ± 0.53 out of 5 points. Physical aggression was the lowest-scoring among the aggression types, with a score of 1.69 ± 0.58 out of 5, and anger was the highest-scoring, with 2.27 ± 0.68. The lowest scores for interpersonal problems were for control dominance with 1.70 ± 0.62 points and vindictive with 1.70 ± 0.67 points out of 5, while overly nurturing was the highest-scoring, with 2.55 ± 0.73 points.

Table 2. Descriptive statistics among the variables.

Variable	Range	M	SD
Ego-resiliency	1~5		
Ego-resiliency		3.38	0.53
Aggression	1~5	1.92	0.48
Physical Aggression		1.69	0.58
Verbal Aggression		2.16	0.67
Anger		2.27	0.68
Hostility		1.82	0.57
Interpersonal problems	1~5	2.05	0.51
Domineering		1.70	0.62
Vindictive		1.70	0.67
Cold		1.89	0.87
Socially avoidant		2.04	0.81
Nonassertive		2.24	0.85
Exploitable		2.19	0.79
Overly nurturing		2.55	0.73
Intrusive		2.09	0.69

3.3. Ego-Resiliency, Aggression, and Interpersonal Problems According to the Respondents' General Characteristics

The focus of this study was on ego-resiliency, aggression, and interpersonal problems among nursing college students. The number of respondents with two siblings was 121 (66.5%), and there was a significant difference in ego-resiliency according to the number of siblings ($F = 3.937$, $p = 0.021$). As a result of the post-test, it was found that ego-resiliency was higher in the case of two siblings than in the case of one. In addition, there was a significant difference in interpersonal problems according to the grade level ($F = 8.308$, $p < 0.001$). As a result of the post-test, it was found that first graders had greater interpersonal problems than third and fourth graders, and second graders had greater interpersonal problems than fourth graders. There were 112 people (61.5%) who thought their economic status was middle, and there were significant differences in interpersonal problems according to economic status ($F = 3.363$, $p = 0.037$). As a result of the post-test, it was found that their interpersonal problem scores were higher than those of respondents who thought that their economic status was low (Table 3).

Table 3. Differences in ego-resiliency, aggression, and interpersonal problems according to the general characteristics of the participants.

Variable	Categories	N	Ego-Resiliency	Aggression	Interpersonal Problems
			M ± SD	M ± SD	M ± SD
Gender	Female	150	47.20 ± 7.22	50.87 ± 11.11	82.14 ± 20.63
	Male	32	47.47 ± 8.43	50.87 ± 19.20	81.47 ± 18.38
	t/F(*p*)		−0.186 (0.853)	−1.708 (0.096)	0.170 (0.865)
Grade	1 [a]	29	45.00 ± 7.96	53.55 ± 13.40	94.52 ± 20.67
	2 [b]	45	49.18 ± 7.23	53.69 ± 13.85	85.87 ± 19.28
	3 [c]	48	46.29 ± 6.97	52.35 ± 10.62	80.83 ± 17.61
	4 [d]	60	47.65 ± 7.40	49.48 ± 13.92	74.05 ± 19.27
	t/F(*p*)		2.274 (0.082)	1.146 (0.332)	8.308 (<0.001)a > c, d †, b > d †
Religion	No	112	47.80 ± 7.97	51.59 ± 12.64	82.65 ± 20.76
	Yes	70	46.35 ± 6.40	52.47 ± 13.74	81.01 ± 19.38
	t/F(*p*)		1.282 (0.202)	−0.443 (0.658)	0.531 (0.596)
Number of Siblings	1 [a]	19	42.84 ± 9.97	55.79 ± 11.17	90.16 ± 25.32
	2 [b]	121	47.89 ± 7.18	52.17 ± 13.19	80.66 ± 17.74
	≥3	42	47.38 ± 6.18	49.48 ± 13.18	82.26 ± 23.73
	t/F(*p*)		3.937 (0.021)a < b †	1.607 (0.203)	1.835 (0.163)
Education level(father)	≤High school	60	46.75 ± 7.53	52.90 ± 16.29	83.48 ± 18.23
	Undergraduate	97	47.21 ± 7.49	52.52 ± 11.47	83.03 ± 21.78
	≥Graduate	25	48.60 ± 6.99	47.32 ± 8.84	74.60 ± 17.25
	t/F(*p*)		0.549 (0.578)	1.843 (0.161)	1.986 (0.140)
Education level(mother)	≤High school	80	46.31 ± 7.77	53.91 ± 16.12	83.20 ± 18.15
	Undergraduate	93	48.27 ± 7.26	50.22 ± 10.07	81.18 ± 21.87
	≥Graduate	9	45.00 ± 4.06	52.00 ± 6.54	80.22 ± 21.30
	t/F(*p*)		1.949 (0.145)	1.743 (0.178)	0.250 (0.779)
Economic status	High [a]	56	48.25 ± 6.54	51.48 ± 13.08	79.50 ± 18.10
	Middle	112	47.06 ± 7.41	51.84 ± 12.76	81.68 ± 21.01
	Low [c]	14	44.71 ± 10.25	54.43 ± 15.69	94.86 ± 18.00
	t/F(*p*)		1.368 (0.257)	0.290 (0.748)	3.363 (0.037)a < c †

† $p < 0.05$ by Scheffé's post hoc test.

3.4. Correlations among Ego-Resiliency, Aggression, and Interpersonal Problems

The relationships among ego-resiliency, aggression, and interpersonal problems were as follows: Ego-resiliency was significantly negatively correlated with aggression (r = −0.21, $p = 0.005$) and interpersonal relationship problems (r = −0.44, $p < 0.001$). Aggression was significantly positively correlated with interpersonal problems (r = 0.30, $p < 0.001$) (Table 4).

Table 4. Correlations among the variables.

Variable	Ego-Resiliency	Aggression	Interpersonal Problems
	r (*p*)	r (*p*)	r (*p*)
Ego-resiliency	1		
Aggression	−0.21 (0.005)	1	
Interpersonal problems	−0.44 (<0.001)	0.30 (<0.001)	1

3.5. Mediating Effects of Aggression on Ego-Resiliency and Interpersonal Problems

The mediating effect of aggression on the effects of ego-resiliency among nursing college students on interpersonal problems is as follows (Table 5). First, as a result of examining the multicollinearity among variables, the Durbin–Watson index was 1.63~1.66, close to 2, indicating that there was residual independence. The VIF (Variance Inflation Factor) index was 1.00 to 1.45, less than 10, making it suitable for regression analysis because there was no problem with multicollinearity.

Table 5. Mediating effect of aggression on the relationship between ego-resiliency and interpersonal problems.

	Step			B	β	t	*p*	Adj. R^2	F	*p*
Step 1.	Ego-resiliency	→	Aggression	−0.36	−0.21	−2.84	0.005	0.04	8.09	0.005
Step 2.	Ego-resiliency	→	Interpersonal problems	−1.20	−0.44	−6.56	<0.001	0.19	42.93	<0.001
Step 3.	Ego-resiliency Aggression	→	Interpersonal problems	−1.07 0.34	−0.39 0.22	−5.90 3.25	<0.001 0.001	0.23	27.90	<0.001

To test the mediating effect of ego-resiliency and aggression on interpersonal problems, the three-step verification detailed by Baron and Kenny was conducted. In Step 1, a simple regression analysis of ego-resiliency (independent variable) and aggression (mediating variable) showed statistical significance ($\beta = -0.21$, $p = 0.005$). The explanatory power to explain aggression was 4%. In Step 2, the effect on ego-resiliency (independent variable) and interpersonal problems (dependent variable) was found to be statistically significant ($\beta = -0.44$, $p < 0.001$). The effect on interpersonal problems was 19%. In Step 3, to test the effect of aggression (mediating variable) on interpersonal problems (dependent variable), a regression analysis was conducted using ego-resiliency and aggression as predictors and interpersonal problems as a dependent variable. As a result, ego-resiliency ($\beta = -0.39$, $p < 0.001$) and aggression ($\beta = 0.22$, $p = 0.001$) were found to be significant predictors of interpersonal problems. That is, when aggression was used as a mediating variable in Step 3, ego-resiliency was significant in interpersonal problems, and the standardized regression coefficient decreased from −0.44 in Step 2 to −0.39 in Step 3, showing partial mediation (Figure 1).

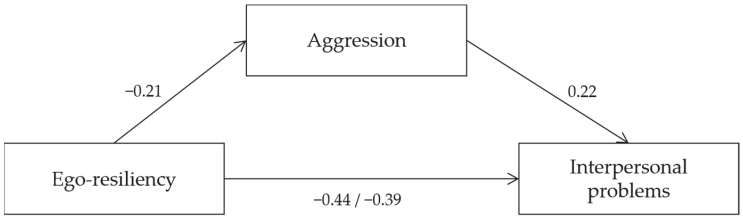

Figure 1. Mediation model of aggression in the relationship between ego-resiliency and interpersonal problems.

4. Discussion

This study was conducted to investigate the mediating effect of aggression in the effect of ego-resiliency on interpersonal problems in nursing students. Based on the results of this study, we intend to provide basic data for education to strengthen ego-resiliency and reduce aggression to lower the severity of interpersonal problems among nursing students.

In a previous study of second-grade nursing students, their ego-resiliency score was 2.80 points out of 4 [31], but the ego-resiliency of nursing students was 3.38 out of 5 in this study. In this study, a 5-point scale was used to allow for neutrality, and nursing college students were found to have a high level of ego-resiliency, similar to that in the previous study. In addition, in previous studies examining the number of siblings and ego-resiliency, those with more than three siblings showed higher ego-resiliency than did those with two siblings [32]. The ego-resiliency was positively, concurrently correlated with perceived social support from friends and family [33]. In this study, ego-resiliency was higher in the case of two siblings than in the case of one. The number of siblings thus affected ego-resiliency.

In this study, the aggressiveness of nursing college students was low at 1.92 out of 5, and there was no significant difference in relation to general characteristics. In a

previous study that analyzed the aggressiveness of general college students using the same tool, male students showed high physical aggression and female students showed anger [26]. Generally, males use more physical aggression and both genders use direct verbal aggression equally [34]. It is thought that nursing college students intend to become nurses, control their aggression, and live in the college area. This can be seen as a difference in aggression from general college students.

In this study, the interpersonal problems score was 2.05 out of 5. The score of first-grade students was higher than those of third- and fourth-grade students, and that of second-grade students was higher than that of fourth-grade students. These results seem to be because, as the students progress through the grades, they meet various people through practice, prepare for national examinations and graduation, and maintain strong relationships with other students, thereby increasing opportunities for interpersonal relationships. In addition, it seems that interpersonal problems decrease as the grade level increases throughout the four years of education. However, in a comparison study, it was found that nursing college students had lower interpersonal scores than did college students with other majors [35]. This is not directly comparable because of the lack of prior studies comparing interpersonal relationship problems between nursing college students and other college students, but in the case of nursing college students, it is considered due to the preparation and practice for nursing national examinations, classes, frequent testing, and job preparation [21]. In comparison, the interpersonal relationship score is considered relatively low, and the interpersonal score is low. In this way, nursing college students' characteristics linked to the ability to respond flexibly to situational demands such as stress might have consequences regarding emotion regulation and interpersonal problems [36].

As a result of testing the correlations between variables in this study, ego-resiliency was found to be inversely correlated with aggression. This means that ego-resiliency in nursing college students lowers aggression. As such, aggression cannot be controlled, but it can be adjusted by increasing ego-resiliency. Therefore, education and strategies to reduce aggression by identifying and improving an individual's ego-resiliency are required. In this study, there was a significant inverse correlation between ego-resiliency and interpersonal problems, and there was a significant correlation between aggression and interpersonal problems. These results support the results of a previous study [19,20,33,36]. As such, it was found that the higher the ego-resiliency, the lower the interpersonal problems, and the higher the aggression, the greater the interpersonal problems. Therefore, it was found that aggression has an important effect on interpersonal problems in nursing college students.

Aggression has a partial mediating effect on the relationship between ego-resiliency and interpersonal problems among nursing college students. That is, the higher their ego-resiliency, the lower their aggression; further, the lower their ego-resiliency and the higher their aggression, the greater their interpersonal problems [20]. These variables accounted for 23% of the explanatory power in explaining interpersonal problems, and it was found that ego-resiliency and aggression affect nursing students' interpersonal problems. As such, it can be seen that the interpersonal relationship problems of nursing college students are a factor influencing aggression in addition to ego-resiliency. Therefore, nursing interventions and education should be provided to reduce aggression [19,20] and create intimate human relationships within mutual relations [33,36].

Nursing students go to college where they live in new student groups and perform a variety of nursing practices. High school students in Korea spend most of their time in school classes and private lessons to prepare for intense college entrance exams. After experiencing the limited interpersonal relationships of high school students, students in the nursing department experience difficulties in interpersonal relationships and express problems. As a result of this study, it was found that increasing the ego-resiliency and decreasing the aggression of nursing students can lower the severity of interpersonal problems [37]. Based on the results of these studies, a program should be developed to help nursing students increase their ego-resiliency and reduce their aggression, which determines their ability to control conflicts in a stressful and threatening environment

to maintain positive interpersonal relationships and advance as nurses. Specifically, it is necessary to prepare a positive psychological program that increases ego-resiliency, an anger control program that alleviates aggression, and a mindfulness program [38] that can help students control their minds whenever aggression appears, and to actively mediate the program so that students can easily access it. In addition, through the results of this study, it is possible to grasp the factors of interpersonal problems among nursing college students, so it will be possible to prevent and educate about interpersonal problems by interviewing students. Furthermore, this approach will improve the relationships between nursing college students and help with the complex human relationships formed as a nurse, contributing to the growth of personally mature nurses.

Limitations

This study was conducted on a modest sample of nursing education students from one city, D City, and this may have limited our ability to detect significant findings. However, the participants were from the nursing college (Baccalaureate) in D province, which was certified by the Korean Accreditation Board of Nursing Education. As such, these findings are reflective of nursing education in the province and appear congruent with global findings. Further investigation with a larger sample is indicated to further validate these findings.

5. Conclusions

This study verified aggression as a mediating factor in the relationship between ego-resiliency and interpersonal problems among nursing students. Nursing is the study of providing and practicing care for human beings. This means that the importance and necessity of interpersonal relations among nursing students are greater than those among students of other majors. As a result of the study, it was found that ego-resiliency affects interpersonal problems, aggression plays a part in the relationship between ego-resiliency and interpersonal problems, and the explanatory power is 23%. The results of these studies confirmed that ego-resiliency and aggression are important variables affecting interpersonal problems.

Considering the volume of publications on resilience studies, this study helps to clarify the dimensions of ego-resiliency and shows that the concept still needs to be investigated to further break down the factors of each dimension. Nevertheless, we have found other significant factors in this review, such as ego-resiliency, interpersonal problems, and mediating effects of aggression, which should be considered in future studies and interventions.

Based on the above research results, we would like to suggest further research. First, this study examined limited research subjects in some regions, so it is necessary to repeat the research with an expanded subject group. Second, a research study is suggested to identify other factors affecting interpersonal problems. Third, based on the results of this study, it is suggested to develop and apply a program to improve ego-resiliency and control aggression to reduce interpersonal problems among nursing college students.

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Institutional Review Board Statement: This study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board (or Ethics Committee) of Eulji University (protocol code EU 18-93 and 23 October 2018).

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Data Availability Statement: The data used is confidential, and the study participants have not consented to data sharing. Due to the sensitive nature of the personal information in the questions asked in this study, the survey respondents were assured that the raw data would be kept confidential and would not be shared.

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

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Structural Equation Model on the Problem Behavior of Adolescents

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Abstract: This study aimed to explain direct and indirect relationship between psychological maltreatment, socio-psychological prevention factors, and problem behavior of adolescents based upon Jessor's protective-risk model and Haase's adolescent resilience model (ARM). A convenience sample of 138 Korean adolescents was recruited for the cross-sectional survey design. Using the collected data, the developed model was verified by structural equation modeling analysis using SPSS and AMOS program. Regarding model fit, $\chi^2 = 151.62$ ($p < 0.001$), GFI = 0.908, AGFI = 0.836, CFI = 0.911, SRMR = 0.060, and RMSEA = 0.10, showing acceptable fit levels. Psychological maltreatment explained 11.5% of perceived social support; psychological maltreatment, perceived social support, and self-control explained 89.9% of resilience; psychological maltreatment and perceived social support explained 53.2% of self-control; and psychological maltreatment, perceived social support, resilience, and self-control explained 39.7% of problem behavior. Psychological maltreatment directly and indirectly influenced perceived social support, self-control, and problem behavior. Psychological maltreatment and self-control were the factors that influence problem behavior of adolescents. The findings suggest that psychological maltreatment must be eradicated to reduce problem behavior of adolescents and enhance their socio-psychological protection factors.

Keywords: adolescent; child abuse; problem behavior; psychological maltreatment; self-control; resilience; psychological; social support

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1. Introduction

Recently, interests in child abuse are increasing in Korea, as related death cases are reported [1]. Since the revision of the Child Welfare Act in 2018, there has been analysis in Korea on the current status of child abuse victims, protection and support, actual cases, policies for child abuse prevention, etc. As a result, the number of child abuse cases has continued to increase according to 2019 statistics of child abuse (Child Abuse & Neglect Korea 2019). The number of child abuse cases has increased drastically: 22,377 in 2017, 24,604 in 2018, and 30,045 in 2019 [2].

There are four types of child abuse: physical maltreatment, psychological maltreatment, sexual maltreatment, and negligence [3]. Among these, psychological maltreatment indicates rejective or indifferent attitudes of the parents or rearers and acts of threatening a child or promoting acts of deviation. Such maltreatment hinders the child's physical psychological and social development [4]. Psychological maltreatment is one of the factors that cause problem behaviors among adolescents, affecting the physical and psychological growth of adolescents negatively [5]. Unfortunately, the number of psychological maltreatment cases was 7622, the largest among child abuse types, and the age group where child abuse occurred most frequently was adolescents aged 13 to 15, according to the 2019 annual report of child abuse by the Ministry of Health and Welfare (KOHW) [3]. While the occurrence rate of psychological maltreatment in Korea is so high, current child abuse

policies focus on physical maltreatment, with the criticality of psychological maltreatment neglected [1,3].

Children and adolescents who experience psychological maltreatment suffer damage to physical and psychological development [4] and exhibit various problem behaviors such as negative self-esteem, anxiety, depression, shrinkage, aggression, etc. [6–10]. Adolescence is a transition period from childhood to adulthood during which drastic physical and psychological changes make adolescents feel sensitive [4]. Moreover, adolescents are psychologically quite unstable since they are easily affected by conflicts with parents or companion groups as well as changes in social environments [11]. Particularly, psychological maltreatment that adolescents experience affects their childhood negatively. Regulating child abuse for adolescents, therefore, is as important as that for children. Fortunately, not every adolescent who experiences child abuse develops problem behaviors or aggressive tendency [12]. Each adolescent's socio-psychological factors act as a protective factor that reduces problem behaviors [13].

Three major socio-psychological protective factors that affect adolescents' problem behaviors are social support, self-control, and resilience [9,14,15]. In adolescence, the occurrence probability of problem behaviors depends on the social support that adolescents experience. As adolescents receive positive support from persons important to them such as parents, friends, and teachers, the occurrence rate of problem behaviors decreases [10,13]. Self-control means the ability to control one's emotions and impulses in order to achieve an important or long-term goal [7,15,16]. Self-control reduces the risk of externalizing internalizing problem behaviors among adolescents [14,17] as well as aggressive and anti-social behaviors and anger among adults [15]. Resilience is a positive psychological resource to explain a feeling of happiness among adolescents [18]. This is an ability to overcome adversities, recover from psychological conditions, and adapt oneself positively in challenging circumstances [5,19]. It is reported that resilience affects the mental condition and subjective feeling of well-being among adolescents, playing an important role in the prevention and treatment of problem behaviors and related education [19,20]. Abused adolescents showed lower resilience than non-abused adolescents. In addition, in a previous study targeting adolescents, resilience was shown to mediate between emotional abuse and problem behaviors [5,19]. Recently, resilience has been shown as a mediating variable and an important protective factor in the effects of emotional abuse on borderline personality disorder [21], and resilience was found to moderate the effects of prior childhood maltreatment on externalizing problems [22]. As such, social support, self-control, and resilience may function as protective factors to adolescents exposed to psychological maltreatment.

Previous studies on child abuse among adolescents have focused on the problem behaviors of adolescents who have experienced maltreatment. There has been little research on psychological maltreatment and adolescent problem behaviors among child abuse types. Particularly, there has been little research on modeling to explain factors affecting psychological maltreatment and adolescent problem behaviors and relationships among them. Two examples of models explaining adolescent problem behaviors are Jessor's protective-risk model [23] and Haase's adolescent resilience model (ARM) [24]. The protective-risk model [23] is based on the theory of problem behaviors [25]. In this model, it is explained that when the protective factors for adolescents are low, the risk factors for problem behavior have a greater effect, and when the protective factors are high, the risk factors for problem behavior decrease [23,26]. The adolescent resilience model (ARM) [24] consists of risk factors and protective factors that affect adolescents' quality of life. This model explains that risk factors affect protective factors and resilience negatively, while protective factors affect resilience positively. It also explains the path that ultimately affects the quality of life [24]. Therefore, these two models are appropriate as a theoretical framework for modeling related to adolescents' psychological maltreatment and problem behaviors.

Accordingly, this study examines the influence and path from psychological maltreatment to adolescents' problem behaviors, with variables of socio-psychological protective

factors (social support, self-control, and resilience) based on the theoretical framework of Jessor's protective-risk model [23] and Haase's adolescent resilience model (ARM) [24].

2. Materials and Methods

2.1. Study Design

In this study, a conceptual framework was constructed to build a hypothetical model composed of factors influencing adolescents' problem behavior. After that, we built a structural equation model that selects variables, collects data cross-sectionally, and tests the effect of the hypothetical model based on the collected data.

Hypothetical Model

With Jessor's protective-risk model [23] and Haase's adolescent resilience model (ARM) [24] as the theoretical framework, a hypothetical model was established to analyze factors affecting adolescents' problem behaviors. The protective-risk model was composed of protective factors and risk factors for adolescent problem behavior. Protective factors directly help adolescents to engage in desirable and positive behaviors and indirectly act as a buffer to reduce risk factors that can cause problem behaviors. Risk factors increase problem behaviors in adolescents. The adolescent resilience model (ARM) consists of risk factors and protective factors that affect adolescent resilience and quality of life. The adolescent resilience model (ARM) includes pathways in which risk factors negatively affect protective factors and resilience and pathways in which protective factors positively affect resilience. The results of these factors are presented as having an impact on quality of life.

The hypothetical model represents the effects of psychological maltreatment, perceived social support, resilience, and self-control on adolescent problem behavior. In addition, direct and indirect pathways through which psychological maltreatment affects problem behaviors of adolescents through protective factors were included. This hypothetical model has one exogenous variable (psychological maltreatment) and four endogenous variables (perceived social support, resilience, self-control, problem behavior) (Figure 1).

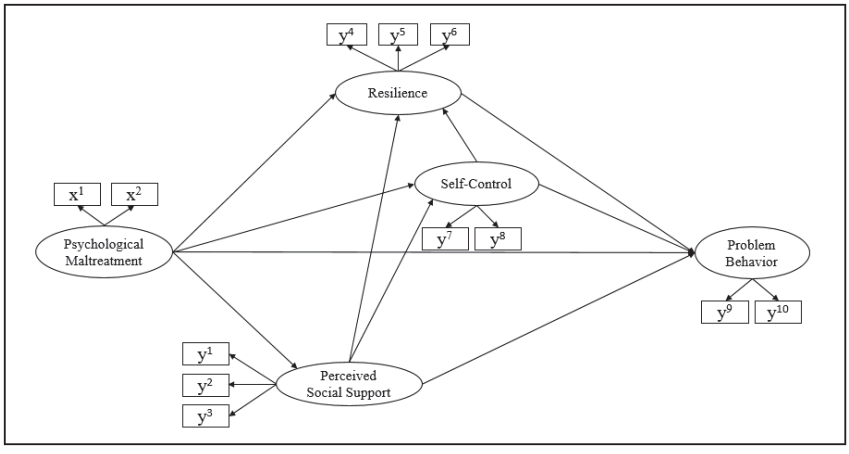

Figure 1. Hypothetical Model of Problem Behavior among Adolescents. x^1, emotional abuse; x^2, neglect; y^1, family; y^2, friend; y^3, teacher; y^4, affirmative; y^5, controllability; y^6, sociability; y^7, long-term control; y^8, short-term control; y^9, internalizing; y^{10}, externalizing.

2.2. Study Participants

The subjects of this study were students enrolled in middle school or high school in K Province and G City selected through convenience sampling. We visited four schools and collected data in the classroom with permission from the teachers and students of the

department. The criteria for inclusion of research subjects are students who have heard and agreed to the purpose of this study. In addition, students should be able to read and understand the contents of the questionnaire and answer the questions. Exclusion criteria are students who disagree with this study.

A total of 250 individuals was selected based on the minimal sample size (200) suggested by the maximum-likelihood classification method and the withdrawal rate according to the asymptotically distribution-free method [27]. Likewise, 250 questionnaires were distributed and collected 100%, but 12 copies with insufficient answers were excluded, and 238 copies were used in the final analysis.

2.3. Measurements

2.3.1. Psychological Maltreatment

In order to measure psychological maltreatment perceived by adolescents in this study, the translated and revised version of the CTS (Conflict Tactics Scale) of Shin et al. [28] and Straus [29] was utilized, and this study includes a survey where 9 questions regarding the "emotional abuse" item and 10 questions regarding the "neglect" item were used. After data were collected through this tool, questions 13 and 15, whose reliability turned out to be low according to the reliability analysis, were removed, and then, the remaining 17 questions were utilized. This tool's range of score is between 17 and 68 points. A high score indicates that the respondent has experienced more abuse. Shin et al.'s research reliability was Cronbach's $\alpha = 0.87$ [28], and this study's reliability was Cronbach's $\alpha = 0.65$. Cronbach's α is a reliability coefficient that provides a method of measuring internal consistency of tests and measures. Internal consistency is satisfied when Cronbach's alpha is 0.6 or higher.

2.3.2. Perceived Social Support

Perceived social support was measured by means of the social support tool [30] developed by Kim. This 5-point Likert scale includes 23 questions: 8 questions about family support, 8 questions about companion support, and 7 questions about teacher support. This tool's range of score is between 23 and 115 points. A high score indicates that the respondent perceives his/her social support as high. Kim's research reliability was Cronbach's $\alpha = 0.84$ [30], and this study's reliability was Cronbach's $\alpha = 0.94$.

2.3.3. Resilience

Resilience was measured by means of the resilience tool [20] developed by Shin et al. for adolescent research. This 5-point Likert scale consists of three sub-factors: controllability, positiveness, and sociability. It includes 27 questions in total. This tool's range of score is between 27 and 135 points. A high score indicates that the resilience is high. Shin et al.'s research reliability was Cronbach's $\alpha = 0.88$ [20], and this study's reliability was Cronbach's $\alpha = 0.94$.

2.3.4. Self-Control

Self-control was measured by means of the self-control scale [31] developed by Nam et al. for adolescent research. This 5-point Likert scale consists of 20 questions in total: 10 questions about short-term control and 10 questions about long-term control. After data were collected through this tool, question 20, whose reliability turned out to be low according to the reliability analysis, was removed, and then, the remaining 19 questions were utilized. This tool's range of score is between 19 and 95 points. A high score indicates that the self-control is high. Nam et al.'s research reliability was Cronbach's $\alpha = 0.78$ [31], and this study's reliability was Cronbach's $\alpha = 0.84$.

2.3.5. Problem Behavior

Problem behaviors were measured by means of the adolescent self-report (K-YSR) [32] tool, which is part of the Korean translation version (Korea Child Behavior Checklist, K-CBCL) of the Child Behavior Checklist (CBCL) of Achenbach, translated and standard-

ized by Oh et al. [33]. This tool consists of 31 questions about internalizing problem behaviors and 32 questions about externalizing problem behaviors. After data were collected through this tool, questions 1, 35, and 61, whose reliability turned out to be low according to the reliability analysis, were removed, and then, the remaining 60 questions were utilized. This tool's range of score is between 60 and 180 points. A higher score means more problem behavior. Oh et al. study's reliability was as follows: For internalizing problem behaviors, Cronbach's $\alpha = 0.91$, and for externalizing problem behaviors, Cronbach's $\alpha = 0.86$ [32]. This study's reliability was as follows: For internalizing problem behaviors, Cronbach's $\alpha = 0.91$, and for externalizing problem behaviors, Cronbach's $\alpha = 0.85$.

2.4. Data Collection and Ethics

Before data collection for this study, the survey was approved (IRB #: **16–47) by the Institutional Review Board (IRB) of ** University to which the researcher belongs. Prior to the survey, the questionnaire was reviewed by two professors of nursing and revised in reflection of expert opinion in order for adolescents' clear understanding. Data collection was conducted for 2 months from November to December 2016. The subjects of this study were 2nd to 3rd grade students in four middle schools and 1st to 2nd grade high school students in K Province and G City, selected through convenience sampling. For this study, the research objective and gist of the study were explained to the school principal, the teacher in charge, and health teacher at the school before the survey in order to request their cooperation.

The survey was conducted directly by the researcher, who visited each classroom. Before the questionnaire was distributed, the research objective, questionnaire contents, and privacy policy were explained to subjects. It was notified that collected data would be used for no other purpose but research. Subjects were also sufficiently informed that they could withdraw from the research. The questionnaire was distributed among subjects who fully understood the research contents, agreed to participate voluntarily, and signed the agreement. Completed questionnaires were put into an envelope and collected directly by the researcher. Before data analysis, collected data were coded for personal data protection.

2.5. Data Analysis

The collected data were analyzed using SPSS (IBM Corporation, New York, NY, USA) for Windows 24.0 and AMOS 24.0. Collected demographic variables of subjects were analyzed in reference to descriptive statistics such as frequency and percentage. The reliability of the scales was verified by Cronbach's α. Measured variables were analyzed in reference to descriptive statistics such as average, standard deviation, skewness, and kurtosis. Correlations among psychological maltreatment, perceived social support, resilience, self-control, and problem behaviors were analyzed in application of Pearson's correlation. To test the fit of the model, χ^2 statistics, GFI (Goodness of Fit Index), AGFI (Adjusted Goodness of Fit Index), CFI (Comparative Fit Index), SRMR (Standardized Root Mean Residual), and RMSEA (Root Mean Square Error of Approximation) were used. The parameter-estimated value of measured variables was analyzed as the SRW (Standardized Regression Weight), RW (Regression Weight), CR (Critical Ratio), SMC (Squared Multiple Correlations), and SE (Standard Error). The statistical significance of the direct effect, indirect effect, and total effect was confirmed by bootstrapping.

3. Results

3.1. Participant Demographics and Characteristics

The gender ratio of subjects is 52.1% (male) to 47.9% (female). As for school types, academic high schools accounted for the largest portion (50.4%) and then middle schools (30.7%) and vocational high schools (18.9%) in order. As for companion relationships, 85.7% answered "good". As for stress from schooling, the largest portion (65.5%) answered "normal". As for family types, the largest portion (67.2%) answered "living with parents". As for economic conditions (53.8%), the largest portion answered "middle". As for the

father's academic background, the largest portion (42.4%) answered "a college graduate". As for the mother's academic background, the largest portion (50.0%) answered "a high school graduate". As for the father's vocation, the percentages were in the order of office work (37.8%), technical production (30.3%), sales service (20.2%), etc. (11.8%). As for the mother's occupation, the percentages were in the order of "working" (64.7%) and "a housewife" (31.9%) (Table 1).

Table 1. Participants' Characteristics.

		(N = 238)
Variables	**Categories**	**n (%)**
Gender	Male	124 (52.1)
	Female	114 (47.9)
School Type	Middle School	73 (30.7)
	Academic High School	120 (50.4)
	Vocational High School	45 (18.9)
Friendship	Good	204 (85.7)
	Usually	33 (13.9)
Academic Stress	High	41 (17.2)
	Usually	156 (65.5)
	Low	41 (17.2)
Family Structure	Two Parent	160 (67.2)
	One Parent	24 (10.1)
	Grandparent	7 (12.9)
	Others	47 (19.7)
Economic Status	High	67 (28.2)
	Middle	128 (53.8)
	Low	43 (18.1)
Paternal Education	Middle School or Less	9 (13.8)
	High School	95 (39.9)
	College	101 (42.4)
	Graduate School	21 (18.8)
Maternal Education	Middle School or Less	7 (12.9)
	High School	119 (50.0)
	College	95 (39.9)
	Graduate School	6 (12.5)
Paternal Job	Office Work	90 (37.8)
	Technical Production	72 (30.3)
	Sale Service	48 (20.2)
	Others	28 (11.8)
Maternal Job	Working	154 (64.7)
	Housewife	76 (31.9)
	No Answer	8 (03.4)

3.2. Research Variables' Descriptive Statistics and Correlation

The average of emotional abuse is 9.56 ± 1.12 points, and that of negligence is 8.34 ± 0.87 points. As for perceived social support, the average of family support is 33.28 ± 6.21 points, that of companion support 30.98 ± 5.20, and that of teacher support 25.36 ± 4.72 respectively. As for resilience, the average of controllability is 31.67 ± 5.27 points, that of positiveness 33.74 ± 5.89, and that of sociability 33.78 ± 5.28, respectively. As for self-control, the average of long-term control is 33.81 ± 5.08 points, and that of short-term control is 38.02 ± 5.27 points. As for problem behaviors, the average of internalizing problem behaviors is 8.97 ± 8.34 points, and that of externalizing problem behaviors is 6.68 ± 5.72 (Table 2).

Table 2. Descriptive Statistics of Study Variable.

				(N = 238)
Variables (Item)	**Range**	**Mean ± SD**	**Skewness**	**Kurtosis**
Perceived Social Support (23)				
Family (8)	8~40	33.28 ± 6.21	−0.65	−0.07
Friend (8)	8~40	30.98 ± 5.20	−0.30	0.66
Teacher (7)	7~35	25.36 ± 4.72	0.02	−0.22
Resilience (27)				
Controllability (9)	9~45	31.67 ± 5.27	0.24	0.37
Affirmative (9)	9~45	33.74 ± 5.89	−0.24	0.54
Sociability (9)	9~45	33.78 ± 5.28	−0.33	1.03
Self-Control (19)				
Long-term Control (9)	9~45	33.81 ± 5.08	0.21	0.65
Short-term Control (10)	10~50	38.02 ± 5.27	−0.18	−0.38
Psychological Maltreatment (17)				
Emotional Abuse (9)	9~36	9.56 ± 1.12	2.31	5.63
Neglect (8)	8~32	8.34 ± 0.87	2.79	7.28
Problem Behavior (60)				
Internalizing (30)	30~90	8.97 ± 8.34	1.19	0.83
Externalizing (30)	30~90	6.68 ± 5.72	1.61	5.24

The data analysis of the structural equation model meets multivariate normality. Because of the significant difference between adolescents who experienced psychological maltreatment and those who did not, we found regarding the data that skewness and kurtosis exceeded the common level. Thus, when the absolute value of skewness exceeds 3, or the absolute value of kurtosis is 8 or larger, it is viewed as extreme kurtosis. If the absolute value of kurtosis exceeds 10, the normality is problematic. If it exceeds 20, the problem is more serious according to the criteria [34]. Among the variables measured in this study, no absolute value of skewness was 3 or larger, and no absolute value of kurtosis was 8 or larger. Thus, the assumption about normal distribution is correct.

As for perceived social support for psychological maltreatment, there was a significant negative correlation with family support ($r = -0.283$, $p < 0.001$), companion support ($r = -0.153$, $p = 0.018$), and teacher support ($r = -0.170$, $p = 0.009$). As for resilience, there was a significant negative correlation with controllability ($r = -0.167$, $p = 0.010$) and positiveness ($r = -0.222$, $p = 0.001$). As for self-control, there was a significant negative correlation with long-term control ($r = -0.142$, $p = 0.029$). As for psychological maltreatment, there was a significant static correlation between internalizing problem behaviors ($r = 0.321$, $p < 0.001$) and externalizing problem behaviors ($r = 0.231$, $p < 0.001$). As for neglect, there was a significant static correlation with family support ($r = -0.181$, $p = 0.005$) and internalizing problem behaviors ($r = 0.200$, $p = 0.002$) and externalizing problem behaviors ($r = 0.189$, $p = 0.003$) (Table 3).

As for data analysis for the structural equation model, if the absolute value of the coefficient of correlation between measured variables is 0.90 or larger, there can be a problem in terms of multi-collinearity [35]. In this study, the absolute value of the coefficient of correlation between measured variables was all under 0.70, and thus, there is no problem in terms of multi-collinearity.

3.3. Verification of the Hypothetical Model

3.3.1. Fitness Verification of the Hypothetical Model

The hypothetical model of this study meets the criteria of multivariate normality. Thus, for parameter estimation, the maximum likelihood (ML) method was utilized. For parameter estimation, the factors—psychological maltreatment, companion, positiveness,

long-term control, and internalizing—were fixed to 1, and the rest of the factors' parameters were estimated. Measured variables explained the potential variables significantly (Table 4).

Table 3. Correlations among the Measured Variables.

	(N = 238)											
	x^1	x^2	y^1	y^2	y^3	y^4	y^5	y^6	y^7	y^8	y^9	y^{10}
x^1: Emotional abuse	1											
x^2: Neglect	0.361 **	1										
y^1: Family	−0.283 **	−0.181 **	1									
y^2: Friend	−0.153 *	−0.094	0.487 **	1								
y^3: Teacher	−0.170 **	−0.035	0.445 **	0.561 **	1							
y^4: Controllability	−0.167 *	−0.032	0.430 **	0.553 **	0.442 **	1						
y^5: Affirmative	−0.222 **	−0.048	0.529 **	0.570 **	0.487 **	0.663 **	1					
y^6: Sociability	−0.109	0.035	0.418 **	0.638 **	0.447 **	0.665 **	0.662 **	1				
y^7: Long-term	−0.142 *	−0.089	0.387 **	0.497 **	0.428 **	0.693 **	0.552 **	0.558 **	1			
y^8: Short-term	−0.030	−0.031	0.163 *	0.375 **	0.304 **	0.486 **	0.415 **	0.382 **	0.538 **	1		
y^9: Internalizing	0.312 **	0.20 **	−0.072	−0.286 **	−0.067	−0.230 **	−0.273 **	−0.173 **	−0.116	−0.333 **	1	
y^{10}: Externalizing	0.231 **	0.189 **	−0.053	−0.224 **	−0.101	−0.284 **	−0.253 **	−0.165 *	−0.283 **	−0.471 **	0.662 **	1

* $p < 0.05$, ** $p < 0.001$, Psychological Maltreatment: x^1 and x^2; Perceived Social Support: y^1, y^2, and y^3; Resilience: y^4, y^5, and y^6; Self-Control: y^7 and y^8; Problem Behavior: y^9 and y^{10}.

Table 4. Standardized Estimations of the Measured Variables.

Measured Variables	RW [1]	SE [2]	CR [3]	*p*	SRW [4]	SMC [5]
Perceived Social Support						
Friend	1				0.799	0.639
Family	0.964	0.101	9.556	<0.001	0.645	0.416
Teacher	0.768	0.076	10.041	<0.001	0.676	0.456
Resilience						
Affirmative	1				0.805	0.647
Controllability	0.931	0.066	14.200	<0.001	0.837	0.700
Sociability	0.891	0.066	13.423	<0.001	0.800	0.640
Self-Control						
Long-term Control	1				0.802	0.643
Short-term Control	0.868	0.088	9.902	<0.001	0.671	0.450
Psychological Maltreatment						
Emotional Abuse	1				0.726	0.526
Neglect	0.530	0.154	3.437	<0.001	0.497	0.247
Problem Behavior						
Internalizing	1				0.701	0.491
Externalizing	0.924	0.135	6.853	<0.001	0.945	0.892

[1] Regression weight, [2] standard error, [3] critical ratio, [4] standard regression weight, and [5] squared multiple correlation.

The following result of the hypothetical model fitness verification shows the acceptability: $\chi^2 = 151.62$, $p < 0.001$, GFI = 0.908, AGFI = 0.836, CFI = 0.911, SRMR = 0.060, and RMSEA = 0.10 [34,35] (Table 5).

Table 5. Model Fit of the Hypothetical Model.

Model	CMIN (x^2)			GFI [1]	AGFI [2]	CFI [3]	SRMR [4]	RMSEA [5]
	χ^2	DF	*p*					
Reference			>0.05	≥0.9	≥0.8~9	≥0.9	≤0.08	0−0.10
Hypothetical	151.62	44	<0.001	0.908	0.836	0.911	0.06	0.10

[1] Goodness of fit index, [2] adjusted goodness of fit index, [3] comparative fit index, [4] standardized root mean square residual, and [5] root mean square error of approximation.

3.3.2. Analysis of the Hypothetical Model

The result of the hypothetical model analysis is as follows (Figure 2):

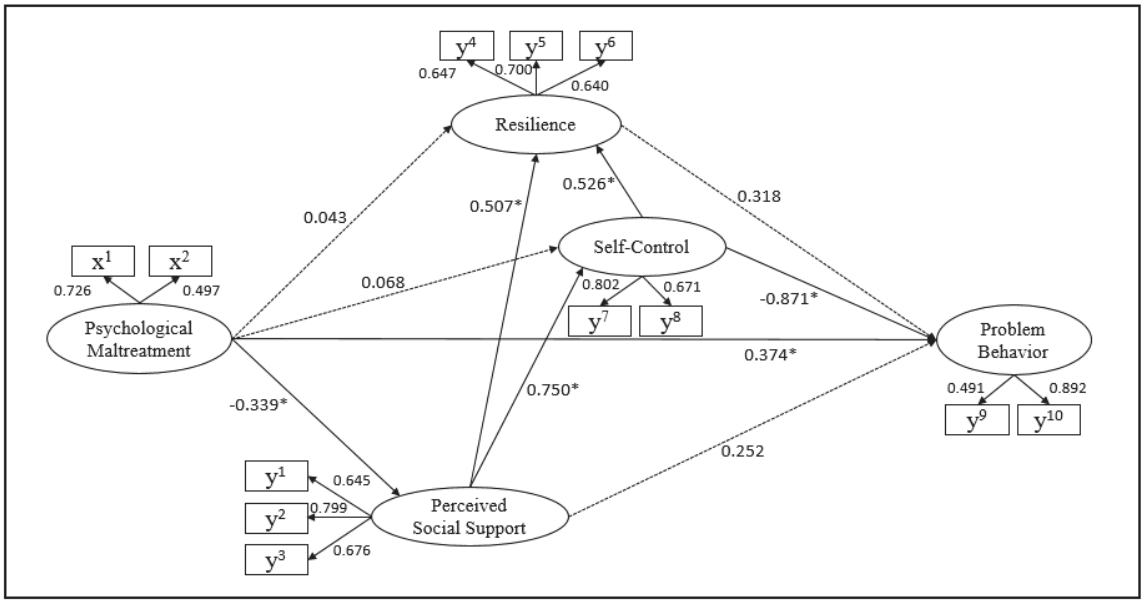

Figure 2. Hypothetical Path Diagram of the Hypothetical Model. x^1, emotional abuse; x^2, neglect; y^1, family; y^2, friend; y^3, teacher; y^4, affirmative; y^5, controllability; y^6, sociability; y^7, long-term control; y^8, short-term control; y^9, internalizing; y^{10}, externalizing. * $p < 0.05$.

The statistically significant paths in this study's hypothetical model were as follows: perceived social support and psychological maltreatment ($\gamma = -0.339$, $p = 0.006$), resilience and perceived social support ($\beta = 0.507$, $p < 0.001$), resilience and self-control ($\beta = 0.526$, $p < 0.001$), self-control and perceived social support ($\beta = 0.750$, $p < 0.001$), problem behaviors and psychological maltreatment ($\gamma = 0.374$, $p = 0.012$), and problem behaviors and self-control ($\gamma = -0.871$, $p = 0.027$) (Figure 2).

Psychological maltreatment explained perceived social support as much as 11.5%, while psychological maltreatment, perceived social support, and self-control explained resilience as much as 89.9%. In this study, psychological maltreatment and perceived social support explained self-control as much as 53.2%, while psychological maltreatment, perceived social support, resilience, and self-control explained problem behaviors as much as 39.7% (Table 6).

Table 6. Standardized Estimations of the Hypothetical Model.

Endogenous Variables Exogenous Variables	RW [1]	SE [2]	CR [3]	*p*	SRW [4]	SMC [5]
Perceived Social Support						0.115
Psychological Maltreatment	−1.733	0.628	−2.759	0.006	−0.339	
Resilience						0.899
Psychological Maltreatment	0.251	0.381	0.659	0.510	0.043	
Perceived Social Support	0.578	0.131	4.406	<0.001	0.507	
Self-Control	0.612	0.134	4.579	<0.001	0.526	

Table 6. *Cont.*

Endogenous Variables Exogenous Variables	RW [1]	SE [2]	CR [3]	*p*	SRW [4]	SMC [5]
Self-Control						
Psychological Maltreatment	0.341	0.484	0.706	0.480	0.068	0.532
Perceived Social Support	0.735	0.095	7.721	<0.001	0.750	
Problem Behavior						
Psychological Maltreatment	2.691	1.073	2.509	0.012	0.374	
Perceived Social Support	0.354	0.415	0.853	0.394	0.252	0.397
Resilience	0.392	0.641	0.611	0.541	0.318	
Self-Control	−1.249	0.566	−2.206	0.027	−0.871	

[1] Regression weight, [2] standard error, [3] critical ratio, [4] standard regression weight, and [5] squared multiple correlation.

3.3.3. Analysis of Hypothetical Model Effects

The direct effect, indirect effect, and total effect of factors related to psychological maltreatment and adolescents' problem behaviors are as shown below (Table 7):

Table 7. Direct, Indirect, and Total Effect of the Hypothetical Model.

Endogenous Variables Exogenous Variables	Standardized Direct Effect (*p*)	Standardized Indirect Effect (*p*)	Standardized Total Effect (*p*)
Perceived Social Support			
Psychological Maltreatment	−0.339 (0.047) *		−0.339 (0.047) *
Resilience			
Psychological Maltreatment	0.043 (0.854)	−0.269 (0.054)	−0.226 (0.102)
Perceived Social Support	0.507 (0.023) *	0.394 (0.002) *	0.901 (0.011) *
Self-Control	0.526 (0.004) *		0.526 (0.004) *
Self-Control			
Psychological Maltreatment	0.068 (0.392)	−0.254 (0.037) *	−0.186 (0.120)
Perceived Social Support	0.750 (0.003) *		0.750 (0.003) *
Problem Behavior			
Psychological Maltreatment	0.374 (0.134)	0.005 (0.964)	0.379 (0.024) *
Perceived Social Support	0.252 (0.579)	−0.366 (0.311)	−0.115 (0.221)
Resilience	0.318 (0.442)		0.318 (0.442)
Self-Control	−0.871 (0.121)	0.167 (0.397)	−0.703 (0.043) *

* $p < 0.05$

The direct effect of psychological maltreatment on perceived social support was ($\beta = -0.339$, $p = 0.047$) significant. The direct effect of perceived social support on resilience ($\beta = 0.507$, $p = 0.023$) and the direct effect of self-control on resilience ($\beta = 0.526$, $p = 0.004$) were significant. The direct effect of psychological maltreatment on self-control was not statistically significant, but its indirect effect ($\beta = -0.254$, $p = 0.037$) was significant. The direct effect of perceived social support on self-control was ($\beta = 0.750$, $p = 0.003$) significant. The total effect of psychological maltreatment on problem behaviors ($\beta = 0.379$, $p = 0.024$) and that of self-control on problem behaviors ($\beta = -0.703$, $p = 0.043$) were significant. However, the direct effect, indirect effect, and total effect of perceived social support and resilience on problem behaviors were all not significant (Table 7).

In other words, it turned out in this study that psychological maltreatment affects perceived social support, self-control, and problem behaviors directly or indirectly. In addition, it turned out that variables affecting adolescents' problem behaviors are psychological maltreatment and self-control.

4. Discussion

This study examines the direct or indirect effects of psychological maltreatment, perceived social support, resilience, and self-control on adolescents' problem behaviors based on the theoretical framework of Jessor's protective-risk model [23] and Haase's adolescent resilience model (ARM) [24].

The findings of this study indicate that psychological maltreatment affects adolescents' perceived social support, self-control, and problem behaviors directly or indirectly. Psychological maltreatment, perceived social support, resilience, and self-control explained adolescents' problem behaviors as much as 39.7%. In other words, adolescents' problem behaviors are affected by socio-psychological factors (perceived social support, resilience, and self-control), and thus, socio-psychological factors may be utilized in strategies to reduce adolescents' problem behaviors. In addition, psychological maltreatment explained perceived social support as much as 11.5%, while psychological maltreatment, perceived social support, and self-control explained resilience explained as much as 89.9%. In addition, psychological maltreatment and perceived social support explained self-control as much as 53.2%. As such, resilience self-control showed significant explanatory power in this study. This indicates that socio-psychological factors are of importance in managing adolescents' problem behaviors that result from psychological maltreatment. In addition to this, an approach to enhance socio-psychological protective factors of adolescents is necessary in order to reduce such problem behaviors.

The direct and indirect effects of psychological maltreatment on adolescents' problem behaviors were not demonstrated, but the total effect turned out to be a significant static impact. This finding corresponds to another overseas research finding that psychological maltreatment is a predictive factor of adolescents' problem behaviors [5,36]. This finding also corresponds partially to a domestic research finding that patents' negative rearing attitudes are related to the child's problem [17,37]. Maltreatment affects the development of both children and adolescents negatively. Particularly in the case of children and adolescents who experience psychological maltreatment, the negative effect is long-lasting and even threatens mental health in the adulthood [7,36]. In order for healthy growth and development of children and adolescents, psychological maltreatment must therefore be eradicated. In addition, parents must play the important role of creating supportive rearing environments. In Korea, there is a cultural characteristic that psychological maltreatment is a kind of discipline [38,39]. Accordingly, the social recognition of child abuse is quite low in Korea [40]. In order to promote proper perception of child abuse, it is therefore necessary to strictly distinguish discipline from maltreatment. In addition, it is necessary to strengthen punishments regarding child abuse and to re-establish legal provisions [40].

The results showed that perceived social support had direct and significant static effects on resilience and self-control. This finding is consistent with the findings of previous studies at home and abroad that social support affects coping ability, psychological feeling of well-being, and resilience among children [41,42]. This finding also supports the theoretical framework that social support for adolescents affects individuals' psychological protective factors positively [24]. Therefore, it is important to establish a positive relationship with the social support system, including the family, companions, and teachers, as part of strategies to reduce problem behaviors among adolescents who experience psychological maltreatment. Strengthening the social support system through positive relationships with meaningful people will be of help in improving resilience and self-control among adolescents. In this study, perceived social support proved to have no direct or indirect significant effect on problem behaviors. This is different from the finding of previous studies that social support prevented adolescents' problem behaviors and had significantly positive effects on their growth and development [43,44]. This is probably because the tools and analysis methods to measure the social support were different.

We found that self-control's direct effect on resilience was significant. In other words, self-control increases the level of resilience significantly, and as the level of self-control

is high, the adolescent is capable of overcoming any danger or failure to which he/she is exposed.

The direct or indirect effect of self-control on problem behaviors was not significant, but the total effect was shown to be significant. This result corresponds to the previous studies [14,44] presenting the finding that self-control is a major factor explaining adolescents' delinquency and deviation [14] and the finding that as the level of self-control is high, internalizing and externalizing problem behaviors are reduced [44]. Such findings suggest that improving adolescents' self-control contributes to reducing problem behaviors and improving resilience. Thus, when intervention programs are developed for adolescents exposed to psychological maltreatment, it is important to reflect content that can improve self-control.

Finally, psychological maltreatment was a risk factor that affects adolescents' problem behaviors significantly. In addition, adolescents' self-control acted as a protective factor and decreased problem behaviors significantly. Such results indicate the importance of preventing adolescents' psychological maltreatment. In order to prevent and manage adolescents' psychological maltreatment, it is necessary to establish governmental policies and systems. Above all, parents, as the main rearers in each family, need to develop a proper perception of psychological maltreatment. To practice rearing appropriately, various education and promotion programs also need to be conducted. Throughout the society, the danger of child abuse needs to be made known continually. Particularly, campaigns and systematic education programs to prevent psychological maltreatment need to be conducted actively. In addition, there need to be programs to improve self-control, which is a psychological protective factor to reduce problem behaviors and improve resilience among adolescents. To this end, it is necessary to develop close relationships between adolescents and their parents as well as positive relationships with teachers and companions at school in consideration of the importance of sufficient social support. Since self-control is significantly affected by parents' rearing behaviors, education needs to be practiced for both actual and potential rearers regarding proper rearing practices. Health education also needs to be conducted for adolescents themselves to improve their own psychological protective factors. Problem behaviors are a serious problem not only for adolescents themselves but also for community members who will take the lead of our society in the future. Therefore, there is an urgent need for individuals, families, and schools as well as the entire society all to put forth efforts to reduce adolescents' problem behaviors.

This study establishes a structural model to analyze the effects of psychological maltreatment on adolescents' problem behaviors. This study is of significance in that social psychological protective factors (social support and self-control) were found to be effective as a medium in reducing adolescents' problem behaviors.

5. Conclusions

Child abuse is a serious social issue although the focus has been on physical abuse. In contrast, the danger of psychological maltreatment has been relatively scarcely recognized although it is a type of abuse mostly frequently committed. Its negative effect on children and adolescents also has been neglected despite its seriousness.

Findings of this study suggest that psychological maltreatment affects adolescents' problem behaviors. It was also shown that psychological maltreatment also affects adolescents' social protective factors (perceived social support) and personal psychological protective factors (self-control) negatively and that adolescents' perceived social support and self-control affect resilience significantly. In other words, psychological maltreatment increases problem behaviors among adolescents and affects social psychological protective factors (social support and self-control) negatively.

In order to reduce adolescents' problem behaviors, psychological maltreatment must therefore be eradicated. In addition, it is necessary to develop ways to strengthen social psychological protective factors among adolescents. Parents in each family need to practice appropriate rearing and to put forth efforts to induce positive parent–child interactions.

Particularly in Korean society and in the families in it, the perception of psychological maltreatment needs to be changed. Specifically, the danger and significance of negative effects of psychological maltreatment on adolescents' growth and development (problem behaviors, mental health deterioration, etc.) need to be made known actively through education programs.

The findings of this study may be utilized in interventions at clinical treatment settings for children and adolescents who experience maltreatment. These findings also may be used for practical guidelines to improve adolescents' mental health in families, schools, and local communities. In addition, it is expected that this study will lead to more investigations and structural model studies on various factors that affect adolescents' problem behaviors as well as psychological maltreatment. It is also hoped that systematic longitudinal research and qualitative research on the effects of psychological maltreatment on adolescents' problem behaviors continue to be conducted.

The following are possible avenues for future research. In hypothetical model research, research is possible if the minimal sample size (200) suggested by the maximum-likelihood classification method is satisfied [27]. However, there are limitations in generalizing the present research results because the subjects were selected by convenience sampling. Therefore, it is necessary to repeat the present research targeting students in various regions.

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Relation between Shyness and Music Academic Engagement: The Mediation of Achievement Goals—A Cross-Sectional Survey Study

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Abstract: Music discipline that emphasizes expression, performance and collaboration may cause difficulties for shy students who are prone to anxiety about social interaction, which might cause low music academic engagement and achievement. According to Models of Personality and Affect regarding the role of psychological constructs in educational contexts, shyness and academic engagement are the first and third-level variables, respectively. We hypothesized that achievement goals might be the second-level variable between shyness and academic engagement. Two hypotheses were proposed in the study: (1) shyness is negatively related to music academic engagement; (2) the music achievement goals mediate shyness and music academic engagement. The research was conducted in May 2022. A total of 515 college students who major in music were randomly recruited from a public university in Shanxi province, China. A 20 min self-report questionnaire was conducted as the data collection method. The research results revealed the following: (1) shyness was negatively associated with musical academic engagement; (2) the music mastery goals and the music performance avoidance goals (excluding the performance approach goal) partially mediated the association between shyness and music academic engagement in music learning. These findings have implications for the research and practice of music academic engagement of shyness.

Keywords: shyness; music; academic engagement; achievement goals; college students

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1. Introduction

Shyness as a personality trait is defined as constraint and anxiety when confronted with new objects or perceived social evaluations in social situations and is mainly reflected in the conflict between approach and avoidance that arises for individuals in such situations [1]. Shy individuals desire social contact but are also anxious or fearful of approaching others and are prone to show fear, anxiety, tension and social withdrawal in social situations [2–4]. School as a social setting for students to learn and live can be stressful for shy students [5]. Hughes and Coplan found that shy students experience social withdrawal in the school environment, which in turn leads to lower academic engagement [6,7].

Fredricks and Blumenfeld defined Academic engagement as an interaction between students and the educational environment [8]. Academic engagement in music educational environment emphasizes collaboration, performance, and responsiveness and is highly demanding of social interaction [9]. Meanwhile, according to the academic engagement positively predict academic achievement [10], shy students' music academic engagement may influence their music academic achievement. Therefore, due to the characteristics of music as an expressive discipline, more engagement [11,12] and less shyness [13] is required for college students majoring in music when they performing on the stage. As shyness may cause social avoidance, thereby negatively predicting students' music academic engagement [6], students with less shyness trait would engage deeper and perform

better [12]. For music education, college students who major in music are involved in a greater concentration of music education activities compared with other disciplines students. So, many more concerns enhancing music engagement and alleviating shyness should be focused on college students majoring in music. Thus, it is important for music college students with the personality of shyness to explore the association between shyness and music academic engagement, as it may predict their music academic engagement and music academic achievement. Matthews, Zeidner and Roberts proposed a Models of Personality and Affect regarding the role of psychological constructs in educational contexts [14], namely, first-level variables—dispositional constructs (e.g., personality traits), second-level variables—motivational processes, and third-level variables—educational outcomes (e.g., classroom behavior, etc.), while with the help of the second-level variables, the first-level variables have an impact on third-level variables. Shyness as a personality trait belongs to the first-level variable [1]. At the same time shyness has been shown to be associated with academic engagement [6] and might also be associated with musical academic engagement. Academic engagement as a part of the educational outcomes is the third-level variable. According to previous studies, the academic behavior of students with shy personalities is associated with achievement goals [15]. Meanwhile, achievement goals could predict students' academic engagement [16,17]. Following this line of thought, in the context of music learning, whether achievement goals could be the second-level variables and mediate the shyness and academic engagement attract the authors' attention. By exploring mechanisms that mediate shyness and music academic engagement, teachers could then provide corresponding support for shy students, thereby improving the potentially low music academic engagement, and promoting their music academic achievement. However, in the context of music learning, there is limited research focus on shyness and music academic engagement. In addition, the integrated model connected the above variable relation in the participants of college students majoring in music is lacking. Therefore, based on Models of Personality and Affect, the present study aimed to verify the association between shyness and music academic engagement and explore whether achievement goals mediate shyness and music academic engagement.

2. Literature Review

2.1. Shyness and Music Academic Engagement

Academic engagement is defined as the interactive relationship between students and the educational environment and the state of student motivation for academic activities [8]. It is both a shapeable state in the classroom environment and an important predictor of student academic progress and achievement [18,19]. Academic engagement is a multidimensional structure with three main components [8], including (1) Cognitive engagement (intellectual effort to acquire the task); (2) Behavioral engagement (behavior in the classroom and participation in the school community, which can be further segmented into effort, attention, persistence, and peer cooperation, etc. (3), and Affective engagement (perceptions and attitudes towards the learning environment) [20]. Research has found that academic engagement is not only positively associated with academic achievement [10,21], but also reduce college dropout rates [22]. In addition, research on academic engagement helps to understand the quality of students' learning experiences and helps teachers to determine and provide instructional resources and course content [23] (Coates, 2007). Thus, it is necessary to exploring the factors that influence the students' academic engagement [24]. Personality is a predictor of academic engagement that impacts how individuals interpret their environment and find ways to self-regulate or adapt to different needs [25]. Shyness, as one of the personality traits, is considered to have a significant negative association with academic engagement [6]. The following discussion attempts to unpack the reasons for it.

Shyness is defined as constraint and anxiety when confronted with new objects or perceived social evaluations in social situations and is mainly reflected in the conflict between approach and avoidance that arises for individuals in such situations [1]. Shy individuals desire social contact but are also anxious or fearful of approaching others [2]

and are prone to show fear, anxiety and tension in social situations [3]. School, as the social context in which students learn and live, is considered to be stressful for shy students [5]. Shyness in the school environment leads to social withdrawal, which is directly related to lower academic engagement and academic achievement [6]. In addition, peer relationships and interactions, such as peer acceptance and peer rejection, have an impact on the academic performance and academic engagement of shy students [26]. Furthermore, lack of positive peer relationships or negative peer experiences can also cause emotional stress or anxiety for shy students, which can negatively affect their participation in learning activities, for example, when they are involved in academic activities such as discussions or group work [27,28]. In addition to social withdrawal and peer interaction, for shy students themselves, shyness may predict students' academic engagement. Firstly, shy students are perceived to have low confidence in their academic abilities, which may reduce their willingness to demonstrate academic achievement and thus affect their participation in demonstrative learning activities [29,30]. Secondly, shy children feel wary and anxious in situations where they believe they will be socially judged [31,32]. In the school setting, academic assessment that focus on academic performance have the potential to stimulate anxiety in shy students [1]. In addition, anxiety levels are predictors of academic engagement [33]. Thus, the academic assessment in the school may influence academic engagement. Although, Hughes and Coplan's study evidenced that shyness had a significant negative association with academic engagement; the study was conducted with Canadian public-school children aged 9–13 years [6]. However, shyness increases rapidly during adolescence [34]. Whether the association between shyness and academic engagement in adolescence is consistent with that in childhood has not been validated. Therefore, this study attempts to fill this research gap by focusing on college-level adolescents.

When shyness and academic engagement transfer to music education, there is limited research on the association between the two. However, there are rationales to predict the relationship between shyness and music academic engagement. In the context of music learning, music learning emphasizes not only understanding what music is about and also music 'within' [35]. High-quality musical experiences and engagement are thought to help music learners 'within the music', which is vital to music learning [36]. As academic engagement is defined as an interaction between a student and the educational environment [8], music academic engagement therefore implies an interaction between a student and the educational environment of music. Academic engagement in music educational environment emphasizes collaboration, performance and responsiveness and is highly demanding of social interaction [9]. Collaboration in music education activities may cause shy students to avoid social interactions, which may negatively predict students' music academic engagement [6]. At the same time, musical performance activities in music education may cause a certain number of negative emotions, such as anxiety, in some of the shy students who lack confidence or have low self-esteem [37]. Besides, Music Performance Anxiety (MPA) is a symptomatology that represents the persistent apprehension and anxiety that compromises the music performance, whether in the form of solo or group performances [38]. It has been shown that MPA influence students who study and engage in music performance [39]. Rodríguez-Mora and Díaz's research showed a positive correlation between MPA and neuroticism and a negative correlation with extraversion and concluded that a personality prone to neuroticism and introversion seems to have an influence on the MPA [40]. In addition, shyness was predicted by introversion and neuroticism [41]. Hence, shyness might positively influence MPA, which in turn negatively predicts the music academic engagement in educational music performance activities [6,33,42]. Therefore, this study hypothesizes that shyness may negatively predict music academic engagement (Hypothesis 1).

2.2. Shyness and Achievement Goals

According to the Models of Personality and Affect regarding the role of psychological constructs in educational contexts [14], including first-level variables—dispositional con-

structs (e.g., personality traits), second-level variables—motivational processes, third-level variables—educational outcomes (e.g., classroom behavior, etc.), there is an association among them, which is that first-level variables influence the third-level variables with the help of the second-level variables. As we mentioned before, shyness is a type of personality which can be categorized as a first-level variable [1], academic engagement can be categorized as the third-level variable, while shyness had a significant negative association with academic engagement [6]. In addition, we found that shyness is defined as constraint and anxiety when confronted with new objects or perceived social evaluations in social situations and it is thought to result from approach and avoidance motivations in social situations [1,7]. The approach–avoidance motivation is an integral part of achievement motivation, which shows the association between shyness and achievement motivation [43]. Meanwhile, achievement motivation could predict student engagement [44,45]. Following this line of thought, whether achievement motivation is the second-level variable influencing shyness and academic engagement attracted our attention.

Elliot and Church proposed a hierarchical model of approach and avoidance achievement motivation [46]. Within the model, achievement motivation is categorized into different achievement goals. Achievement goals are defined as the purpose of task engagement as a way of explaining an individual's ability-related effort [46], which could influence individual motivation and individual achievement behavior and is an important component of student motivation and self-regulated learning [47]. Different types of achievement goals unpack the explanations, experiences and actions associated with the individual's pursuit of achievement [48]. Initially, achievement goal theory was conceptualized in two directions, namely performance goals that focus on demonstrating competence and mastery goals that focus on developing competence and mastery of the task [49]. Furthermore, there is also a categorization based on mastery—performance and approach–avoidance distinctions and divides the achievement goals into four orientations, namely mastery-approach, performance-approach, mastery-avoidance and performance-avoidance [50]. The categorizations discussed above both conceptualize achievement goals by a performance goal versus mastery goal dichotomy. However, Elliot and Harackiewicz categorized performance goal orientation into independent approach and avoidance motivational orientations and three achievement orientations have been proposed, namely mastery goals, performance-approach goals and performance-avoidance goals [51]. The reason for this division is that researchers have experimentally found that only performance goals grounded in the avoidance of failure, which means that only performance goals have an approach-avoidance dichotomy, while mastery goals do not have an avoidance dimension, therefore, mastery-avoidance goals should not as a dimension of achievement goals [51,52].

There is limited research on the relationship between shyness and achievement goals. However, shyness is subgroups of social withdrawal [53]. Meanwhile, in the school setting, social withdrawal is the represent feature of punishment sensitivity, which is one of the basic systems in reinforcement sensitivity theory [54]. Reinforcement sensitivity theory, which includes reward sensitivity and punishment sensitivity, explains the innate tendency of individuals to be sensitive to rewards or punishments in the environment and respond to approach or avoidance behaviors [55]. The research has shown that temperamental sensitivities are associated with achievement goal orientations [56]. Thus, shyness might be associated with achievement goal orientations. Based on the above discussion, the present study further unpacks achievement motivation and attempts to explore the predictive role of shyness on three achievement goals. Mastery goals that focus on developing competence and mastery of the task, performance-approach goals focus on making positive judgments about competence, and performance-avoidance goals avoid making negative judgments about competence [46]. More specifically, mastery goals, which emphasize self-evaluation of one's abilities, are mostly self-oriented or task-oriented and contribute to intrinsic motivation. Shyness was a negative predictor of intrinsic motivation [57]. Thus, shyness was negatively associated with mastery goals [16]. In addition, shy people are more likely to have low self-esteem [58]. Meanwhile, students with low self-esteem were

thought to have lower perceptions of mastery goals [15], which also validates this result. Performance goals, which emphasize leaving the judgment of one's abilities to others, lead to individuals being more susceptible to extrinsic motivation. Researchers found that shy individuals are prone worry about self-presentation and the judgments of others [31,34,59]. It follows that shy individuals may be vulnerable to extrinsic motivation. Studies have identified that shyness was positively associated with performance-approach goals and performance-avoidance goals [16]. Therefore, shyness is considered to be associated with achievement goals. However, limited research has been conducted on shy students and music achievement goals in music learning. Therefore, based on these findings, the present study made the hypothesis that shyness might associated with achievement goals.

2.3. Achievement Goals and Music Academic Engagement

Different achievement goals students hold in academic settings can make qualitative differences in their cognitive, affective and behavioral processes and outcomes [60]. Achievement goals have been found to predict students' academic engagement. More specifically, it has been found that mastery goals positively predict academic engagement and are negatively associated with behaviors such as withdrawal and avoidance of challenges [17,61]; Performance-approach goals negatively predict academic engagement [61,62]. They are consistently associated with negative behaviors, such as low engagement, higher levels of withdrawal and challenge avoidance [61], and are related to avoidant help-seeking, and self-handicapping [63]; performance-avoidance goals negatively predict academic engagement, as they influence students' self-control strategies, disruptive behaviors and task disengagement [64]. Although achievement goals have been shown to be related to academic engagement, there is a research gap in the association between achievement goals and music academic engagement in the field of music education. Considering the above discussion, this study hypothesizes that achievement goals might be associated with music academic engagement. As discussed above, shyness could predict achievement goals [16]. In addition, researchers found that achievement goals are considered helpful in understanding students' engagement and could predict the achievement engagement [65]. Thus, achievement goals may mediate shyness and academic engagement. However, given the discussion above, there is a research gap in this area in the field of music education. Therefore, this study hypothesizes that achievement goals may mediate shyness and music academic engagement (Hypothesis 2).

2.4. The Current Study

Based on the above discussion, this study proposed the two hypotheses. Previous research has found that shyness is negatively related to academic engagement [6]. Therefore, when brought into the music learning context, the first hypothesis of this study is that shyness is negatively related to music academic engagement. The second hypothesis in the study comes from two aspects. Firstly, the role of psychological constructs in educational contexts is framed in the Models of Personality and Affect: (1) the first-level variables are dispositional constructs (e.g., personality traits); (2) the second-level variables are motivational processes, and with the help of the second-level variables, the first-level variables have an impact on (3) educational outcomes such as classroom behavior, etc. [14]. In other words, personality traits are fundamental to an individual's classroom behavior [66,67]. Based on the Models of Personality and Affect, this study included shyness as a personality trait in the first level of variables, engagement in learning as part of educational outcomes and achievement goals as the second level of motivational variables. Secondly, after the above discussion of the existing views and studies. The researcher found that shyness was associated with academic engagement, while achievement goals was associated with both shyness and academic engagement. Therefore, the second hypothesis of this study expects to identify the music achievement goals mediate shyness and music academic engagement (See Figure 1a). The hypothesis model of the relation among music achievement goals, shyness and music academic engagement is shown below (See Figure 1b).

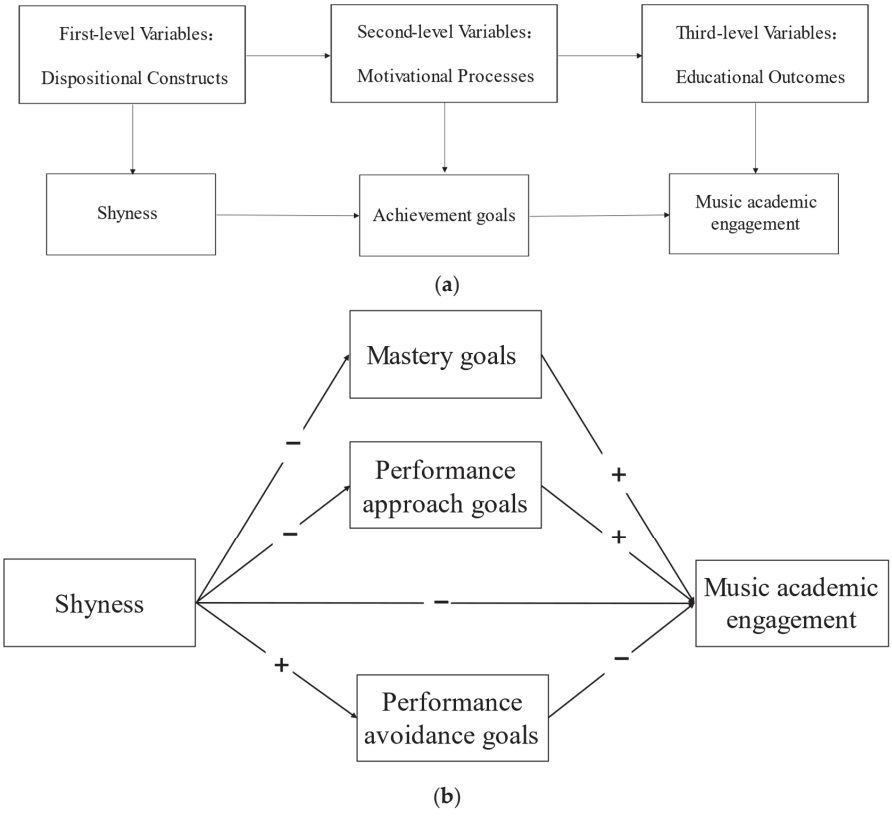

Figure 1. (**a**) The Models of Personality and Affect and hypothesis of the relation among achievement goals, shyness and music academic engagement. (**b**) Hypothesis model of the relation among achievement goals, shyness and music academic engagement.

3. Methods

3.1. Participants

Because public universities are the main type of higher education in China, we selected college students majored in music as the participants in a public university, which means that they can represent the general music college students. We used the cluster random sampling method to select these participants from a public university located in Shanxi Province as this province represents the middle-income regions of China. The department of music in this university has about 600 undergraduates, and 515 participants finally volunteered to complete the questionnaire. So, in current study, 515 college students majoring in music were randomly recruited from a public university in Shanxi province, China in May 2022 through a quantitative survey. The average age of participants was 19.12 with the standard deviation equal to 1.75 (from 15–26 years old). Among them, 198 (38.4%) participants were girls and 317 (61.6%) participants were boys. All participants reported studying music-related majors.

3.2. Procedures

First, the research procedures and project were approved by the academic ethics committee of the first author's school. Second, written informed consent and consent forms were provided to students participating in the study. For 23 students under 18 years of age, we obtained their parents' permission. They were told that their responses to the questionnaire would be anonymous and confidential, and that the data collected would

be used only for academic research. Finally, trained research assistants distributed and collected questionnaires using *wenjuanxing*, an online questionnaire publishing platform (https://www.wjx.cn/, accessed on 10 May 2022). The participants took about 20 min to complete the self-report questionnaire.

3.3. Measures

3.3.1. Shyness

The trait of shyness was measured by a shyness scale which was developed by previous researchers [68] and has been recently proved to be suitable for the Chinese context [69]. The scale consists of 9 items (e.g., I feel nervous when speaking to someone in authority). Participants were asked to rate how much they agreed or disagreed with each using a five-point Likert scale ("1 = strongly disagree" and "5 = strongly agree"). After converting the reverse items, the higher scores showed the higher level of shyness. In the current study, the results of Confirmatory Factor Analysis (CFA, $\chi^2/df = 90.818/23$, CFI = 0.973, TLI = 0.957, RMSEA = 0.076, SRMR = 0.030) indicated the good fit indices, and the Cronbach α value (0.808) for this scale showed a good internal consistency reliability.

3.3.2. Music Achievement Goals

College students' music achievement goals were assessed by a Chinese adapted scale of the achievement goals questionnaire [46] which has been used in a music context [70]. The scale has 16 items with three aspects including mastery goals (e.g., It is important for me to have a deep and thorough understanding of music theory and music works), performance approach goals (e.g., It is important for me to master more theoretical knowledge and better playing skills than others) and performance avoidance goals (e.g., I often worry that I will study worse than most students in my class.). All items were assessed on a 5-point Likert scale, ranging from 1 (completely disagree) to 5 (completely agree), with higher scores indicating a higher level of trait self-regulation. The CFA results of mastery goals showed the good structural validity ($\chi^2/df = 8.615/3$, CFI = 0.997, TLI = 0.989, RMSEA = 0.060, SRMR = 0.009) and good internal consistency reliability (Cronbach's alpha = 0.907). Additionally, the dimension of performance approach goals ($\chi^2/df = 22.623/7$, CFI = 0.993, TLI = 0.984, RMSEA = 0.066, SRMR = 0.016; Cronbach's alpha = 0.914) and performance avoidance goals also showed good structural validity and good internal consistency reliability ($\chi^2/df = 14.406/5$, CFI = 0.992, TLI = 0.985, RMSEA = 0.060, SRMR = 0.018; Cronbach's $\alpha = 0.875$) in the present study.

3.3.3. Music Academic Engagement

The music academic engagement questionnaire adopted from previous research [71,72] was used to measure college students' cognitive engagement ("I'll check my music homework to make sure it's correct") and behavioral ("In music theory and professional courses, I stayed focused") and emotional ("I enjoy the theoretical knowledge and professional challenges of music") characteristics, respectively. Participants were asked to rate their music academic engagement on a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). In the current study, the fit index displayed the good structural validity ($\chi^2/df = 401.385/95$, CFI = 0.960, TLI = 0.950, RMSEA = 0.079, SRMR = 0.028). In addition, the Cronbach's α of these 30 items was 0.899, indicating the average scores of these items were used to represent participants' engagement appropriately.

3.4. Data Analyses

To answer the research question, we mainly used the statistic software of SPSS 26.0 with PROCESS macro (http://www.afhayes.com, accessed on 21 December 2018) [73] to conduct the data analyses. First, the descriptive statistics and correlation analysis were performed to acquire the primary descriptive results. Second, linear regression was used to examine the predictive relation between independent variable and dependent variable. Finally, the bias-corrected bootstrapping method was used to check the path coefficient and significance

of mediating effects. According to Hayes's suggestion, if the 95% confidence interval does not contain zero, it indicates a significant predictive effect [73].

The model fit quality was assessed by the following criteria [74]: χ^2 likelihood ratio tests, the comparative fit index (CFI), the Tucker–Lewis index (TLI), the root mean square error of approximation (RMSEA) and the standardized root mean residual (SRMR). Following the suggestion of Wen et al., the reasonable cut-off value of the acceptable model fitting index was as follows: CFI and TLI no less than 0.90, and RMSEA and SRMR no more than 0.08 [75].

4. Results

4.1. Preliminary Analyses

Table 1 demonstrates the results of correlations and descriptive analysis for the main research variables. As expected, shyness was positively correlated with performance avoidance goals, but was negatively correlated with mastery goals, and music academic engagement. Additionally, mastery goals were significantly and positively associated with performance approach goals, performance avoidance goals and music academic engagement. Performance approach goals were also positively associated with performance avoidance goals and music academic engagement. The mean value for shyness, mastery goals, performance approach goals, performance avoidance goals, and music academic engagement were 3.03, 4.18, 3.92, 3.78 and 3.73. Due to the total score of these variables are all 5, the average level of shyness among these participants was relatively low but the average level of mastery goals and performance approach goals was relatively high. The SD for main variables wave ranged from 0.469 to 0.831. Among them, the SD of music academic engagement was smallest, while the SD of performance avoidance goals was largest. These results meant that the degree of dispersion (i.e., between-participants differences) of music academic engagement was small but the individual differences of performance avoidance goals was relatively large. The details of age and gender could be shown in Tables S1 and S2.

Table 1. Means, standard deviations, and correlations statistics.

Variables	M	SD	Shyness	Mastery Goals	Performance Approach Goals	Performance Avoidance Goals	Music Academic Engagement	Gender	Age
Shyness	3.03	0.647							
Mastery goals	4.18	0.648	−0.114 **						
Performance approach goals	3.92	0.732	−0.029	0.501 ***					
Performance avoidance goals	3.78	0.831	0.130 **	0.222 ***	0.551 ***				
Music academic engagement	3.73	0.469	−0.272 ***	0.594 ***	0.267 ***	−0.072			
Gender			0.063	−0.126 **	−0.177 ***	−0.035	−0.043		
Age	19.12	1.749	0.019	−0.009	−0.053	−0.073	−0.117 **	−0.069	

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

4.2. Testing for the Hypothetical Model

To verify Hypothesis 1, a direct linear regression model of shyness and music academic engagement was built. The results showed that shyness trait positively predicted students' music academic engagement even after controlling for the effects of gender and age ($\beta = -0.197$, $p < 0.001$). So, Hypothesis 1 was supported.

Next, to verify Hypothesis 2, the mediation model with music achievement goals as mediators between shyness and music academic engagement was formulated using the No. 4 Model in PROCESS macro [73]. The results in Table 2 showed that shyness was negatively associated with mastery goals ($\beta = -0.108$, $p < 0.01$, 95% CI: [−0.196, −0.021]) and music academic engagement ($\beta = -0.126$, $p < 0.001$, 95% CI: [−0.175, −0.078]), and was positively associated with performance avoidance goals ($\beta = 0.175$, $p < 0.01$, 95% CI: [0.063, 0.287]), but was not significantly associated with performance approach goals ($\beta = -0.019$, $p > 0.05$, 95% CI: [−0.118, 0.079]). Additionally, mastery goals ($\beta = 0.419$, $p < 0.001$, 95% CI: [0.361, 0.473]) and performance approach goals ($\beta = -0.068$, $p < 0.01$, 95% CI: [0.011, 0.125]) were positively associated with music academic engagement; however, performance avoidance goals were negatively associated with music academic engagement ($\beta = -0.137$, $p < 0.001$,

95% CI: [−0.182, −0.093]). The path coefficient and adjusted R-square were also displayed in Figure 2.

Table 2. Mediation model of music achievement goals between shyness and music academic engagement.

Predictors	Mastery Goals			Performance Approach Goals			Performance Avoidance Goals			Music Academic Engagement		
	β	SE	95% CI	β	SE	95% CI	β	SE	95% CI	β	SE	95% CI
Shyness	−0.108 **	0.045	[−0.196, −0.021]	−0.019	0.050	[−0.118, 0.079]	0.175 **	0.057	[0.063, 0.287]	−0.126 ***	0.025	[−0.175, −0.078]
Mastery goals										0.419 ***	0.028	[0.361, 0.473]
Performance approach goals										0.068 *	0.029	[0.011, 0.125]
Performance avoidance goals										−0.137 ***	0.023	[−0.182, −0.093]
Gender	−0.160 **	0.058	[−0.275, −0.046]	−0.272 ***	0.066	[−0.401, −0.143]	−0.084	0.075	[−0.231, 0.063]	0.041	0.033	[−0.023, 0.105]
Age	−0.006	0.016	[−0.038, 0.026]	0.028	0.018	[−0.063, 0.008]	−0.037 *	0.021	[−0.078, 0.003]	−0.032	0.009	[−0.049, −0.014]
R^2	0.027			0.036			0.025			0.449		
F	4.805			6.380			6.344			68.856		

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

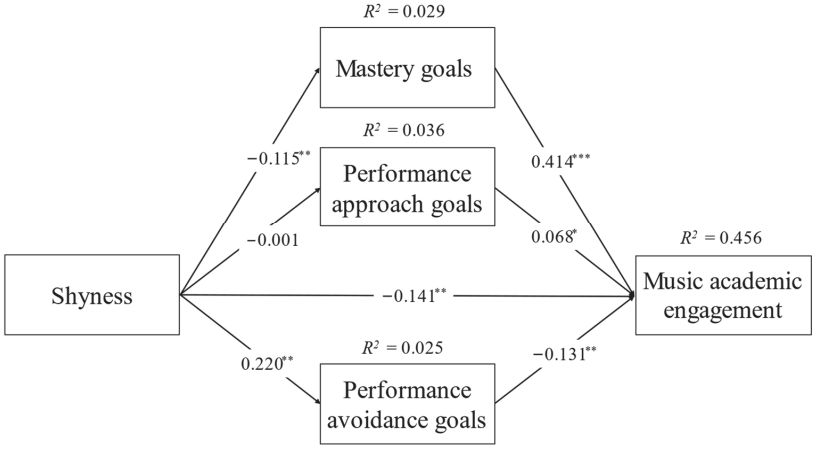

Figure 2. Mediation model of music achievement goals between shyness and music academic engagement. Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Finally, the 95% confidence interval of mastery goals, as a judgment index of mediating effect, ranged from −0.079 to −0.010 (not including zero), and the 95% confidence interval of performance avoidance goals ranged from −0.047 to −0.006 (not including zero), but the 95% confidence interval of performance approach goals ranged from −0.010 to 0.007 (including zero). These findings indicated that mastery goals and performance-avoidance goals (but not performance approach goals) partially mediated the relation between shyness and music academic engagement, partially supporting Hypothesis 2.

5. Discussions

5.1. Shyness Negatively Predicts Music Academic Engagement

This study aimed to explore the association between shyness and music academic engagement in music learning context. This study concludes that shyness is negatively related to musical academic participation. In other words, the shyer the students, the worse the students' academic engagement in music learning. Such a conclusion is consistent with the correlation between shyness and non-musical academic engagement [6,76]. It also proves that shyness and academic engagement do not change their correlation when transferred to the context of music learning context. The finding proves the possibility of speculations that shy students are prone to negative cognition and low self-esteem due to lack of and fear of social interaction and generate tension, anxiety and avoidance, which reduce students' music academic engagement [16]. However, these speculations still need

to be further unpacked and evaluated. Furthermore, according to the discussion in the literature review section, the emphasis on experience, performance, participation, and collaboration in the music discipline seems to be more likely than in other disciplines to cause negative emotions in shy students and further impact students' academic engagement [11–13,37]. This study does not provide sufficient evidence of whether and how the characteristics of the music discipline impact differently on shy students compared to other disciplines. Hence, it is also a future research direction for this study.

5.2. The Mediating Role of Achievement Goals

The findings indicate that the music mastery goal and the music performance-avoidance goals (excluding the performance approach goal) partially mediated the association between shyness and music academic engagement in music learning. More specifically, firstly, shyness was negatively related to the music mastery goals and shyness was positively related to the music performance-avoidance goals, but not significantly related to the music performance-approach goals. Second, the music mastery goals and the music performance-approach goals were positively related to music academic engagement, while the music performance-avoidance goal was negatively related to music academic engagement.

The findings that shyness and music mastery goals are negatively related are consistent with existing research [16]. Transferring to music learning did not change the relationship between the two. When students value mastery goals, they are usually able to enjoy the learning itself and have a higher sense of self-efficacy, so mastery goals usually promote more active classroom participation [77]. However, for shy students, lack of confidence and the tendency to have biased negative perceptions make shy students prone to self-doubt [59]. Thus, they are less likely to make mastery goals their achievement goals [15,16]. This study found that shyness was positively associated with music performance-avoidance goals, but not significantly associated with music performance-approach goals. Exploring whether musical disciplines, such as performance, collaboration and other components of music learning, are related to the changes in the relationship between shyness and music performance-approach goals is also one of the future directions of this study.

The finding that music mastery goals and music performance-approach goals were positively related to music academic engagement and that music performance-avoidance goals were negatively related to music academic engagement are consistent with existing research [61]. Whether intrinsically or extrinsically motivated, shy students are likely to adopt music mastery goals and music performance-approach goals in order to avoid failure in music learning (e.g., performance) and thus engage in more music academic engagement [37]. Conversely, for shy students, lack of confidence and proneness to negative perceptions may prompt students to directly choose the music performance-avoidance goals, resulting in lower music academic engagement [59]. However, these inferences need to be further examined.

6. Conclusions

This research revealed the following conclusions: (1) shyness is negatively associated with musical academic engagement; (2) the music mastery goal and the music performance-avoidance goals (excluding the performance approach goal) partially mediated the association between shyness and music academic engagement in music learning. These findings have implications for the research and practice of music academic engagement of shyness. There are both theoretical and practical implications for this study. For the theoretical implications, this study transferred shyness and academic engagement to a music learning context and found a negative association between shyness and music academic engagement in a music learning context. In the meantime, this study explored the differentiated mediation role of multi-dimensional music achievement goals in the association of shyness and music academic engagement. This study fills a gap in the current research on shyness and academic engagement in music learning contexts. At the same time, as the study was conducted with Chinese university students, the proposed model also provides a reference

for studying the academic engagement of shyness in Chinese contexts. For the practical implication, this study offers a reference for the implementation of music education in the Chinese context. For music teachers, the findings of this study may help music teachers to detect and notice the motivational goal orientations of shy students and provide appropriate music learning activities and enhance shy students' academic engagement in music learning. Firstly, this study verifies the association between shyness and music academic engagement. To improve shy students' music academic engagement, music teachers should perceive students' shyness and try to use teaching strategies to relieve students' shyness. For example, college music teachers could help ease their students' shyness and enhance their academic engagement by encouraging students to pay full attention in music learning and act with confidence [78], trying not to be judgmental, setting reasonable goals for shy students, avoiding pushing students and avoiding use the shy label to students [79]. In addition, studies have shown that shyness was significantly and negatively related to close teacher–child relationships and significantly and positively associated with dependent teacher–child relationships. Therefore, music teachers could alleviate students' shyness by maintaining a close teacher-student relationship [80]. Meanwhile, a study on shyness and college students' physical education found that group counselling can influence multiple dimensions of student shyness and reduce the degree of shyness. College music teachers could also apply such an approach to ease the degree of students' shyness [81,82]. At the same time, research has shown that there is an association between teachers' teaching and students' academic engagement. For example, there is a significant but moderate relationship between teachers' teaching styles and students' academic engagement [83]. Furthermore, teachers' instructional design [84], academic support [85], teacher need-supporting practices (autonomy support, structure, and involvement) [86] and teaching learning strategies [87] contribute to students' academic engagement. In addition, research on academic engagement helps to understand the quality of students' learning experiences and helps teachers to determine and provide instructional resources and course content [23]. Despite the lack of relevant studies on music education, the study in the context of English education has suggested that English as a Foreign Language learners with a high degree of shyness may keep silent in the course, avoid participating in cooperative tasks, and tend to use some avoidance strategies in the face of pressure. Language teachers should adopt various skills and appropriate tasks to help these students overcome their negative emotional characteristics and promote students' academic participation [88]. Hence, based on the findings of this study, in order to promote shy students' music academic engagement, the teachers should not only relieve the degree of shyness for students but also use the teaching strategy or guiding shy students to use mastery goals and performances-approach goals and avoid use performance-avoidance goals. Research has shown that a master-oriented classroom environment which is characterized by providing students with motivating tasks, and autonomy support could encourage students to adopt a mastery goal orientation [89]. In addition, teachers could set concrete performance goals for their students based on their ability levels and guide them to plan appropriate strategies to encourage them to use performance approach goals orientation and achieve the goals [90]. Besides, teachers should be vigilant and avoid shy students using performance-approach goals, including the use of self-handicapping strategies, avoidance of novelty and challenges, and reluctance to cooperate with peers [91].

Although this study has some theoretical and practical implications, it also has limitations. Firstly, the data for this study were derived from a self-report method. Although the self-report method is considered a classic research paradigm in the field of personality and motivation research [92], there are differences in subjects' introspective abilities. In the future, more experimental task paradigms would be applied to avoid subjective bias caused by differences in subjects' introspective abilities; secondly, the sample for this study was collected from one university in China, and the sample size may limit the generalization of the study findings. Future research may consider expanding the subject population of the study to enhance the external validity of the study and the generalizability of the findings;

finally, the framework of cognitive, behavioral and affective was used to examine learning engagement in this paper. Other researchers have studied academic engagement from the framework of vigor, dedication and absorption [93]. For this study, whether the current relations of variables are valid under this theoretical framework (i.e., vigor, dedication and absorption) is a promising direction for future research.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/ijerph20010824/s1, Table S1: The descriptive statistics of age; Table S2: The descriptive statistics of gender.

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The Association of Short-Video Problematic Use, Learning Engagement, and Perceived Learning Ineffectiveness among Chinese Vocational Students

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Abstract: Short videos are very popular among students, but the immersive nature of the software makes them prone to problematic use and even addiction. Internet addiction, including short-video problematic use, has been a hot topic in recent years due to the COVID-19 epidemic. However, there are few empirical studies that have explored the effects of short-video problematic use on students. Thus, vocational colleges in China were recruited to participate in this study. There were 1089 effective participants, with a valid recall rate of 90.8%. This included 466 male students (42.8%) and 623 female students (57.2%), with a mean age of 19.19 years (standard deviation of 1.07 years). Five hypotheses were proposed and validated by structural equation modeling within the framework of ecological systems theory and engagement theory to explore the association of short-video problematic use, three types of learning engagement, and perceived learning ineffectiveness. Research findings showed that: (1) short-video problematic use has a negative effect on behavioral engagement; (2) behavioral engagement has a positive effect on both emotional and cognitive engagement; and (3) emotional and cognitive engagement have a negative effect on perceived learning ineffectiveness. According to the results, it can be seen that short-video problematic use has a detrimental effect on students' learning experiences, so teachers and parents need to pay attention to the negative effects of excessive use among students.

Keywords: behavioral–emotional–cognitive; ecological systems theory; engagement theory; learning engagement; perceived learning ineffectiveness; person–process–content; short-video addiction; short-video problematic use

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1. Introduction

In recent years, short-video applications have become popular worldwide, and although this software encourages people to communicate and interact via the Internet [1], excessive use of these applications may lead to addiction. However, watching online videos (including short videos) has become the most popular leisure activity in China [2], and short-video applications such as TikTok and Kuaishou are becoming increasingly popular in China. The number of people addicted to short videos is also increasing [3]. Because social media is a platform where ideas, opinions, feelings and information can be easily exchanged, it leads to students spending most of their time using different media applications and eventually becoming addicted [4]. In addition, the popularity of this software has contributed to the over-addiction of adolescents, with short-video problematic use

existing to some extent among adolescents [5]. This excessive use of short-video apps can be considered to be a state in which people spend a great deal of time using these apps, even though they are aware of the negative outcomes that may occur by doing so [1]. The use of short videos raises new concerns [6]. Therefore, it is an emerging Internet addiction, which refers to the inability of short-video users to use the software reasonably, to the extent that the desire to use it will affect their normal daily life.

Despite the growing impact of short videos, there is a lack of research on short-video problematic use [5]. Little is known about the psychological mechanisms associated with TikTok use [7]. This also makes short-video problematic use an emerging and under-researched public health problem. Because of the highly immersive nature of short videos, users are more likely to find it difficult to extricate themselves, so it is necessary to explore this issue in more depth. The Internet has become an important part of daily life for young students, as people of the Internet nation. Thus, this research explores how short-video problematic use affects students' academic engagement and effective learning.

Bronfenbrenner proposed the ecological systems theory (EST) to explain the interaction between humans and the environment, arguing that an individual's world can be theorized as an ecological system [8]. This theory has been used to investigate the interaction among person–process–content (PPC) [9]. The core analysis of mental health research that applies Bronfenbrenner's theory examines how mental health is determined through the interactions between individual factors and the ecosystems surrounding the individual/group and the interactions between and within these ecosystems [10]. Furthermore, the EST framework uses the interaction between student characteristics and background as a driver of student experience and outcomes and thus can help explain the pathways through which students can achieve academic success [11]. Therefore, this study explored the impact of short-video problematic use on student learning through the lens of the EST-based PPC model.

It is now widely accepted that the emphasis on effective learning is based on the individual. Therefore, effective learning requires students to be actively engaged in learning activities through which they internalize what they have learned and are able to absorb and reflect on their learning experiences [12]. Generally, students engage in a learning activity by interacting, acting, trying, thinking, and talking with their classmates and teachers [13]. Thus, engagement is assumed to be malleable, responsive to environmental features and adaptable to environmental changes. Thus, it is also thought to encompass three dimensions, namely behavioral, emotional and cognitive, and is proposed for study as a multidimensional construct [14]. In educational contexts, behavioral engagement represents learner effort, persistence, engagement, and perseverance, which are critical to achieving positive academic outcomes and preventing dropping out [15]. On the other hand, emotional engagement is a form of participation that addresses the level of motivation, satisfaction, comfort and interest that young people have in their classes and their desire to achieve academic success [16]. On the other hand, cognitive engagement refers to a student's level of commitment to learning, which involves being thoughtful and determined in approaching tasks from school and being ready to put in the essential effort required to know complicated ideas or master challenging skills [14]. Therefore, learning engagement is considered critical to effective learning because it has a positive impact on learning outcomes [12]. However, the process from learner engagement to learning outcomes still requires more specific research [15]. Based on the above, this study considers multidimensional learning engagement to be an important factor influencing learning, and therefore, this dimension is one of the variables.

The aim of the activity determines the learning outcomes, especially whether the desired results are achieved [17]. However, young students tend to evaluate their learning effectiveness from a negative perspective [18], which means learning ineffectiveness. However, in the past, most research has focused on student learning outcomes. The issue of ineffective learning has only begun to receive attention since the onset of COVID-19 [19], so exploration of the factors that contribute to ineffective learning is still rare. In addition,

studies on the topic of short-video problematic use have not been conclusive about the effect of addiction on learning ineffectiveness. However, understanding how to promote and inhibit ineffective learning is critical to improving educational outcomes. Therefore, this study used perceived learning ineffectiveness as a way for vocational students to express their perceptions of whether the learning outcomes met their needs after using the short videos.

In summary, within the framework of EST and engagement theory, the purpose of this study was to examine the relationship between short-video problematic use as a "person," the three types of learning engagement as a "process," and perceived learning ineffectiveness as "content" in order to construct a research model based on a cross-sectional design scope. Five research hypotheses were proposed to examine the associations between short-video problematic use, the three types of learning engagement, and perceived learning ineffectiveness.

2. Research Model and Hypothesis

2.1. Theoretical Background

EST adopts a life course method to know how improvement happens throughout increasingly complex procedures of contact between people and their environment [20]. It helps explain how individuals and the environment they live in are synergistic and interdependent, so this theory is largely regarded as an environmental theory [21]. In the framework of EST, ecology indicates the fit between individuals and the environment, which not only promotes the improvement of the environment, but additionally gives people an environment to grow in. It is, therefore, thought that there is a close association between people and the environment. Thus, EST assumes that individual development is a dynamic process involving interactions between individuals and the systems in which they operate [22]. Moreover, Bronfenbrenner encourages educationalists and psychologists to see people as central to such complex systems and to recognize and analyze the systems that make up their environment and how they interact in trying to understand people and their personal challenges [23]. EST is now one of the key frameworks in educational research, helping to explain how people produce corresponding educational outcomes as a result of the influence of environmental systems. Therefore, EST can also help explain how students' addiction to short videos can affect their learning environment and further contribute to the outcome.

2.2. Research Model

The PPC model of EST can help explain the impact of addiction in the educational setting [24]. Therefore, under the framework of EST and engagement theory, for this study, we proposed five hypotheses and constructed a model to explore the association among short-video problematic use, three types of learning engagement, and perceived learning ineffectiveness, which can be seen in Figure 1.

2.3. Research Hypothesis

Many studies have been conducted in the past to confirm the negative effects of problematic cell phone use, problematic Internet use, and excessive game playing on the student population. The problematic use of short-video applications has also gained attention in the past few years, and studies have gradually begun to confirm its adverse effects on students' academic life. Therefore, this study proposed the following five hypotheses based on the theory and the related literature.

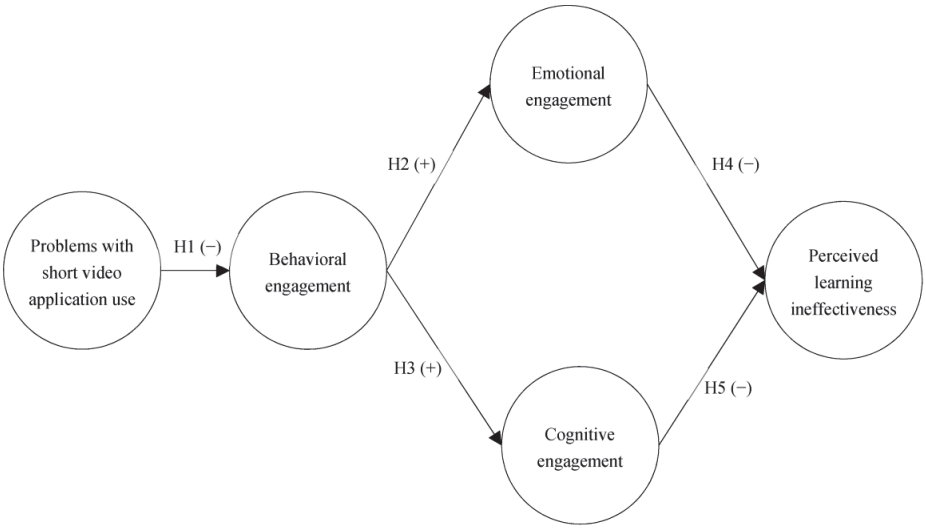

Figure 1. Research model.

2.3.1. Short-Video Problematic Use Is Negatively Related to Behavioral Engagement

The addiction process can be defined as a transition between patterns of behavioral control [25]. Many people are addicted to watching short videos on their cell phones and thus neglect their normal school life and work due to their preoccupation with the Internet. This, in turn, negatively affects their academic performance [3]. In addition, it has been suggested that smartphone addiction can negatively affect students' learning [26] because students' attention in class is disturbed by the use of their phones, and this distraction also affects their learning outside of class [27]. In addition, it has been found that Internet addiction is a significant predictor of school engagement [28]. Some studies have also established that Internet addiction is negatively related to academic engagement [29]. Therefore, this study used short-video problematic use to investigate the association between participants' behavioral engagement with the following hypothesis:

H1. *Short-video problematic use is negatively related to behavioral engagement*.

2.3.2. Behavioral Engagement Is Positively Related to Emotional and Cognitive Engagement

Behavioral, emotional, and cognitive engagement are considered to be content-specific and, by extension, lead to the identification of different determinants and outcomes [30]. In different contexts, they all emphasize the importance of different dimensions of engagement to the particular outcome sought [31]. In the educational context, engagement refers to the process of students' effective participation in learning activities, and engagement in educational settings is conceptualized as three components: emotional, behavioral, and cognitive, which are conceptually separate but related [32]. Furthermore, previous research has indicated that a strong relationship between behavioral, emotional, and cognitive engagement is often observed [33]. This is because, without engagement, students emotionally and cognitively retreat from the learning process [34]. Furthermore, the study by Luan et al. confirms the role of behavioral engagement in influencing the remaining engagement dimensions [35].

When students feel bored or uninterested in a task, they will also be emotionally detached from the task. In addition, when they are not willing to listen to other members' reactions or engage in interactions, they are less likely to exert effort or persistence or direct attentional resources in an effective manner for cognitive engagement [31]. Therefore, it is reasonable to assume that when students are not behaviorally engaged, it would be difficult

for them to become emotionally and cognitively engaged. Taken these factors together, this study used behavioral engagement to examine the associations of participants' emotional and cognitive engagement, with the following hypotheses.

H2. *Behavioral engagement is positively related to emotional engagement.*

H3. *Behavioral engagement is positively related to cognitive engagement.*

2.3.3. Emotional and Cognitive Engagement Are Negatively Related to Perceived Learning Ineffectiveness

Student engagement is a hotly debated topic in all areas of higher education, and it is considered to have a clear and potential relationship with assessment outcomes [36]. This is because once students are well engaged, student learning ineffectiveness is somewhat alleviated [37]. In addition, student engagement is also considered to be related to the success of school, educational, and social activities, which is important for avoiding academic failure and improving competence, which influences a broad range of youths' outcomes [33].

Whereas emotional engagement is conceptualized as a sense of investment and identification, identification is a sense of belonging, feeling that school is an essential factor of learning, and finding value in the school experience [34]. The evolutionary view of emotion suggests that valuable environmental events should be easily prioritized for perceptual processing, and this can be achieved by increasing the detection of emotional events by enhancing attention through emotion [38]. Therefore, when students are emotionally engaged in the learning process, it increases their sense of value and focus on the learning task, leading to better learning outcomes.

In addition, a cognitively engaged student will be one who is willing to engage in learning and accept the challenge of acquiring new knowledge or skills and exerting effort beyond the requirements of the course [36]. This is because students become mentally engaged when they make cognitive efforts to understand, exceed activity requirements, solve problems flexibly, and select challenging tasks [39]. Therefore, self-reflection can enhance their strengths and improve their learning outcomes [16]. Having good cognitive engagement will thus help students achieve good learning outcomes. Taking these factors together, this study examined the relationship between participants' perceived learning ineffectiveness in terms of emotional and cognitive engagement, with the following hypotheses:

H4. *Emotional engagement is negatively related to perceived learning ineffectiveness.*

H5. *Cognitive engagement is negatively related to perceived learning ineffectiveness.*

3. Methods

3.1. Procedure

This study was conducted by creating an online questionnaire through the Wenjuanxing platform (one of the most well-known questionnaire platforms in China) and used the snowball sampling method to send the questionnaire link to exchange groups of university students in Chinese vocational colleges via messaging applications such as WeChat and QQ, inviting students who use short-video applications to complete the questionnaire and send it to their classmates. In addition, it was also stated that students from vocational institutions who were using short-video applications could participate in this study. If they did not meet these criteria, they could not complete the survey. In addition, no incentives were provided to participate. This study was based on a cross-sectional design, and questionnaires were collected on 1 June 2022. The questionnaire link was shut down after 1200 questionnaires were received.

In this study, all research processes, including questionnaire collection, were conducted according to American Psychological Association ethical principles and China's regulatory ethical requirements. We provided a statement of the aim of the study, how data would be used, participant rights and privacy protection, and a contact email address of the author on

the front page of the web-based questionnaire. By agreeing to complete the questionnaire, participants were deemed to have signed an electronic informed consent statement.

3.2. Participants

This study collected 1200 questionnaires, of which 111 were excluded due to being incomplete or taking less than 5 min to complete. This left a final sample of 1089, including 466 male students (42.8%) and 623 female students (57.2%); 743 (68.2%) were enrolled in a vocational school, and 346 (31.8%) were enrolled in a university of science and technology. The average number of days per week of short-video application use was 675 (62%) for daily users, 277 (25.4%) for 4~6 days, and 137 (12.6%) for 1–3 days. The average number of minutes of use was 97 (8.9%) for less than 1 h, 609 (55.9%) for 1–3 h, 334 (30.7%) for 3–5 h, and 49 (4.5%) for more than 5 h. The short-video platforms used are TikTok (616; 56.6%), Kuaishou (360; 33.1%), Huoshan (108; 9.9%), and other platforms (5; 0.5%). In addition, the participants' mean age was 19.19 years (standard deviation of 1.07 years).

3.3. Measurement

The questionnaire was translated and modified from reliable instruments used in previous studies. The study population of this study comprised students. The questionnaire was evaluated by three educational experts and was measured with a 5-point Likert scale (1 to 5 for strongly disagree to strongly agree).

3.3.1. Short-Video Problematic Use

In this study, the short-video scale from Ye et al. was used as a reference and adapted, with 10 questions [24]. When the average score is higher, it means a higher level of addiction. Example questions are: "I will put aside what I need to finish or do and spend my time watching short videos" and "I will sacrifice my sleep at night by watching short videos".

3.3.2. Learning Engagement

The study adapted the Learning Engagement Scale of Luan et al., with eight items each to analyze participants' views of engagement in learning. When the average score is higher, it means a higher level of engagement [35]. An example of behavioral engagement is: "I usually arrive on time for class"; an example of emotional engagement is: "If the quality of my work is not satisfactory after I finish it, I am willing to correct it again"; and an example of cognitive engagement is: "I will remind myself to check the areas of my work where I tend to make mistakes".

3.3.3. Perceived Learning Ineffectiveness

This study was based on and adapted from Hong et al.'s Learning Ineffectiveness Scale, which consists of eight questions to measure participants' perceptions of the adverse effects on learning after using short-video applications [18]. The higher the average score, the more severe the ineffectiveness of learning. Example questions are: "Since I started watching short videos, I think my study efficiency has decreased" and "Since I started watching short videos, I think the quality of my homework has deteriorated".

3.4. Data Analysis

Structural equation modeling (SEM) is a statistical modeling tool that has been popularly used in many disciplines [40]. SEM is a theory-driven method for analyzing data and can be conducted to evaluate hypotheses and the causal association between measured and/or possible variables [41]. At the same time, SEM has many advantages, including the fact that when analyzing the association among factors, these associations have no measurement errors because the errors have been estimated or eliminated, leaving only the common variance; and by estimating and eliminating the measurement error, the reliability of the measurements can be stated explicitly in the analysis [42]. Therefore, this study used SEM to validate the research model based on the theoretical framework constructs.

4. Results and Discussion

This was a validation study; therefore, the reliability, validity analysis, and descriptive statistics analysis were tested with SPSS 23.0, followed by AMOS 23.0 for item analysis, overall fit analysis, and model validation. The related statistical results are described as follows.

4.1. Item Analysis

In order to ensure whether the measurement model has a good fit, we first conducted an item analysis, and the criteria for the relevant fit indicators were that the χ^2/df value must be smaller than the value 5, the RMSEA must be smaller than 0.10, and the GFI and AGFI must be greater than the value 0.80. Questions with a factor loading (FL) not greater than the value 0.50 must be eliminated from the questionnaire [43,44]. Table 1 shows the results of the analysis. Based on the above analysis criteria, items were deleted as follows: short-video problematic use was reduced from ten to seven questions, behavioral engagement from eight to five questions, emotional engagement from eight to six questions, cognitive engagement from eight to six questions, and perceived learning ineffectiveness from eight to six questions.

Table 1. Confirmatory factor analysis.

Index	χ^2	*df*	χ^2/df	RMSEA	GFI	AGFI	FL	*t*
Threshold	—	—	<5	<0.10	>0.80	>0.80	>0.50	>3
Short-video problematic use	58.69	14	4.19	0.05	0.98	0.97	0.56~0.86	18.69~40.31
Behavioral engagement	20.53	5	4.11	0.05	0.99	0.98	0.57~0.92	17.90~58.57
Emotional engagement	37.95	9	4.22	0.05	0.99	0.97	0.79~0.91	30.73~38.20
Cognitive engagement	36.19	9	4.02	0.05	0.99	0.97	0.78~0.90	32.68~42.64
Perceived learning ineffectiveness	43.27	9	4.81	0.06	0.99	0.97	0.90~0.94	38.97~47.00

External validity of the items was used to discriminate the explanatory range of the study [45], and the values of all respondents for each question were divided into the first 27% and the last 27% and *t* tested. If the *t*-value was greater than 3 (*** $p < 0.001$), the external validity was regarded as significant. Table 1 indicates that the *t*-values for the constructs were from 17.90 to 58.57 (*** $p < 0.001$), which means that all of the questions in this study were discriminatory and were able to determine the response level of the different sample groups [46].

4.2. Reliability and Validity Analysis

In order to obtain a model that could be used for validation, statistical tests of reliability were performed. Hair et al. suggested that Cronbach's α composite reliability (CR) values should exceed the criterion of 0.70 [43]. The Cronbach's α values of the present study components ranged from 0.877 to 0.97, and the CR values ranged from 0.89 to 0.97; thus, both analyses met the suggested criteria, and the results of the analyses are shown in Table 2.

Table 2. Reliability and validity analysis.

Constructs	*M*	*SD*	α	CR	AVE	FL
	—	—	>0.70	>0.70	>0.50	>0.50
Short-video problematic use	2.34	0.91	0.87	0.89	0.54	0.73
Behavioral engagement	3.53	0.92	0.91	0.91	0.68	0.82
Emotional engagement	3.33	0.83	0.94	0.94	0.74	0.86
Cognitive engagement	3.46	0.82	0.94	0.94	0.73	0.85
Perceived learning ineffectiveness	2.83	0.97	0.97	0.97	0.86	0.93

Moreover, Hair et al. also recommended that the FL value must be greater than the threshold 0.50, and if it is smaller than this threshold, the question should be removed [43]. In this study, Table 2 shows the FL values which were between 0.73 and 0.93. Hair et al. indicated that the average variance extracted (AVE) value must be greater than 0.50 to represent the constructs with convergent validity [47]. In this study, the AVE values of the constructs ranged from 0.54 to 0.86. The results of these two analyses also met the suggested criteria, as can be seen in Table 2.

Awang stated that when the threshold of the AVE root number for each construct is greater than the threshold of Pearson's correlation coefficient for other constructs, this signified that there was discriminant validity for the constructs [48]. The analysis results in this study showed that there was discriminant validity for each construct; that is, all constructs are statistically different and can be used to test the structural model, as shown in Table 3.

Table 3. Discriminant construct validity.

Construct	1	2	3	4	5
1. Short-video problematic use	(0.85)				
2. Behavioral engagement	−0.45	(0.91)			
3. Emotional engagement	−0.25	0.73	(0.93)		
4. Cognitive engagement	−0.19	0.60	0.77	(0.92)	
5. Perceived learning ineffectiveness	0.27	−0.35	−0.35	−0.32	(0.96)

Note: The value on the diagonal line is the square root value of AVE, whereas the other values are the related coefficient values.

4.3. Model Fit Analysis

Before performing model validation, it is necessary to verify that the structural model has a suitable degree of compatibility. The relevant fitness metrics are as follows: χ^2/df values must be smaller than the value 5 [43]; RMSEA values must be smaller than 0.1; GFI, AGFI, NFI, NNFI, CFI, IFI, and RFI values must be greater than 0.80 [49]; and PNFI and PGFI values must be greater than 0.50 [43]. This study's fit index values were $\chi^2 = 1670.35$, $df = 400$, $\chi^2/df = 4.18$, RMSEA = 0.05, GFI = 0.90, AGFI = 0.88, NFI = 0.95, NNFI = 0.96, CFI = 0.96, IFI = 0.96, RFI = 0.94, PNFI = 0.87, and PGFI = 0.77.

4.4. Path Analysis

The study model validated that short-video problematic use was negatively related to behavioral engagement (β = −0.50 ***; $t = -12.94$); behavioral engagement was positively related to emotional engagement (β = 0.75 ***; $t = 23.47$); behavioral engagement was positively related to cognitive engagement (β = 0.65 ***; $t = 21.17$); emotional engagement was negatively related to perceived learning ineffectiveness (β = −0.27 ***; $t = -5.60$); and cognitive engagement was negatively related to perceived learning ineffectiveness (β = −0.13 **; $t = -2.80$), as can be seen in Figure 2.

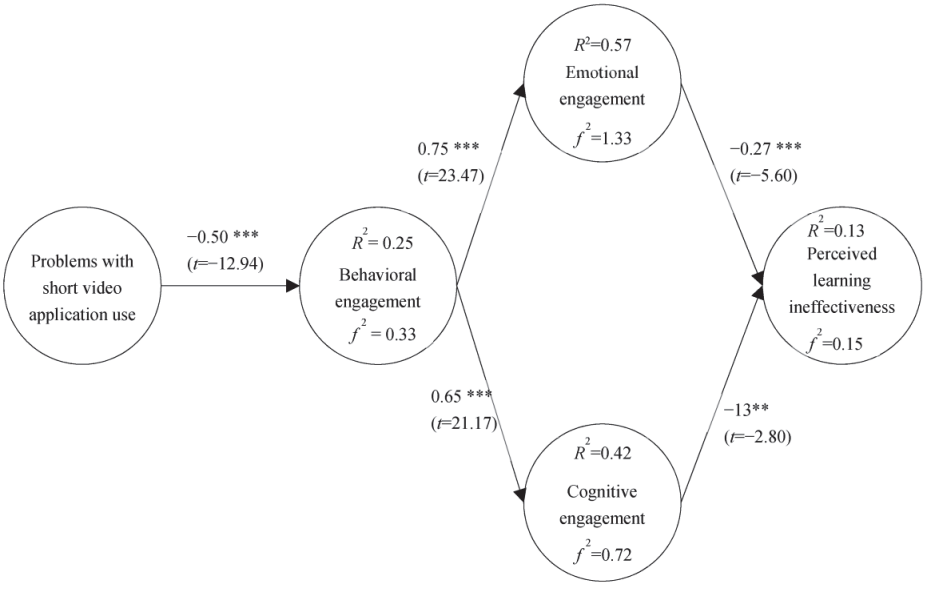

Figure 2. Research model verification. ** $p < 0.01$. *** $p < 0.001$.

In addition, the explanatory power of short-video problematic use on behavioral engagement was 25% with an *f*2 of 0.33; the explanatory power of behavioral engagement on emotional engagement was 57% with an *f*2 of 1.33; the explanatory power of behavioral engagement over cognitive engagement was 42% and *f*2 was 0.72; the explanatory power of emotional and cognitive engagement over perceived learning ineffectiveness was 13%; and *f*2 was 0.15, as can be seen in Figure 2.

4.5. Discussion

In this study, short-video problematic use was regarded as the inability of participants to use short-video applications in a reasonable manner; it includes the inability to control the use of time, such as still wanting to watch short videos when busy, leading to interference with their daily routine. Behavioral engagement refers to participants' ability to complete learning tasks in an accurate and responsible manner. Emotional engagement refers to the participant's sense of identification with and emotional response to the learning task throughout the learning process. Cognitive engagement is defined as the application of a postulated cognitive strategy by the participant during learning. Perceived learning ineffectiveness was defined as the participant's perception of the learning situation becoming poor after using the short video.

Based on the definitions of the above dimensions and in the cross-sectional analysis, the results of this study showed that the mean of students' short-video problematic use is 2.34, which is lower than the average (3.00). This indicates that student respondents are less likely to have short-video problematic use; the mean of students' behavioral engagement is 3.53, the mean of students' emotional engagement is 3.33, and the mean of students' cognitive engagement is 3.46, which is higher than the average (3.00). In terms of the mean of the three types of learning engagement, students generally perceived themselves as being better engaged in learning activities. The mean of students' perceived learning ineffectiveness was 2.83, which was lower than the mean (3.00), indicating that the students generally perceived less learning ineffectiveness occurring.

4.5.1. Short-Video Problematic Use Has a Negative Effect on Behavioral Engagement

The results of this study indicated that short-video problematic use was negatively related to behavioral engagement. That is, the more severe a student's short-video problematic use is, the less engaged they will be in their learning. Such results can also be well explained by past studies.

According to Perales et al., the process of addiction is a transition between behavioral control patterns [25]. If people are addicted to watching short videos, it will cause them to neglect their normal school life and work, which will have a negative impact on their schooling [3]. Sunday et al. also found that smartphone addiction negatively affects students' learning [26], and Roberts et al. also indicated that students' attention in the classroom is disturbed by their phone use, and this distraction further affects their learning outside of the classroom [27]. That is, problematic use will have a negative effect on learning or academics. In addition, Tas's study found that Internet addiction was a significant predictor of school engagement [28]. From this study, it is clear that short-video problematic use, like other Internet addictions, has the same negative impact on learning and, more specifically, on students' behavioral engagement.

4.5.2. Behavioral Engagement Has a Positive Effect on Emotional and Cognitive Engagement

In the past, most studies analyzed multidimensional engagements at the same level, rather than examining the causal relationships before and after. In contrast, this study concluded that behavioral engagement should precede emotional and cognitive engagement. The results also confirm that behavioral engagement has a positive effect on affective and cognitive engagement. That is, the better the students' behavioral engagement in learning, the higher their emotional and cognitive engagement will be.

Such a result can be explained by the arguments and findings of the following scholars. Furthermore, Philp and Duchesne also argued that in different contexts, it is important to emphasize the different dimensions of engagements for the particular outcome sought [31]. Philp and Duchesne noted that when students feel bored or uninterested in a task, they will be emotionally detached from it, and when they are unwilling to listen to other partners' reactions or engage in interactions, they are less likely to exert effort or persist in learning or to direct their attentional resources in an effective way for cognitive engagement [31]. As seen above, without engagement, students emotionally and cognitively retreat from the learning process [34]. This was confirmed by the study of Luan et al. (2020), who found a role for behavioral engagement in influencing the remaining engagement dimensions [35].

In addition, previous studies have indicated that a strong relationship between behavioral, emotional, and cognitive engagements is often observed. Furthermore, Ben-Eliyahu et al.'s study found that in educational settings, engagement is defined as the process of students' effective participation in learning activities, and engagement in educational settings is conceptualized as three components: affective, behavioral, and cognitive, which are conceptually separate but interrelated [32]. In summary, when students have good behavioral engagement in learning, it will lead to good emotional and cognitive engagement.

4.5.3. Emotional and Cognitive Engagement Have a Negative Effect on Perceived Learning Ineffectiveness

This study showed that emotional and cognitive engagement were negatively related to perceived learning ineffectiveness. In other words, the more emotionally and cognitively engaged students are in their learning, the less likely they are to be ineffective after using short videos.

This result can also be explained by the following research findings. Pickering noted that student engagement is considered to have a clear and potential relationship with assessment results [36]. Tulaskar and Turunen also indicated that student engagement has a crucial influence on maintaining students' association with their courses and learning [13]. That is, students' academic engagement may be an important personal factor that is closely

related to academic achievement [29]. Moreover, Hong et al. suggested that once students are well engaged, student learning ineffectiveness is somewhat mitigated [37].

Furthermore, Dolan argued that people are more likely to prioritize events that they perceive as valuable and that the way to achieve this valuation goal is to enhance attention through emotion. Therefore, when people are emotionally engaged, they will give more attention to tasks other than learning and are more likely to achieve good learning outcomes [38]. In addition, Pickering stated that a cognitively engaged student would be one who is willing to engage in learning and take on the challenge of acquiring new knowledge or skills and exerting effort beyond the requirements of the course [36]. Moreover, according to Dubovi and Tabak, students are mentally engaged when they put cognitive effort into understanding, exceeding the demands of the activity, solving problems flexibly, and selecting challenging tasks [39]. Therefore, students' self-reflection (postulated cognitive ability) can enhance their learning strengths and improve their learning outcomes [16]. According to this, it can be seen that the higher the level of students' cognitive engagement, the better their learning tasks will be, and the better their learning outcomes will be.

4.5.4. Implications

The convenience of entertainment and the highly immersive feeling that short videos bring to people make the issue of short-video usage a new challenge to overcome. From these results, short-video problematic use shows a negative impact on learners' behavioral engagement. However, students are often unaware of the seriousness of this outcome for their learning. Although students are legally adults, parents and teachers should still actively understand their usage habits and explain to them the principles of reasonable use to avoid problematic usage behaviors. In addition, according to Adan, establishing a regular day/night pattern is also an effective way to prevent addictive behaviors [50]. Therefore, it is recommended to advocate the daily work and rest of student users to avoid the problem of work and rest disorders due to the use of short-video software.

In addition, because of the adverse effects of addiction on students, platform operators have an obligation to prevent students from using the existing problems and should design some prevention and control mechanisms to fulfill their corporate social responsibility. At the same time, in order to prevent students from watching short videos as their main leisure activity, schools should organize more leisure activities and student clubs that are beneficial to physical and mental health, so that students can focus away from these addictions and build good interpersonal relationships with their peers.

In addition, the results of the study indicated that learning engagement was positively related to learning and can effectively inhibit the occurrence of ineffective learning. Therefore, teachers should adopt a learner-centered teaching approach and make good use of innovative teaching strategies to create a meaningful learning environment for students in order to promote active participation in classroom activities and further enhance the three types of learning engagement.

4.5.5. Research Limitations and Future Study

Some limitations were present in this study. First, this study used a cross-sectional design to conduct a questionnaire survey, and these data were used for statistical analysis. Therefore, the results obtained show the relationship of the variables and only capture the perceptions of the participants at this point in time but not the longitudinal association between short-video problematic use and other learning factors. Therefore, it is suggested that future research could adopt a longitudinal design to track short-video-addicted users over a long period of time, so as to confirm that poor learning engagement and ineffective learning are both the result of problematic use of short videos. In addition, the data collection was based on the participants' personal preferences, without many conditions being set for participation, which may have led to uneven sample characteristics. This is also an issue that can be considered in follow-up studies. In addition, this study was a form of backward extrapolation to determine whether short-video problematic use would

cause adverse learning effects. Therefore, it is possible that this is a symptom of social media/short-video addiction rather than the entire cause of poor learning. Therefore, subsequent studies may expand the exploration of the causes of poor learning.

Secondly, the sample of students in this study was from vocational colleges in China, although the outcomes of the external validity analysis indicated that the results can be extrapolated to different scopes and contexts. However, it is still not possible to compare whether there are differences in the perception of these constructs across school age groups, systems, and regions of the country. Therefore, it is suggested that future studies could extend the sampling area of the study and conduct a difference analysis.

Finally, the self-reporting of participants may have resulted in biased results in order to meet social expectations, leading to a distortion of the descriptive statistics. Moreover, biased responses may be found in this study because it was a relations study that aimed to examine the relationship between pathways, not a descriptive statistical survey [9]; therefore, the impact is limited. However, given the discrepancy between the options selected by the users in the background data and the responses given to the short-video problematic use scale, interviews can be used in the follow-up study to investigate whether this phenomenon is due to the response of the short-video users or the gap in their personal perceptions.

5. Conclusions

Recently, the reputation of short videos has been spreading rapidly. Whether it is active use (creators) or passive use (viewers), the problem of short-video problematic use has gradually become an Internet addiction-related issue of concern to the general public, educators, and even researchers. However, compared to other Internet addictions, short-video problematic use is an emerging area of research, and there are still few empirical studies on the effects of short-video problematic use on young students. This is an essential concern that needs to be extensively explored. Therefore, for this study, we constructed a research model within the framework of EST and engagement theory to extend the understanding of the influence of short-video problematic use in the education field; this is a significant contribution of this study to the Internet addiction field. The results in this study indicated that: 1. short-video problematic use was negatively related to behavioral engagement; 2. behavioral engagement was negatively related to both emotional and cognitive engagement; and 3. both emotional and cognitive engagement have a negative effect on perceived learning ineffectiveness. As shown above, short-video problematic use is also a harmful online behavioral addiction for learning, so it should be avoided or improved by all means. From the study results, it can be seen that behavioral engagement is an important prerequisite for promoting emotional and cognitive engagement, and short-video problematic use is a key antecedent of behavioral engagement.

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behavioral sciences

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Review

Traumatised Children's Perspectives on Their Lived Experience: A Review

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Abstract: *Introduction:* Most children have exposure of traumatic events during their life, such as natural disasters, accidents, and abuses. A review of traumatised children's perspective on traumatic events plays an important role in enhancing our understanding and promoting appropriate tailor-made intervention and support to these children. *Methods:* Four main health-related electronic databases were searched for all English full-text qualitative research articles over the past 11 years to uncover the recent best available perspective/evidence from traumatised children. The PRISMA checklist was adopted to guide the review process. *Results:* Five themes about children's experiences and perspectives towards the traumatic events encountered were summarised and integrated from 19 qualitative studies identified. They included daily life problems related to trauma, negative responses to trauma, perceived health needs, coping strategies related to trauma and stress, and growth from traumatic experience. *Conclusions:* This systematic review provides evidence about responses/impacts and perceived health needs of traumatised children and informs the direction caregivers' training can take, helping these children by early identification and timely intervention. More research is needed to examine/compare traumatised children's responses and coping between diverse traumatic experiences, time from exposure, and the sociodemographic characteristics of these children.

Keywords: traumatised children; trauma; lived experience; post-traumatic stress; systematic review

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1. Introduction

Traumas are long-lasting emotional responses that often result from living through a distressing event, which may subsequently contribute to post-traumatic stress disorder (PTSD) [1]. The majority of children have been exposed to different types of traumas, such as natural disasters, accidents, and abuse during their early life stages [2–4]. These trauma events are perceived by individual children to be frightening, violent and/or dangerous experiences, causing intense behavioural and physical reactions that likely last over a long period of time [5]. Recent studies have shown that trauma exposure is associated with elevated risks of psychiatric disorders, suicidality, substance use, psychological adjustment difficulties (e.g., PTSD), and/or functional impairments (e.g., poorer adaptive functioning and social functioning) [6,7]. Epidemiological studies and territory-wide service evaluations suggest that traumatic events can adversely affect children's social, emotional, cognitive, and physical development, as well as their well-being [8–10]. These studies have contributed to our recognition of the severe and long-term impacts of traumatic events on children's health in adulthood.

In the past, children's views have been undervalued in medical care, as they were seen as being protected, vulnerable, and difficult to be engaged with in research [11]. Understanding children's perceptions of their own traumas is essential to help them adjust to their traumatic experiences [12]. Over the past decade, there have been qualitative studies conducted to explore or attempt to support and guide the development of an appropriate

and effective intervention addressing the complex health needs of children exposed to traumas. Although a review on the psychosocial impacts of traumatic experiences among children was published a decade ago [13], many selected articles included only parents' or caregivers' perspectives concerning the experiences of their traumatised children. Without children's perspective in the qualitative evidence, it is difficult to accurately examine children's own specific and important perspectives on their traumatic experiences and related responses and impacts. Therefore, this systematic review identified the best available qualitative research articles published over the past 11 years (between 2012 and 2022) and aimed to summarise and consolidate the current evidence from all accessible qualitative research on children's subjective experiences and perspectives on their traumas and related daily life problems, positive and negative responses, and coping strategies used.

2. Materials & Methods

2.1. Search Strategy

Qualitative studies on children's perspectives on traumatic experiences were searched using four main electronic databases, CINAHL, ProQuest, PubMed, and Web of Science. The keywords for the literature search were focused on trauma (e.g., trauma, traumatic, or post-traumatic stress), children (e.g., children, adolescents, or adolescence) qualitative research (e.g., qualitative, exploratory, or semi-structured/unstructured interview), and stress (e.g., stress, psychological response/reaction impact, or coping). The search covered peer-reviewed and full-text English articles published between 1 January 2012 and 30 June 2022 (i.e., to uncover the recent best available perspective/evidence from the traumatised children). The article search and selection procedure (Figure 1) was performed according to the PRISMA checklist (http://www.prisma-statement.org/; accessed on 13 July 2022).

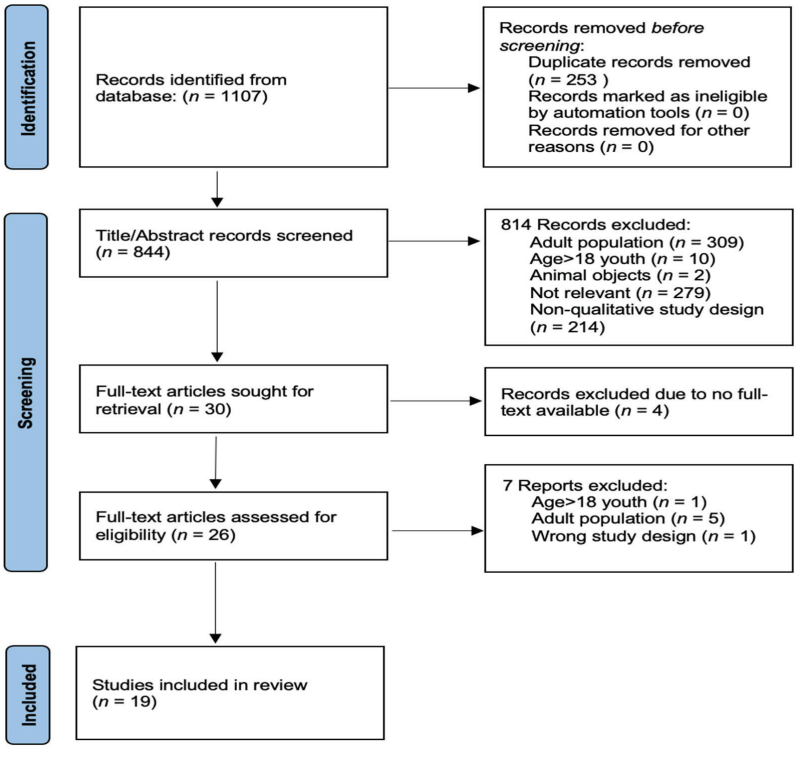

Figure 1. PRISMA flow diagram of the study selection.

2.2. Inclusion Criteria

This review included qualitative studies. The studies were included if they focused on the perspectives of traumatised children (aged ≤18 years) about their traumatic events and related experiences and responses. Within articles describing interviews of both traumatised children and their parents/caregivers/service providers, mainly the children's views about their traumatic experiences and related stress were included.

2.3. Exclusion Criteria

Articles were excluded if: (a) They were adult subjects' recollections of their long-ago childhood trauma; (b) Only involved the views of traumatised children's parents/caregivers on their children's traumatic experiences; (c) They did not focus upon the main objective on traumatic experiences and/or their related stress/impacts; (d) They were not based upon a qualitative research design (e.g., cross-section or longitudinal survey study, review or discussion papers, case studies, and editorials); and (e) Presented ongoing research or a brief report.

2.4. Study Selection Procedures

All studies identified from database searches were exported into Convidence, and duplicates were removed. The titles and abstracts of all the articles were read and initially screened for eligibility according to the above-mentioned criteria. The full texts of the potentially eligible articles were retrieved and screened by two reviewers (CTL and WTC) independently. Finally, the screening results and disagreements were discussed among the two reviewers and a third independent reviewer until all reviewers reached consensus about the results.

2.5. Quality Appraisal

The quality of reviewed qualitative studies was then critically examined using the critical appraisal skills programme (CASP) checklist for qualitative research [14]. Quality assessment was undertaken by two independent reviewers (CTL and WTC). Any discrepancy was discussed and an agreed decision was reached between reviewers. Quality appraisal was not used to determine excluded studies, but rather to assess each study's quality. The overall studies were judged to be generally of good quality (see Supplementary Table S1).

2.6. Data Extraction and Synthesis

The study information of all included studies (e.g., authors, country, and year of publication; study design, types of traumas, main characteristics, and size of study sample) were extracted and summarised. The qualitative findings were coded, condensed, and integrated into themes and subthemes on an Excel spreadsheet. Commonalities and differences in subthemes of subjective traumatic experience in the included studies were discussed.

3. Results

3.1. Selection of Qualitative Studies

A total of 1107 studies were identified from the electronic searches on the four databases. After removing the duplicates, 844 articles remained. Of these, 814 did not meet the inclusion criteria due to adult population (n = 309), animal samples (n = 2), age > 18 youth participants (n = 10), not focusing on trauma experiences and its impact (n = 279), and non-qualitative study design (n = 214). The full texts of four studies were not available. After reviewing the full text of the remaining 26 relevant studies, another seven studies were excluded for several reasons, including majority of participants were adolescents, studies conducted in the adult population, and studies employing the wrong study design. Finally, the 19 articles that met all the review criteria were included. The PRISMA flow diagram of the article searching and selection process of this systematic review is presented in Figure 1.

3.2. Characteristics of Included Studies

The 19 included studies were conducted worldwide, including Australia (n = 1), Cambodia (n = 1), the Democratic Republic of Congo (n = 1), Denmark (n = 1), Indonesia (n = 1), Iran (n = 1), Myanmar (n = 1), Norway (n = 1), Palestine (n = 1), Sweden (n = 1), South Africa (n = 1), The Netherlands (n = 1), United Kingdom (n = 4), and United States (n = 3). The types of traumatic events included family illness/death (n = 6), violence, (n = 4), burn injury (n = 2), natural disasters (n = 2), political detention/deportation (n = 2), sexual abuse (n = 2), and experiencing cancer (n = 1). Thirteen of the 19 studies (68%) had child participants only. The majority of the qualitative data (n = 11) were collected using semi-structured interviews (see Table 1).

Table 1. Summary of included studies.

Study (Authors, Year of Publication and Country)	Type of Trauma	Sample	Study Design	Data Collection Method
Asgari and Naghavi (2020) [15], Iran	Sudden loss of a parent	14 children (age: 14–17)	Qualitative	In-depth and semi-structured interviews
Cherewick et al. (2015) [16], Democratic Republic of Congo	Violence	30 children (age: 10–15)	Qualitative	In-depth interviews (Interview questions given, face-to-face)
Chester and Joscelyne (2021) [17], United Kingdom	Domestic violence	5 children (age: 14–18)	Qualitative	Semi-structured interviews
Darcy et al. (2014) [11], Sweden	Cancer	13 children (age: 1–6) 23 parents	Qualitative	Semi-structured interviews (Face-to-face, parental presence)
Egberts et al. (2020) [18], The Netherlands	Burn injury	8 children (age: 12–17)	Qualitative	Semi-structured interviews (Face-to-face, individual or with parental presence)
Figge et al. (2020) [19], Cambodia	Traumatic experiences (e.g., domestic violence)	30 children (age: 10–13) 30 caregivers	Qualitative	In-person interviews (interview questions given)
Foster (2017) [20], United States	Sexual abuse	19 children (age: 3–17)	Qualitative	Written narratives
Foster and Hagedorn (2014) [21], United States	Sexual abuse	21 children (age: 6–17)	Qualitative	Written narratives
Harazneh et al. (2021) [22], Palestine	Political detention	18 children (age: 12–18)	Qualitative	Semi-structured interviews (Face-to-face, individual or parental presence)
Jensen et al. (2013) [23], Norway	Tsunami	56 children (age: 6–18)	Qualitative	Semi-structured interviews (individual, face-to-face)

Table 1. *Cont.*

Study (Authors, Year of Publication and Country)	Type of Trauma	Sample	Study Design	Data Collection Method
Jones et al. (2021) [24], United Kingdom	Traumatic injury	13 children (age: 5–15) 19 parents/guardian	Qualitative	Semi-structured interviews via telephone call or in-person (Joint or separate with parents/guardian)
Kieffer-Kristensen and Johansen (2013) [25], Denmark	Parental ABI	14 children (age: 7–14)	Qualitative	Semi-structured interviews (Face-to-face)
Lee et al. (2018) [26], Myanmar	Traumatic experiences (e.g., conflict and violence)	28 children (age: 12–17) 12 adults (parents/teachers/service providers)	Qualitative	In-depth interviews
Lovato (2019) [27], United States	Forced family separation (parental deportation)	8 children (age: 14–18) 8 mothers 11 school-based staff	Qualitative	Semi-structured interviews (Face-to-face)
McGarry et al. (2014) [28], Australia	Burn injury	12 children (age: 8–15)	Qualitative	In-depth and unstructured interviews (Face-to-face, individual), record all non-verbal cues
Parsons et al. (2021) [29], South Africa	Loss of a parent	22 children (age: 10–12)	Qualitative	Semi-structured interviews (Individual)
Rohleder et al. (2017) [30], United Kingdom	Parental ABI	6 children (age: 9–18) 6 parents (3 with ABI) 3 support workers	Qualitative	Semi-structured interviews (Face-to-face)
Salawali et al. (2020) [31], Indonesia	Natural disasters	16 children (age: 12–18)	Qualitative	In-depth interviews (face-to-face, using field notes)
Tyerman et al. (2019) [32], United Kingdom	The potential loss of the injured sibling with ABI	5 children (age: 9–12)	Qualitative	Semi-structured interviews (Individual or with parental presence)

Note. ABI = acquired brain injury.

3.3. Main Findings of Qualitative Studies

Traumatised children's experiences and perspectives towards the traumatic events were categorized in five themes: daily life problems related to trauma, negative responses to trauma, perceived health needs, coping strategies related to trauma and stress, and growth from traumatic experience. These themes with their subthemes are presented in Table 2.

Table 2. Themes and subthemes of traumatised children's experiences and perspectives towards the traumatic events.

Themes	Subthemes
Daily life problems related to trauma	Daily routines [11,15,18,19,24,26–28,30]
	Relationship issues [19,21,24–26,28,30]
	Daily function [15–18,20,21,24,25,27,28,32]
Negative responses to trauma	Physical aspect [11,15,17–19,21,26–29]
	Psychological aspect [15–21,23–32]
	Cognitive aspect [16–21,24,25,27–29]
	Behavioural aspect [11,15–19,23–25,28,29]
	Social aspect [15,17,19,21,24,26,29]
Perceived health needs	Emotional support [11,17,18,24,30,32]
	Social support [16,25,30]
	More detailed information [25,30]
	Need for play [11,23–25]
Coping strategies related to trauma and stress	Cognitive coping strategies [15–18,23,25,26,28–32]
	Behavioural coping strategies [15–18,20,22,23,25,26,28–30,32]
Growth from traumatic experience	Meaning of life [15,17,24,28,29,31]
	Close relationship [17,25,31]
	New life goals [15,18,24,28,31]
	Personal strengths [15,22,24,28,31]
	Religious beliefs [15,16,23,31]

Note. Examples of illustrative verbatim quotes were shown in Supplementary Table S2.

3.3.1. Daily Life Problems Related to Trauma

Traumatic events negatively impacted children's daily life and relationship issues. Traumatised children experienced disruptions in their daily lives, such as developing poor appetite [15,19,26,27], difficulties with school comprehension [18,27,32], communication problems [30], and disturbances in their daily routines due to frequent medical follow-ups [11,18,26]. Several studies reported that children had found it difficult to maintain interpersonal relationships because they had to move or could not attend most school and social events [19,21,24–26]. Moreover, those children experienced vivid flashbacks and intrusive thoughts related to their trauma in the form of sleep disturbances and nightmares, which interfered with their daily functioning [15–18,20,21,24,25,27]. In injury-related trauma research, injury management measures, such as activity restriction and protective solutions, profoundly impacted the traumatised children's activities of daily life [24,28]. Many children found injury management measures frustrating and annoying because they stopped them from participating in sports and activities with their friends [24,28]. They sometimes felt that they had lost their independence and needed assistance from caregivers or nurses for self-care tasks such as bathing and toileting [28].

3.3.2. Negative Responses to Trauma

Physical Aspect

Most other studies reported traumatised children as being vulnerable to headaches, increased heart rate, stomach ache, trembling, might have had difficulty breathing, dizziness, sleeping difficulties, lethargy, appetite changes, decreased concentration, hyper-alertness, and/or nightmares [11,15,17–19,21,26–29]. One study reported that some children who

experienced the loss of a parent felt severe weakness, tightness in their chest, and/or heart palpitations after the traumatic loss [15].

Psychological Aspect

There were various negative feelings that were found to be directly related to trauma, such as loss, fright, loneliness, stress, guilt, shame, helplessness, isolation, shock, and being scared, and, fear, anger, worry, and sadness were most frequently mentioned in all included studies. The fear was often related to their loss [25,27,31,32], worrying about the occurrence of the events [18,23,27,28], uncertainty about the future [21], and being in trouble [20]. Most traumatised children reported feeling angry at themselves, others, or at God for some situations such as their traumatic experience and pain, the injustice of their parents' death or lack of understanding [15,17,19–21,24,26,29,30].

Additionally, the most common worries were about the health of their family, threat of violence or the potential outcomes [16,19,21,25–27,29]. Those who experienced burn accidents worried about medical procedures because they did not know what to expect and were scared of experiencing pain during the process [18,28]. Traumatised children also experienced persistent sadness, anxiety, and post-traumatic symptoms such as intrusive distressing memories of their injury [16,18,20,21,24,25], and in some cases, refused to express any feelings [15,29].

Cognitive Aspect

Traumatic experiences negatively affected children's cognition, including loss of memory and forgetting aspects of the traumatic accident [20,25]. Children with injury-related experiences tended to ruminate and catastrophise by imagining worst-case scenarios [18,28]. Certain cues could trigger vivid and detailed flashbacks and intrusive thoughts of the trauma [16–21,24,25,27,32]. Children with injury-related trauma relived the pain and emotions (e.g., fear) associated with their trauma while experiencing static or moving accident-related visual intrusions [18,24,28]. These intrusions could be triggered by the location of the incident, the specific object that caused the injury, or by watching clips (e.g., fire-related material) on television [18,24,28].

Behavioural Aspect

There was a wide variety of changes in children's behaviours after a traumatic experience such as crying [15–17,19,29], increased aggressive or risky behaviours [15–17,29], being quiet [17,25,29], insulting others [16,17], loss of motivation [11], being stubborn or angry with siblings and parents [25], taking responsibility for household duties [25], and preferring to stay at home [25]. Traumatised children sometimes showed increased attachment-seeking behaviours that provided comfort, including being close to family or school [15,17,25,29], and seeking their parent's support [23]. In a study on exposure to domestic violence, the children were found to develop a suicidality when they were unsuccessful in stopping the violent events, leading to a loss of control and powerlessness coupled with the inability to talk about trauma [17].

Additionally, injured children exhibited not only hypervigilant behaviours such as being overly concerned about their surroundings and protective of their scars, but also avoidance behaviours towards situations, objects, and activities that reminded them of their trauma [18,24,28]. Despite receiving approval from their medical team, they preferred to avoid sports and everyday activities, such as riding bicycles, to increase their sense of safety [28]. Conversely, children with other traumatic injuries sometimes found alternative sedentary activities, or devised ways to remain connected to their original hobbies with varying degrees of acceptance [24].

Social Aspect

Traumatised children showed negative social reactions. Some bereaved children often avoided all forms of communication with others or withdrew from their social circles [15,29].

Six studies also found that traumatised children experienced social withdrawal due to fear of others' negative reactions [15,17,19,24,26,29]. Sexually abused children developed negative social reactions because they had become distrustful of others and felt unsafe in their relationships, even with family members and friends [21]. Those who experienced conflict-related trauma reported having difficulty connecting with others and preferred keeping other people at a distance because they felt they were being looked down upon, developed a lack of trust for others or had a fear or expectation of being hurt [17,26]. Furthermore, injured children avoided social interactions because they were worried about what others might think of changes in their physical appearance such as scars, external fixators, or having a limp [19,24]. Their friendships became weaker as they thought their friends no longer understood them and conflicts frequently developed between them [19]. They then tended to establish new friendships with other children with an injury or illness, as they could relate to each other better [19].

3.3.3. Perceived Health Needs

Children who developed post-traumatic stress could have different needs. First, several studies found that the most commonly expressed need among traumatised children was emotional support. They indicated a need to freely talk about their feelings with someone they trusted [30,32]. Families could play a vital role in providing emotional support and physical closeness, especially comforting and reassuring anxious children during medical procedures [11,17,18,24].

Second, social support provided genuine understanding, empathy, and mutual support from peers, health and educational professionals, and communities. Examples included counselling and mentorship at school and church [16]. Two studies showed that brain-injured children liked to communicate with peers undergoing a similar situation and discuss how they handled their problems [25,30]. When support was perceived as pleasant and good, it had a positive effect on the children getting through the traumatic experience.

Third, traumatised children expressed a desire for more detailed information. Because of post-traumatic amnesia or loss of consciousness, children desired having more detailed information than what was suitable to their developmental age [25,30]. Children of parents with brain injury-related experiences expressed their need for more information and advice about living with someone with a brain injury and managing their anxiety [30].

Fourth, traumatised children expressed a desire to play. Children who lived with or had experiences with their injured or ill parents often felt bored, wanted to play with their peers, and returned to their usual activities [24,25]. A study found that play as an activity can dramatically change a traumatised child's life at home and in hospital [11]. Immediately or sometime after post-injury, children needed emotional support, social connections, and detailed information, which helps them counteract feelings of being abandoned, alone, and anxious [23,25].

3.3.4. Coping Strategies Related to Trauma and Stress

Most of the included studies indicated that traumatised children reported using cognitive and behavioural coping strategies to deal with trauma and stress. They sometimes used more than one coping strategy simultaneously, with each one reinforcing the others. The most used coping strategies are described as follows.

Cognitive Coping Strategies

The most commonly reported cognitive coping strategies were positive thinking, distraction, turning to religion and praying, rationalisation, and acceptance. The consistent use of cognitive distancing strategies that involved distraction and cognitive avoidance, such as leisure activities, could help both younger and older children to forget or at least take a break from complicated thoughts about traumatic events, including the loss of a loved one, tsunamis, and parental-illness-related issues [15–17,23,25,26,28–30]. Making use of positive thinking, mainly focusing on positive outcomes, and using

positive affirmations, might help children to calm down and overcome distressing memories [18,23,25,29–31]. Moreover, turning to religion and prayer appeared to help children who experienced traumatic events (e.g., violence and natural disasters) obtain safety and comfort by seeking God's blessing, asking for forgiveness, giving strength, and providing hope for the future [16,23,32]. Rationalisation and acceptance might also help children accept and adapt to their changed life circumstances [23,25,29,30].

Behavioural Coping Strategies

The behavioural coping strategies undertaken by children in most studies included behavioural avoidance, talking to others, seeking support, helping others, gradual exposure, suppression of emotions, relaxation, and/or risky and aggressive behaviours. To prevent further distress, traumatised children reported using behavioural avoidance and suppression of emotions such as deliberately not crying, being quiet, and withdrawing socially [15,18,20,22,28–30]. In contrast, children with burn-injury-related trauma were more likely to use gradual exposure to face their fears [18]. In a study of people in political detention, early exposure to social activities seemed helpful for children in overcoming their trauma and enhancing feelings of belonging and a sense of commitment to social issues [22]. Talking to others, such as family members and friends, and seeking support were reported to be particularly helpful in dealing with negative feelings [16–18,23,26,29,30,32]. Additionally, relaxation techniques, such as deep breathing, were sometimes used to ease participants' intense emotions [18,30]. Older children who experienced tsunami and parental-illness-related trauma reported that helping people in need made them feel valued [23,25]. On the other hand, children who experienced the sudden loss of a parent and violence-related trauma developed risky behaviours, including stealing, fighting, or other criminal activities, to cope with the pressure and increase their sense of safety [15–17,29].

3.3.5. Growth from Traumatic Experience

Traumatic experiences could also produce some positive outcomes and benefits. The experience of trauma could help children to realise the meaning and importance of life, and some were even able to positively reframe and transform their experiences [15,17,24,28,29,31]. Some children reported feeling closer to others, such as their parents [17,25,31]. In addition, trauma could also prompt new life goals and action plans to help others in need and live well by committing to a changed lifestyle [15,18,24,28,31]. Furthermore, children might become more confident, courageous, resilient [15,22,24,31], and more able to overcome difficulties [15,28,31]. Some children became more religious and closer to God by praying and seeking God's blessing [15,16,23,31].

4. Discussion

This systematic review aimed to consolidate the best available current qualitative studies on children's perspectives of their traumatic experiences and related responses. The findings could help health professionals and researchers integrate the best evidence and most important needs/concerns from these vulnerable groups of children who had traumatic experiences. A total of 19 qualitative studies and their findings were examined and summarised to understand perceived daily-life problems related to trauma, responses to trauma, perceived needs, coping strategies, and growth from trauma experiences. The review consistently found that traumatised children were often living in debilitating and stressful conditions that exacerbated their negative physical, psychological, and behavioural responses to trauma and interfered with their psychological well-being and daily functions, such as with self-care. This finding suggests that paying attention to the traumatised children's voices and feelings is necessary, alongside the provision of timely care and support.

Parents and peers could play an important role in children's recovery from traumatic experiences by providing physical closeness and genuine understanding. Children might emphasise the importance of emotional and mutual support from their family and peers

after a traumatic event. Children's distress levels can be reduced when being supported by peers and other social contacts with open sharing, psychological comfort, empathy, and reassurance [33]. Parents are often children's leading source of support post-trauma, and parental behaviours may mediate children's resilience [34]. This review elaborated on the traumatised children's perceptions of family and peer support and encouraged them to engage, participate, and assist in specialised intervention strategies. Furthermore, the findings highlight the need for caregivers and peers to provide further guidance and support during their child's physical and emotional recovery.

There might be a lack of resources among traumatised children to cope with their situation. The most common coping strategy reported across studies was the persistent avoidance of stimuli that were associated with trauma events. Avoidance coping seemed not to work in the long-term. The negative effect of continued avoidant coping was especially well-examined in research, including a higher level of depression and PTSD symptoms [35,36]. Among the included studies, traumatised children reported a need for support, resources, and information about their situation [25,30]. Therefore, it is important to facilitate traumatised children's help-seeking and help them master healthy coping skills. This evidence highlights the need to provide easily accessible trauma-specific services and interventions that help them understand and better cope with their negative psychological responses and related stress towards the traumatic experiences.

Traumatised children often had negative responses and consequences to trauma. However, on the other hand, some could experience positive life changes after trauma, including realising the meaning of life and thinking of survival as a second chance to live better. Consistent with recent studies, growth after trauma could also be found in traumatised children, together with those above-mentioned negative impacts. Mancini et al. [37] found that traumatic experiences could be a reason for survivors to enhance their psychological well-being by self-reflecting and overcoming their difficulties. However, post-traumatic growth, which seems like a coping mechanism and defence against the pathogenic consequences of trauma, lacks adaptive value that reduces distress, depression, and anxiety levels [38]. The extents of their impairments may depend on whether they have had access to mental health services, and/or whether they were kept safe from compounding traumatic events [39]. Given the stress responses in traumatised children who experienced growth, early screening and identification of both positive and negative impacts of traumatic events, with subsequent appropriate and timely intervention designed to strengthen and weaken these impacts respectively, are necessary.

Interviewing children about their responses to traumatic experiences is important for understanding their thoughts and situations. Common subjective experiences and impacts of trauma were revealed. However, getting a child to reflect on their life situation, functioning, and well-being, especially when negative and traumatic in nature, is challenging because children lack verbal and conceptual abilities, and the competence of recall, as well as an overall narrative to share their experiences due to their developmental stages [11,40,41]. When interviewing young children, the presence of parents during the interview may enhance the data as parents can give cues to the child and explain interview questions and scenarios [42]. Interviews with young children should involve caregivers and focus more on behavioural manifestations than on verbal descriptions of their internal state [43]. Furthermore, tailored assessment methods, such as examining verbal and non-verbal expressions, perceptions, and level of understanding, should be considered [40,41]. Future assessments and qualitative research on children and trauma should adopt more tailored and child-friendly methodologies such as pre-meeting interviews with families for building rapport and confidential relationship and individual or parental presence interview depending on the children's preference [44].

Strengths and Limitations of the Review

The findings of this systematic review had several implications for practice and future research in the fields of post-traumatic stress and children care. First, the results highlighted

the importance of children's perspectives in assessment and research. As suggested by Coyne [45], conducting research with children was essential and important to gain access to and a clear understanding of the child's views or make them visible. It highlights the need for early, appropriate, and evidence-based screening, as well as identification and interventions for traumatised children. Second, traumatised children may experience complex events/situations and feelings of loss and stress that need to be shared with their peers to normalise and validate their experiences. To facilitate traumatised children's sharing of trauma narratives and peer support, practitioners and educators can apply the mutual aid model of group work and trauma-informed care principles in their practice [46]. Third, to provide effective and timely support for traumatised children, caregivers and professionals who are working with traumatised children need to be aware of information such as common post-traumatic stress/PTSD symptoms and guidelines on how to intervene. Fourth, future qualitative research on children and trauma care can compare children's reactions and coping strategies in diverse samples, such as children with different exposures (single versus multiple; different types/natures and severity), traumatic experiences, and sociocultural backgrounds.

Several methodological limitations of the review need to be considered. First, we only examined qualitative studies in English and might have missed some relevant evidence in other languages. Second, the review did not impose requirements on the minimum levels or varieties of post-traumatic stress symptoms and types of traumatic events, as well as the recall bias induced by a longer period of exposure from the traumatic event. In addition, some studies did not mention the length of time since the children experienced trauma, which might compromise the validity and generalisability of the findings.

5. Conclusions

This review has provided comprehensive evidence of the experiences and perspectives of individual traumatised children about their responses, impacts/challenges, needs, and coping with trauma. The review found that traumatic experiences lead to disruptions in traumatised children's daily lives, mood swings towards traumatic experiences and various aspects such as well-being, mental health, and changes in behaviours. The children appeared to try to manage the psychological stress that arises from trauma through different behavioural and cognitive coping strategies. For instance, they sometimes used persistent avoidance of trauma-related stimuli, which could not work well or was found to be ineffective in long-term. This evidence supports the inclusion of the voice and perspective of children and in both the assessment and intervention regarding post-traumatic stress reaction or disorder. To facilitate traumatised children's understanding to better cope with their stress and related impacts, there is a pressing need to provide early assessment and appropriate intervention based on these children's individual concerns and needs to minimise post-traumatic stress symptoms, and thus, the subsequent emergence of PTSD.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/bs13020170/s1, Table S1: Quality appraisal of studies reviewed; Table S2: Themes, subthemes, and examples of illustrative verbatim quotes.

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Article

Perceptions on Their Own Social Participation: A Qualitative Exploration of Ethiopian Secondary Students with Visual Impairments

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Abstract: Social participation is a vital part of life and has multifaceted positive outcomes on personal health and wellbeing. Social participation or the lack thereof might have more profound psychological impacts on individuals in a collectivist culture than its counterpart. The current study explored personal and environmental barriers that have hindered the effective social participation of secondary students with visual impairments. Exploration addressed various activities in and outside school settings in Ethiopia and discussed findings in relation to the prevailing cultural orientation. In-depth semi-structured interviews were conducted to gather qualitative data on barriers to social participation of 17 secondary students with visual impairments in Addis Ababa, Ethiopia. The qualitative data were analysed thematically, yielding four major themes and identifying twenty sub-themes that limited the social participation of students with visual impairments, such as personal, attitudinal, sociocultural, and practical barriers. The study showed a range of barriers that participants experienced related to social participation, the criticality of cultural orientation in providing context to understand the impacts of social participation, and the need for future research in the area.

Keywords: visual impairments; social participation; secondary students; disability; Ethiopia

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1. Introduction

Social participation is key to human beings and a remedy for social isolation [1]. It encompasses an individual's involvement in a variety of formal and informal activities [2,3] "ranging from working for organisations to inter-personal and friendship activities" [4] (p. 448). Social activities enhance quality of life, health, wellbeing, self-esteem, and social and cognitive skills [1,2,5–7]. The nature of the activities involved and the participant's age determine the benefits one may obtain from social participation. For instance, while social participation helps children to develop social skills and knowledge through interactions [5], it also improves health for older adults [2,8], and significantly impacts dimensions of identity in adolescence and emerging adulthood [9].

Despite the range of advantages that social participation provides, not everyone in a society has equal access and opportunity to participate [10]. Historical accounts have shown that people with disabilities (PWDs) were generally among the socially excluded groups [11]. Some exclusionary practices included hiding, forsaking, and killing children with disabilities [11,12]. Similarly, people with visual impairments (PVIs) (including students with visual impairments (SVIs)) are commonly reported to have lower social participation and face a great risk of sociocultural exclusion from everyday life activities [13–22].

Previous studies discuss various personal and environmental factors that restrict individuals' social participation, including functional abilities, skills, and personal interests, as well as cultural, physical, social, and institutional environments [23]. Yet, some shortcomings have also been demonstrated in the social participation literature as most research

on the topic focuses on the participation of older and retired adults (e.g., [1,24,25]), or on certain activities, such as physical activities (e.g., [26,27]) in school settings (e.g., [28,29]), and in formal services. However, little attention has been paid to individuals' participation in the community (e.g., [30]). Notably, most empirical evidence mainly concerns the conditions of PWDs in the global north, although 80% of them live in the developing world [31], especially in Africa.

Additionally, although the impacts of participation on health, wellbeing, socio-economic status, and quality of life have been well documented [32–37], the findings' implications have rarely been explained against cultural contexts. Considering the cultural dimension is essential, especially in disability studies [38], as society's beliefs considerably shape norms, values, attitudes, and the reality for PWDs. Culture influences social relationships and interpretations [39] and determines perspectives on what disability is and how PWDs are treated [40]. It provides context to understand PWDs' disabilities and participation in a given society. In Ethiopia, the belief that disability is a punishment from God for one's parents' sinful deeds [41] may be used to justify the exclusion of PWDs [42]. Cultural beliefs also affect the early identification of and interventions for children with disabilities [43]. The theoretical resources for the cultural model of disability espouses that "disability cannot be taken as a given but that its meanings must be understood as inherently part of culture" [38] (p. 6).

Moreover, the implications of cultural orientation as an individualist and collectivist culture in studying social participation may provide additional clues on the severity of outcomes. Individualism–collectivism is one of the dimensions that help explain cultural differences [44]. In an individualistic cultural context, individuals are deemed to stand independently and have distant social relationships. In contrast, social relationships, roles, and status are the defining elements in collectivist cultures [45,46]. Ethiopia is culturally highly collectivistic, involving group obligation and relationships to subdue individual interests [47]. Subsequently, being stigmatised in a collectivistic cultural context usually has adverse relational impacts because, in this cultural reality, norms determine relationships and are enforced without explicit communication. Ethiopia, a country with a high-context (collectivist) culture, tends to have more implicit and vaguer verbal and non-verbal communications, powerfully controlling individual society members in many subtle ways [47] and impacting social interactions and participation. For those with disabilities, this situational circumstance often presents additional difficulties in hindering their meaningful communication and social engagement.

Because social life and relationships are more valued in a collectivist cultural context [46,48–50], the feelings social deprivation creates would ostensibly be more intense. Beyond the direct disadvantages of inadequate social resources, the meaning and value attached to social worth (in the context of collectivistic culture) can cause psychological trouble. To this effect, empirical evidence shows that culture impacts individuals' psychological processes [51], identity, and personality [52]. This might imply that (a) cultural context highly influences the participation of exceptional groups in a society; and (b) there is bitterness of social exclusion for individuals in a collectivist culture, in which social relations, support, and interdependence are essential.

Given the critical impact of culture on the health and wellbeing of participants, the present study aimed to explore the barriers to social participation for secondary SVIs in Ethiopia. A secondary school setting encompasses more social interactions [53] and (even in the best of circumstances) is one of the most difficult settings involving intense biological and social pressure on students [54]. Given these perspectives, this study focuses on the experiences and perceptions of secondary SVIs regarding their participation in structured and unstructured social activities in and out of school settings. The findings are discussed in relation to the collectivist cultural context in which the participants are acculturated.

2. Materials and Methods

2.1. Design

This study used an exploratory multi-case qualitative design to understand complex situations contextually [55,56]. Using the qualitative method, individual semi-structured interviews were conducted with secondary SVIs. The design enabled free exploration of the complexities of the social participation phenomenon and provided insight into how SVIs experienced and perceived the phenomenon in their school and community settings while participating in formal and informal activities.

2.2. Participants and Settings

With the help of school officers, seventeen participants who had only vision impairments and were willing to share their experiences were selected from three inclusive secondary schools in Addis Ababa. To be able to see the impacts of vision impairment and other personal and environmental contextual factors on social participation, SVIs with additional disabilities were not included. Variations in the number of SVIs in a school setting may cause changes in the pattern of social interactions and participation. Three schools (with relatively higher and lower numbers of SVIs) were selected to gain insight into the impacts of this variation. While Schools A and B had higher numbers of SVIs (n = 22 and n = 14, respectively), School C had only two. Of the 17 participating SVIs, 5 were male and 12 were female; 6 were students with blindness, while 11 had low vision; none had any additional impairment. The students' ages ranged from 17 to 22, with the average age being 19.88. Perhaps due to their impairments, the participants were older than typical students, on average. Additionally, while three students were impaired from birth, the remaining 14 acquired their impairment when they were between one and seven years old.

2.3. Procedure

This study was approved by the Human Research Ethics Committee of the authors' university. The Addis Ababa City Administration Bureau of Education granted a letter of support to the schools. Consent letters, including confidentiality clauses and participants' rights, were then prepared. As the participants could not read and few were under 18, proxy consents were obtained from their parents or caregivers to participate in the study and publish this paper. Interviews were conducted in the participants' schools. Field notes were taken, and each interview was recorded, except for four students unwilling to be audio-recorded.

Focus group discussion was conducted as a pilot study to help reframe the research design, refine the research questions, and clarify the concepts and languages used in the interview protocol. Some changes included selecting the most appropriate term for vision impairment (*ayne-siwur* instead of *mayet yetesanew*) in the Amharic language and deciding to do semi-structured interviews instead of focus group interviews to avoid participants' discomfort about disclosing personal and family-related issues observed during group discussion. The interview questions, which included participants' demographic information and their families' socio-economic backgrounds, were designed to explore diverse personal and environmental barriers and understand how they denied SVIs access and participation opportunities in and outside school settings. Each interview took an average of 45 to 60 min. Respondents also confirmed that their responses had been transcribed correctly and that the findings and conclusions were reasonably drawn.

2.4. Data Analysis

In this study, data were analysed thematically. The thematic analysis involves searching for common patterns of meaning to emerge as significant themes for describing the phenomenon [57]. Braun and Clarke's Stages of Thematic Analysis [58] were applied in this study. The collected data were transcribed and organised in a readable format with which we became familiarised. As part of the analysis, familiarity took a long time, un-

til the researchers better understood what was raised by whom and so on. This further involved a conscious examination of the data in terms of their relevance to the research questions. This step of data examination was followed by coding, another important data analysis stage. Coding involves identifying relevant and related aspects of the research questions [58]. Accordingly, concepts and ideas crucial to the basic questions of the research were identified from the data, categorised, and formed themes (see Appendix A, Table A1). The authors re-examined the themes, sub-themes, and codes before achieving consensus. Participants' responses were tabulated to see the distribution of themes and facilitate using measuring words (such as a majority of, a few of . . . participants) to indicate the number of respondents sharing similar opinions while presenting results (see Appendix B, Table A2).

3. Results

The study participants reported many similar and unique social participation experiences across settings. The prevailing cultural beliefs toward PWDs and the similarity of personal and environmental conditions may explain the resemblance. The analysis gave rise to four major themes and twenty sub-themes (see Figure 1 below). Each theme was based on significant barriers to social participation in formal (extra-curricular, community-based platforms, religious services, and events) and informal (family-based social events, community-based sport and artistic events, sociocultural ceremonies, social relationships, and hanging out with friends) activities at home, in the community, and in school settings. The emerged themes are presented as follows in Figure 1: (I) Personal barriers; (II) Attitudinal barriers; (III) Sociocultural barriers; and (IV) Practical barriers.

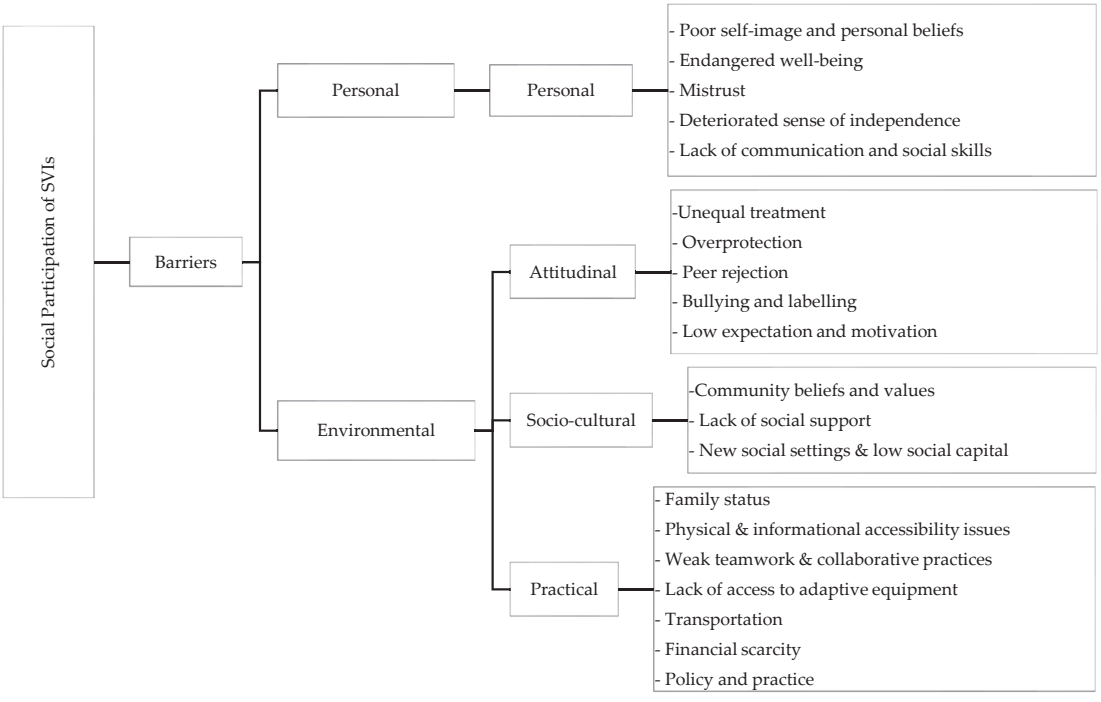

Figure 1. Themes and sub-themes which emerged from interviews with SVIs.

3.1. Theme I: Personal Barriers

The first theme that SVIs experienced as personal barriers limiting social participation across settings addressed students' personal beliefs, world views, and skills. The study found that these barriers did not exist in isolation but were subject to other environmental

factors, mainly cultural values. Interaction with environmental factors and their personal conditions imprisoned SVIs in their solitary zones, as detailed below.

3.1.1. Poor Self-Image and Personal Beliefs

All participants discussed their personal factors limiting participation in social activities at home, in the community, and at school. In their responses, feelings of "worthlessness" were identified in various ways as a hindrance to social participation. Some participants plainly indicated that their impairments ruined their perceptions of themselves: "*My impairment is my weakness. I feel low and undeserving and then try to isolate myself*" (S13). Most participants believed they steadily developed these negative personal beliefs due to the influence of and their unyielding interactions with the social environment. They even thought that their self-image directly replicated society's image of them. A Grade 11 student stated his anguish, saying, "*I don't believe people will accept me. The surrounding social environment already made me believe what they do . . . I see the way people see me*" (S11, from School B, Grade 11). Some participants also explained that they faced challenges whenever they tried to develop a positive self-belief and new reactions. For example, one student stated, "*Sometimes when I feel good about myself and relax, someone will appear to remind me that impairment is an enemy to being equal, independent, and other similar stuff, which always makes me feel low. I often say, 'maybe they are right*" (S15, from School B, Grade 12). These participants highlighted that whatever caused self-doubt and poor self-image would likely also affect their confidence and social participation.

3.1.2. Endangered Wellbeing

The interview discussions with the students showed that most were often stressed and unhappy about themselves due to their impairment. They revealed that their lack of satisfaction affected their social lives across different settings. A Grade 12 student concisely stated, "*I don't feel happy due to my impairment . . . I don't feel psychologically well and often prefer to stay alone as a result*" (S13, from School B, Grade 12); "*I also feel insecure and threatened when I think about the social world*" (S7). Not surprisingly, participants indicated that due to their enormous daily challenges because of their impairments, they were in constant conflict with their inner peace, further influencing their social participation patterns. The data indicated that because most regularly experienced stress and their subjective wellbeing was threatened, SVIs often lost the enthusiasm to have a more comprehensive social network and participation in and outside the school settings: "*Going out and meeting people needs positive energy and feelings. How come you think in the first place to intrude into other's boundaries while you feel low*?" (S11, from School B, Grade 11).

3.1.3. Mistrust

The interview results with SVIs showed that most were sceptical of some relationships. They reported that prior experiences of some people's misbehaviours affected their trust and social participation. One participant concisely said, "*Some people take advantage of our vision loss in the name of support. I've been deceived a few times*" (S5, School A, Grade 11); "*I experienced theft and harassment on different occasions. Going out always has consequences*" (S8). In addition to material deceptions and other physical crimes, two female participants reported experiencing sexual abuse, which ruined their social trust: "*A few weeks after I came here [to the capital], someone whom I haven't recognised yet tried to rape me, pretending that he would help*" (S9, School A, Grade 12). This and other abuses and misconduct altered the trust SVIs had, especially in new people, impacting their social participation and independent movement: "*Could you imagine someone who has sight will steal your white cane? . . . But, this happened to me. That sort of experience spoils my social life in general*" (S4). Most participants highlighted the risk of finding themselves in strange places with strange people due to their fear of multiple types of crimes, directly impacting their mobility and participation.

3.1.4. Deteriorated Sense of Independence

Interesting views were reflected regarding the need for independence in the existing social context of Ethiopia. While some acknowledged the risk of being independent, others expressed concern that their lack of autonomy hindered social participation. Participants who doubted the importance of independence for participation mentioned the risks (raised above) of being independent and the nature of social life in Ethiopia: "*We are culturally interdependent. Deviating from the group and standing alone would give a hard time instead*" (S10). However, these participants did not deny the essentiality of independent life skills, such as independently participating in self-caring. Participating students who highly favoured independence as social enablers explained that their lack of skills to manage their everyday life independently affects their social participation: "*There are times you need to do things on your own. Seeking out others' support will restrict your reach*" (S8, School A, Grade 12). This same student noted that failure to do things independently inevitably causes feelings of shame which impacts the enthusiasm to participate in a social gathering. Additionally, difficulties in identifying places, travelling alone, and making independent decisions were reported to hinder participation. One student said, "*The need for independence skills begins when you wake up and never ends even after sleeping. You may learn some of these skills, but others will still affect your daily activities, including social participation*" (S5, School A, Grade 11).

3.1.5. Lack of Communication and Social Skills

Most participating SVIs revealed a lack of interpersonal and social skills, which rendered them socially isolated. For these participants, such skills are compulsory for social engagement. They categorised their personalities as 'shy' and 'introverted': "*I don't have the know-how or experience to introduce myself and initiate a discussion with someone who is not intimate*" (S3, from School A, Grade 9). Some participants did not mention that such difficulties might have their roots in the past. In the interviews, most participants stated that many social problems accompanied their childhood. The data revealed that almost all participants experienced loneliness during childhood as their parents hid them in fear of social pressures: "*I rarely met and played with peers in my childhood, which may have deprived me of learning some skills*" (S8). Similarly, all participants who experienced vision impairments from birth (S3, S9, and S13) and ten other participants who acquired the impairments at age three or younger indicated they had few chances to play with peers during childhood. According to these participants, this experience resulted in, among other things, poor communication and social skills—which were reported as crucial skills for social participation. Participants believed that the sociocultural climate did not provide fertile ground to ensure personal growth and considered it the reason they were denied opportunities to learn basic skills during their formative age. The lost opportunities are now underlined as they are crucial social roles for a young adult.

3.2. Theme II: Attitudinal Barriers

Unfavourable attitudes across settings caused massive damage to SVIs. Participants unanimously reported that attitudinal barriers considerably limit their social participation. They noted that barriers pertaining to attitudes toward them vary in their nature.

3.2.1. Unequal Treatment

Most students in this study reported unequal treatment and privilege across settings compared to their siblings and sighted peers at home and beyond. One student commented, "*Even my parents favour my siblings both in material and non-material aspects. Once I was told that I only needed a few things as I had little mobility compared to my two brothers*" (S1, School A, Grade 9). Most participants also reported having fewer opportunities to participate in family social networks: "*Physical presence doesn't guarantee equal treatment, which is worse than isolation*" (S14). Most participants disclosed that parents, neighbours, and teachers vehemently favoured sighted children and seemed to agree on the primary cause

of such maltreatment: "*People do not behave the same way if this is not where we're culturally positioned*" (S6).

3.2.2. Overprotection

Overprotection was reported and various other relevant factors impacted their social participation, including independence, skill learning, and relationship formation. Participants also mentioned that overprotection by family and caregivers, especially during their younger years, was a barrier to learning social skills and establishing social networks: "*I've rarely been left alone whenever I'm out of my home*" (S17). Most participants agreed that overprotection hampered their social participation and facilitated social exclusion. Some SVIs, such as S5 and S6 (S5, from School A, Grade 11; S6, from School A, Grade 11), felt suffocated and manipulated when they were overly protected. According to them, parents tried to control every move they made for diverse reasons, including fear of accidents and stigma. One student said, "*Even if I've changed, I've still been protected [by my parents] like I used to be a decade ago. I can't hang out with friends*" (S6, School A, Grade 11). Many students still living with their families said that overprotection was an attitudinal enemy to social participation.

3.2.3. Peer Rejection

In school, SVIs reported having distant relationships with peers, teachers and the school community, often experiencing rejection by their peers: "*Rejection can be common to everyone, but the most common experience to us, everywhere by everybody*" (S7). Most students expressed dissatisfaction with their relationships with the school community, particularly with peers. According to one Grade 11 student in School B, "*Peer rejection is common. Sighted peers perceive us as dependent and leave us alone*" (S12, from School B, Grade 11). According to these participants, a lack of interest on the other end of the relationship substantially impacted their social relationships and participation. Some participants experienced sharp pain due to peer rejection: "*Rejection is denying a relationship and social space, an insult that disgraces the rejected*" (S14). Many of these participants were excommunicated and experienced rejection at least once in their life.

3.2.4. Bullying and Labelling

Bullying and labelling were commonly reported barriers to SVIs' social participation in schools. Most participating students encountered these challenges repeatedly; "*For me, bullying alone can lead to self-isolation; it's painful*" (S17). Data showed that these problems increased in secondary school. Participants revealed that some sighted students worked hard to make fun of them, which is detrimental to their social participation in school. Regarding these school phenomena, a student said the following:

> *"I finally discovered that I had a nickname used by sighted students. I tried to reach the name giver but couldn't. I reported to the school, but in vain. I have no option other than learning with students who don't call you by your name"* (S9, from School A, Grade 12).

These and other experiences of bullying and labelling were mentioned in association with ostracising environmental factors. Keeping oneself away from participation was seen as a solution.

3.2.5. Low Expectations and Motivation

Most participating students revealed that low expectations and motivation significantly limited their participation. This challenge, according to participants, has its root at home and elsewhere: "*Some people put you down even in tasks or activities that do not necessarily require visual ability. They will jump over you and invite others instead. Teachers, peers, parents, siblings, neighbours all do this thing*" (S12, from School B, Grade 11). Those students who mentioned low motivation and expectation as social environments disabling participation made it clear that spending time with people who viewed one as a quiet achiever was painful: "*Some people will tell you that this is not for you... It's an insult that you are incapable . . .*

Such tendency loosens social networks" (S17, from School C, Grade 10). Participants showed that this circumstance eroded their interest in companionship and weakened participation.

3.3. Theme III: Sociocultural Barriers

3.3.1. Community's Beliefs and Cultural Values

One of the most problematic areas for SVIs' social participation rests on the social value system. Participating SVIs unanimously agreed that community beliefs and cultural values are among the most critical barriers to social participation and the primary source of the other challenges they encountered: "*The very reason behind our miserable childhood lies in our culture. With the culture, the misery still follows us*" (S1). Participants revealed that viewing blindness as a punishment from God was a prevailing belief and reported continuous suffering. One participant delineated, "*Some people see us as a reminder of finding a reason to praise God as a result of not being [created] blind like us*" (S8, from School A, Grade 12). This belief was referred to as a boundary that made SVIs feel alone and was a deterrence to social participation.

3.3.2. Lack of Social Support

Most participants revealed that a lack of social support was a crucial barrier to widening social networks and participation. Some students reported rarely receiving psychosocial support from all but a few friends and family members. Participants agreed that non-material support does not cost schools or the community extra resources but remains scarce regardless of its benefits, further presenting challenges to social relationships: "*If there is no one to encourage and make you feel comfortable, you are already isolated*" (S2, School A, Grade 9).

3.3.3. New Social Setting and Low Social Capital

Some participants raised the point that moving from one place of residence to another and changing schools practically limited social networks and caused estrangement. According to them, such a limitation hinders meaningful social participation. As the participating students' demographic information indicated, most migrated to the capital in search of opportunities, including schooling. According to them, this circumstance prevented them from finding friends in their neighbourhoods and schools. A Grade 9 student (S3, from School A, Grade 9) said, "*One of my major problems since I came here [Addis Ababa] is to find people I know well. I'm still viewed as a stranger in the city and know limited friends*".

3.4. Theme IV: Practical Barriers

3.4.1. Family Status

Most participants revealed that their low family socio-economic background contributed to their reduced social participation. Most came to the capital due to poverty and a lack of opportunity in other cities. Additionally, for those who lived with their families, social participation was not an accessible business. Families were usually busy making ends meet and were less concerned with their children's social needs. Some indicated that leisure activities cost money and time, which their families always lacked. A student added, "*My family must sweat to ensure our daily subsistence. No one cares about issues of this kind [participation]. I don't even think that it's important as compared to our pressing problems*" (S6, from School A, Grade 11).

3.4.2. Lack of Access to Adaptive Equipment

Students revealed that essential assistive equipment—such as a tactile map, compass, flashlights, sunglasses, and a long cane—is very scarce: "*I only know a list of assistive equipment by name while some of my friends talk about them. They are far from my daily life*" (S12, School B, Grade 11). Most students clarified that their families could not provide such materials, and support from other bodies was limited. According to these participants, the absence of such equipment restricted social participation. One student noted, "*Some*

equipment facilitates mobility and independence. The lack of them would have an adverse impact not only on social participation but also daily lives" (S17, School C, Grade 10).

3.4.3. Physical and Informational Accessibility Issues

Nearly all participating students reported that the physical environment in classrooms, schools, and the community presented immense difficulties in mobility and participation. Most participants indicated that moving from place to place without support was challenging in classrooms, schools, and outside schools: "*It's impossible to move and use facilities in school independently freely*" (S15, School B, Grade 12). Participants reported that uneven grounds, open ditches, wells, and roadblocks limited their mobility and social relationships. According to such SVIs, even classrooms lacked the proper arrangements of chairs and other items needed to make mobility free and without difficulty. The interview data indicated that beyond limiting SVIs' mobility and social participation, physical barriers in and outside school caused multiple bodily injuries.

Most participants reported that access to relevant and timely information helped them remain included. Information, in this case, refers to evidence that SVIs can get from various sources in every possible way, including print, online, electronic, and word of mouth. They agreed that information is a method and resource to explore the environment. However, these students indicated they did not receive information, raising their dependency level across settings and hindering participation in some social activities. One student added, "*I missed attending some free-of-charge leisure activities due to inaccessible information both in school and the community*" (S10, School B, Grade 11). When essential information was communicated visually through reading and writing, SVIs had to seek information from their sighted peers.

3.4.4. Weak Teamwork and Collaborative Practices

Findings revealed that teamwork is poorly practised in all schools. Participants described a pre-2018 collaboration practice in which every primary and secondary public school organised students into five-member groups. In addition, a student leader was often selected within each group, with the responsibility to help other members, head the discussions, and report the progress of group members. This system was said to be interrupted following the country's political reform in 2018, as explained during the data collection.

Most SVIs highlighted the absence of alternatives or practices to encourage teamwork and collaboration. One student said, "With all its weaknesses, the former practice created a chance for me to meet peers and know each other. But there's no such thing now to keep us networked" (S7, School A). Similarly, another student mentioned the social and academic benefits of teamwork: "Teamwork practice helped me to get support. Peers in the group tried to explain what I did not understand during classroom discussion. It was also social as we became friends in the process" (S11, School B). The results showed that the absence of such practices prohibits chances to connect with peers.

3.4.5. Transportation

Transportation in the capital was reported to be very difficult for SVIs. According to participants, the transportation system deters mobility and participation. Students revealed that losing one's personal belongings on public transport was very common in the city. Moreover, for the study participants, buying a ticket and getting on and off the city buses (the type of transportation they regularly use) were terrible experiences. Most participants agreed that such inconveniences negatively impacted SVIs' mobility and social participation.

3.4.6. Financial Scarcity

Most participants explained that financial resources were significant barriers to social participation. Some SVIs lived independently, struggling financially to make ends

meet. They did different things to get money, including selling tickets to the national lottery agency (see the interview transcript of a student in Appendix A). Those SVIs were always busy with their survival and overcoming financial hardships to cover their expenses. Due to this, they found seeking additional support to meet social and special needs acceptable. They believed that accessing additional financial resources improved mobility, independence, and social participation. However, the findings showed an acute shortage of financial resources needed to strengthen SVIs' participation and life trajectory across settings.

3.4.7. Policy and Practice

Participants reported that poorly executed policies and legislation, as well as institutional malpractices, hindered SWDs' social participation. The government's failure to effectively execute legal and policy provisions and supervise their status was reported as a significant barrier to SVIs' social participation.

> *"You see, to say 'the sky is the limit' on policy documents is not a big deal. Everybody can say that. To implement them and provide limitless opportunities is the one that makes the difference."* (S11, Grade 11, School B).

Moreover, some participants indicated that malpractice, including physical and informational inaccessibility, lack of courtesy, differential treatment, etc., in public institutions and services, such as media, presented multiple challenges to images of and attitudes toward SVIs, further hurting their social participation.

4. Discussion

Ethiopia is culturally collectivist [47], and maintaining relationships is highly valued [50]. In a collectivist culture, emotions are linked with assessments of social worth and connection—not with individuals' inner world and subjective self, as in individualist cultures [46]. Culture influences personality [50] and is crucial to shaping interactions and behaviour and informing decisions [59], which are all critical to social participation. An individual's worldview (which is hugely culturally formed) determines preferences for participation [60]. Thus, culture provides a lens through which individuals view themselves and others, which is crucial to social engagement, especially in a collectivist cultural orientation.

Most participating SVIs developed self-doubt in many areas of their lives, affecting their social networks and participation at home, school, and community. Although negative self-perception and its behavioural impact among young people with vision impairment has research evidence [53], in a collectivist culture—where social adjustment and interdependence within groups are eminent [50]—the severe impact of social exclusion has been rarely discussed. The visually impaired participants' assumptions about how others would perceive them and their attendant feelings of embarrassment limited their participation in sports and arts activities [60]. In a collectivist cultural orientation, emotions are emerged, embedded, and reflected as relational phenomena [46], and the kinds of relationships one has influence emotions and attendant actions. In this case, self-perception in a culturally collectivist society was affected by relational feedback, which further impacted other areas of life, including social participation. Poor self-esteem [61,62], insecurity, stress, and life dissatisfaction severely hindered social participation. Stress is negatively associated with participation in social and leisure activities [63]. SVIs' low level of independence was reported to affect their social participation as a personal barrier. In a collectivist culture, people generally are less independent and likely to maintain the will of in-groups [49]. The fact that social interdependence is a defining element of a collectivist culture suggests that visually impaired people's lack of independence might not only be associated with their impairment [49]. Individuals in such contexts prefer maintaining relationships to acting and accomplishing competitively [48,50].

The community's negative attitudes toward PWDs in Ethiopia, including those with vision impairments, has earlier research evidence [64–66]. Multiple studies show that

students with special needs experience more negative attitudes in school settings than those without impairments. Harassing behaviours and bullying of students with impairments by their non-disabled peers are among the commonly reported negative attitudes affecting social participation at school [67,68].

The influence of culture on forming attitudes, opinions, and personalities has been well documented [50,69,70], and non-disabled peers, teachers, family, and community members might learn to behave as they do toward SVIs through socialisation since childhood as normative behaviour. Notably, people with collectivist values tend to conform to the existing norm, as members are relationship-oriented and value group harmony [48,50]. Low levels of expectation and motivation in SVIs contribute to their social disengagement as attitudinal barriers. Similar findings also show the positive association between PWDs' levels of expectation and confidence [71] and the latter's impact on social participation [61,62].

In this study, community, societal, and cultural values remarkably restricted SVIs' social participation. In this regard, Rao et al. [72] noted that variations in stigmatising attitudes across different cultures might be interpreted through cultural characteristics. Participants highlighted how misconceptions about disability as a punishment for sin limit their social participation. Other studies' findings reveal that erroneous community beliefs and values are the most daunting social challenges to PWDs in Ethiopia [73–75]. Unlike in an individualist culture, where disability is considered a physical and individual phenomenon and a chronic illness seeking remedy, in a collectivist culture, it is viewed as a spiritual and group phenomenon that must be accepted [76]. It is reasonable to assume such perspective differences might influence other areas of life activities for PWDs, including social participation.

This study's findings indicated that SVIs suffered from a lack of social support across settings, which hugely impacted their participation, echoing previous studies that found that poor social support is an environmental factor that adversely impacts social participation [63,77]. Support, particularly from peers, is crucial for enhancing self-esteem and social acceptance [78]. As social support and relationships are more valued in a collectivist cultural context [46,49,50], SVIs' resultant feelings due to rejection and isolation might be severe. This suggests that more research is needed to understand what it feels like to be socially marginalised in different cultural orientations.

Family socio-economic conditions put SVIs at elevated risk of having restricted social participation. Family status is a crucial predictor of social participation in impaired youth [63,79,80]. It is significant to note that due to the financial, psychosocial, and physical burden of caring and assisting disabled family members, families often encounter multiple limitations [81], adversely impacting caretakers' social participation.

The lack of accessible information about leisure activities and events hindered SVIs' social participation. A previous study also indicated that inaccessible communication and information systems hindered participation opportunities [82]. This study provides evidence that physical inaccessibility and adjustment difficulties are significant practical barriers to SVIs' social participation across settings [83].

This finding reveals that due to their design and construction, indoor and outdoor facilities—such as public institutions, transportation services, and footpaths, among others—are difficult to access for people with visual impairments in Ethiopia, negatively impacting social participation. The data also showed that transportation is a major practical barrier hampering mobility and participation in Addis Ababa. In support of this, the literature reveals that access and transportation facilities play critical roles in social participation [77].

SVIs' lack of social and adaptation skills practically limited their social participation. Supporting this finding, another study revealed that children with vision impairments experience difficulty in forming and maintaining relationships [18,84]. Results of previous studies indicate that assuming social skills determines children's acceptance [83], social engagement, and participation [18], and its deficits lead to exclusion from social and educational activities [85]. As cultural characteristics influence children's social skill devel-

opment [17], concerns should be taken regarding the multifaceted impact of underlying cultural values on relevant skill development and participation.

The current study reveals that poor policy implementation and institutional malpractice negatively affected SVIs' social participation. Introducing unexecuted policies regarding PWDs alone has brought no change in Ethiopia [86]. Similarly, the findings showed that institutional malpractice in providing appropriate service for PWDs limited participants' opportunities to participate. Prior assessments in the context of Africa revealed that cultural perspective influences perceptions of disability and shapes the kind of services delivered in Africa [40]. Hence, cultural norms affect the pattern of participation or perceptions toward PWDs and the services provided, including early identification and rehabilitation [43].

The major limitation of this study is that it is based on scarce information generated from a small sample of participants, which may raise questions about the findings' generalisability. Consequently, future research should consider gathering additional data from more participants (SVIs and stakeholders) from school and community settings.

5. Conclusions

The study's results revealed that a wide range of barriers affected SVIs' social participation. How the students experienced this phenomenon depended on various personal and environmental contextual factors. Personal factors, including poor self-image and self-belief, mistrust, a lack of independence, and poor communication and social skills, significantly impacted SVIs' social participation experience. The interaction of personal factors and environmental challenges, such as attitudinal, sociocultural, and practical attributes, determined SVIs' social participation. The results were discussed concerning the collectivist cultural context of the study setting and indicated the crucial role cultural orientation might play in influencing personal and environmental contextual factors and determining social participation. Interventions are needed to unblock wide-ranging barriers to social participation and meet positive health and wellbeing outcomes. More research is also needed to understand how social participation is crucial to giving life meaning and what it feels like to be socially ostracised in different cultural orientations beyond exploring barriers.

6. Limitations

We acknowledge the limitations of our study and note opportunities for future work. The findings of this qualitative inquiry from a small sample of participants raise questions about the findings' generalisability. As such, future research should consider additional data from more SVI participants and stakeholders from school and community settings.

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Institutional Review Board Statement: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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

Data Availability Statement: Data are available on request due to privacy and ethical restrictions. The data presented in this study are available on request from the corresponding author. The data are not publicly available due to the privacy of the people who took part in this research.

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Appendix A

Table A1. Example Transcript: Semi-structured interview with SVIs–Student 1 (S1)–School A, Form 6, 2020.

Initial Codes from the Interview Data of SVIs	Categories	Emerged Themes & Subthemes
Interviewer (I): Hi (S1). How are you? Thank you for your willingness to participate in this study. We have time to talk?	Family income and education Environmental barrier (lack of information)	Family socio-economic status Inaccessibility of information
Participant student 1 (S1): I'm good, it's okay. Yes, I have time, we can start.		
I: OK S1, can you tell me about the onset of your vision impairment?		
S1: It started when I was three.		
I: Do you have partial sight?		
S1: Yes, I'm partially sighted?		
I: Can you tell me about your family? (Where your family is, the size of the family, parental education, source of income . . .)		
S1: My family lives more than three hundred kilometers away from Addis Ababa. I don't remember when my dad died. It was my mother's responsibility to support the family. I'm the third child in my family. We are six altogether, four males and two females. My mother is not educated		
I: If you don't live with your family, who provides you with support and how do you come here?	Environmental barrier (unstable resident area)	New social setting and lack of social resource
S1: My uncle brought me here when I was eight. With the help of him, I started to receive financial assistance from an organisation. I went to school too, and stayed with my uncle for five years. Due to financial problems, the organisation quit the support. I began to face a lot of challenges [sigh]. Anyway, I had to leave my uncle and family behind. After some troubles, I began to sell tickets to the national lottery agency and get some money. Sometimes some individuals who meet me doing this, encourage and support me in different ways. I have lived with three friends in a shabby house for three years now. We share our expenses; we keep our schooling. Now we have few friends in school	Environmental barrier (attitude)	Rejection
I: What kind of (extra-curricular) activities do you know that peers participate in School And the community? Do you have any experience of participating in these activities?	Environmental barrier (attitude) Environmental barrier (attitude)	Bullying Unequal treatment

Table A1. *Cont.*

Initial Codes from the Interview Data of SVIs	Categories	Emerged Themes & Subthemes
S1: There're a lot of clubs and activities in school that students voluntarily participate in. Additionally, in the community, there are also youth leagues, youth centers and the like that invite youth to participate. But, I don't even know how to get involved in it	Environmental barrier (attitude) Environmental barrier (attitude)	Bullying Unequal treatment
I: What do you mean by 'you don't know how'? What's the problem?		
S1: I have never seen people invited to membership or participate. Maybe the invitation is written and posted on a noticeboard for those who can read.	Environmental barrier (beliefs)	Social values as barrier
I: How is your social participation with your neighborhoods? Do you have friends and relationships with the community at various events?		
S1: I have no social participation with my neighbors. I live in different new areas of residents in the city. I'm always an outsider to them. We don't know each other. If there is some event in the family of our house renter and I'm invited, I would participate passively without interacting with any people there. In the neighborhood, I don't have many friends. Most people will avoid you. Some young people make fun of you. It's not easy to have many good friends. But fortunately also, I have a friend who encourages me to go with him and attend religious services. These kinds of people are medicine to this world. Their help is immense to make us feel good and participate in some areas of life.	Environmental barrier (estrangement)	Poor social capital Lack od confidence
I: What does your participation look like in other areas of life in the community as leisure activities?		
S1: I sell tickets to make my living and have little spare time. However, I enjoyed attending religious services. People have different approaches in the church, they have empathy. At home and in society, I've never been treated equally. My siblings and peers have greater value than me. There's something wrong in this area. Look, most people do not question the way they think. They take for granted what they receive from society as true. Some educated people, including our teachers, are the same as the uneducated farmers in rural areas	Personal barrier (lack of confidence) Personal barrier (being introvert) Environmental barrier (financial hardship)	Lack of communication skill Financial problem, practical limitation Sociocultural values as barrier
I: Do you mean you have poor social resources in all the areas you mentioned?		
S1: Yes, I have no such resources. I had already left my family for numerous social and economic reasons. I face similar experiences in the city too. My friends and I live on a social island.	Environmental barrier (beliefs)	Transportation as practical barrier
I: What do you mean 'you live on an island within the city'?		
S1: It's obvious, the island is an isolated area from the larger landmass. I used this analogy to reveal that we also live in isolation with the community although we are not physically isolated.	Environmental barrier (mobility)	

Table A1. *Cont.*

Initial Codes from the Interview Data of SVIs	Categories	Emerged Themes & Subthemes
I: So how did you manage to get through this experience?	Environmental barrier (policy and institution)	Poor implementation of policy, practical challenge
S1: I trained myself to live alone. I see attaining an active social life is not easy for a person with vision impairment. So, I'm less interested in ensuring acceptance and participation.		
I: If you have such an unsatisfactory social participation experience, what's the reason for this reality? How do you evaluate your share of the circumstances?		
S1: Let me begin with the second question. Frankly speaking, I'm shy and not sociable. I don't know how to start communicating with people. Additionally, effective social participation requires the ability to freely move and identify places. These are all my problems. But, most of the challenges come from the outside. You know social relationships are bidirectional. It's not only your interest, but also the acceptance of others that plays a major role. Sighted peers feel like we are a burden and try to avoid us as much as possible. I'm financially unstable and should refrain myself from such aspects. So, I don't even have time to take part in the activities we mentioned earlier. However, even if we wish, you can't force relationships. The traditional belief in the community is still abrasive. Moreover, you can't overcome the transportation challenges in the city if you try to participate in some recreational activities, for instance. The government is not working as per policies and regulations. We always hear about these policies, but the realities are not changed.		

Appendix B

Table A2. Participants' responses and frequency of themes. SVIs interview responses: What barriers affect your social participation at home, in the community, and in school?

Themes	Student Response																	
	S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**	**S10**	**S11**	**S12**	**S13**	**S14**	**S15**	**S16**	**S17**	
What barriers do affect their social participation?																		Total
Personal barriers																		
Poor self-image and personal belief	-	√	√	-	√	-	-	√	√	-	√	-	√	√	-	-	√	9
Endangered wellbeing	√	√	-	√	√	-	√	√	√	-	√	-	√	-	√	√	√	12
Mistrust	-	√	√	-	√	-	-	-	√	√	√	√	-	√	-	√	-	9
Deteriorated sense of independence	√	√	-	√	√	√	√	√	√	-	√	√	√	-	√	-	√	13
Lack of communication and social skills	√	√	√	√	-	√	√	√	√	√	-	√	√	-	-	√	√	13
Attitudinal																		
Unequal treatment	√	-	√	√	√	√	-	-	√	-	√	-	√	-	√	-	-	9
Overprotection	-	-	√	-	√	√	-	-	√	-	√	√	-	-	-	-	-	6
Peer rejection	√	-	√	-	-	√	√	-	-	-	-	√	-	√	√	√	-	8
Bullying & labelling	√	-	√	-	-	√	√	-	√	-	-	√	√	√	√	√	√	11
Low expectation and motivation	-	√	√	√	-	√	√	√	-	√	√	-	√	√	-	√	√	12

Table A2. *Cont.*

Themes	Student Response																	
	S1	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**	**S10**	**S11**	**S12**	**S13**	**S14**	**S15**	**S16**	**S17**	
Sociocultural																		
Community beliefs and values	√	√	-	√	√	√	√	√	-	√	-	√	√	√	√	√	√	14
Lack of social support	-	√	√	√	-	-	√	√	√	-	√	√	-	√	√	√	√	11
New social settings and low social capital	√	-	√	√	-	-	-	√	√	-	-	√	-	√	√	-	-	8
Practical																		
Family status	√	√	-	-	-	-	√	√	√	√	-	-	√	√	-	-	√	9
Lack of access to adaptive equipment	-	√	-	-	-	√	√	-	√	-	-	√	-	-	-	√	√	7
Weak teamwork & collaborative practices	-	-	-	√	√	-	√	-	-	-	√	-	-	√	√	-	-	6
Physical and informational accessibility issues	√	√	√	√	√	-	√	√	√	-	√	√	-	√	√	√	√	14
Transportation	√	√	-	-	-	√	-	-	-	√	√	-	-	-	-	√	√	7
Financial scarcity	√	√	√	√	-	√	-	-	√	√	√	-	√	√	√	√	√	13
Policy and practice	√	√	-	-	√	√	-	-	-	-	√	√	-	√	-	√	√	9
Individual sharing, out of the 20 themes	13	14	12	12	11	12	12	10	14	7	13	12	10	13	11	13	14	

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Predicting the Learning Avoidance Motivation, Learning Commitment, and Silent Classroom Behavior of Chinese Vocational College Students Caused by Short Video Addiction

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Abstract: As short video addiction has gradually become an emerging Internet behavioral addiction, its negative impacts on the student population have been noticed and cannot be ignored. Based on a literature review, this study referred to the person-process-content framework and drew on the ecosystem theory to define the relationship between short video addiction, learning avoidance motivation, learning commitment, and silent classroom behavior by using structural equation modeling. This study recruited 1000 participants from Chinese vocational colleges to fill out questionnaires. With an effective recovery rate of 94.6%, there were 946 effective study participants comprising 445 males (47%) and 501 females (53%). After it was confirmed that the data passed the reliability and validity tests, structural equation model analysis was carried out. The study results showed that short video addiction was positively correlated with learning avoidance motivation, but negatively correlated with learning commitment; on the other hand, study avoidance motivation was negatively correlated with learning commitment, but positively correlated with silent classroom behavior. Meanwhile, there was a negative correlation between learning commitment and silent classroom behavior. As a result, the negative correlation between short video addiction and learning behavior needs attention from parents and teachers.

Keywords: ecological systems theory; person-process-content model; relying on short video apps; short film videos; short video problematic use

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1. Introduction

1.1. The Influence of Short Videos on Learning

As a hedonic technology, short film videos (SFVs) such as TikTok, Kuaishou, and iXigua have attracted many users [1]. In the past few years, the number of short video users has increased dramatically, while also accelerating short video addiction as a new form of Internet addiction among the younger generations that cannot be ignored. To be more specific, SFVs have had a great negative impact on the student population. Therefore, exploring the issues regarding short video addiction has theoretical and practical significance.

Short video addiction is also known as pathological short video use or short video overuse. This is the situation when short video users cannot control their behavior properly and watch short videos excessively. This problematic usage is generally considered to be

detrimental to users. Students in particular love short videos, but because of the immersive nature of the videos, many students can experience associated problems, and some even become addicted [2–4]. Therefore, Hong et al. pointed out that video addiction behaviors have had a very large negative impact on the study and life of students of different school ages [5]. "Tech Addictions" have become proprietary and are a popular topic of research in the information systems field; the main focus of the research to date has been on addiction and its antecedents [6]. However, Hong et al. suggested that follow-up research can adopt empirical research methods to explore the impact of video addiction on students' learning [5]. Therefore, short video addiction is used as an independent variable of the research model to explore the relationship with the learning behavior of the student users in this study.

1.2. The Influence of Short Video Addiction from the Point of View of Ecological Systems Theory

To effectively determine the correlations between short video addiction and learning, a mature theory is required to support the findings. As one of the most well-known theoretical frameworks in social science, Brofenbrenner's ecological systems theory (EST) is considered the most capable of describing and explaining the thoughts [7] and behaviors of individuals and groups within the specific context in which they live [8]. It can also provide an insightful perspective for determining the root cause of the problem [9]. Furthermore, the EST provides guidelines to higher education researchers and practitioners for how they can examine student development within their educational ecosystems [10]. The EST posits that each system has different norms, rules, and procedures that have direct relationships defined as the face-to-face events that students collect as experience, and these also affect how students understand the surrounding world [11]. The EST helps to explain students' experience of using short videos and their own rules of learning, and so was adopted as the theoretical basis of this study.

Hong et al. further adopted the person-process-content (PPC) model in the EST to explore the relationship between addiction and learning according to the research purpose [5]. In this study, "person" is regarded as the short video addiction state of students, "process" is regarded as the pursuit and enthusiasm of students for learning tasks, and "content" is the behavioral performance in the classroom. Therefore, the EST's PPC model was used to support the hypothetical model of this study.

1.3. Learning Avoidance Motivation

Furthermore, cognitive, affective, and behavioral aspects cannot be ignored when discussing student learning. Motivation itself can be treated as a representative factor of cognition, and its role in learning varies across studies [12]. For the students' sakes, it is necessary to have positive learning motivation and avoid negative motivation, because motivation is significant for the completion of goal-directed behaviors [13]. Motivating behaviors can be driven to desired stimuli (approach motivation) or away from undesired stimuli (avoidance motivation) [14]. Hence, avoidance motivation is the motivation or direction of behavior away from negative stimuli (objects, events, possibilities) [15], and goal orientation that avoids performance is considered undesirable in an academic setting [14]. Avoidance learning motivation can be conceptualized as a negative learning behavior of avoiding studies. Considering the influences of avoidance learning motivation to learning enthusiasm and behavior, it was adopted as one of the variables of this study model.

1.4. Learning Commitment

Christenson et al. stated that commitment to learning contributes to individuals' active participation in learning activities, which is considered to be the most important theoretical variable for understanding dropouts and facilitating school completion [16]. Rodríguez-Izquierdo also proposed that encouraging students' learning commitment (academic commitment) is a student-centered teaching method implemented by universities, but students' learning commitment does not always exist [17]. Therefore, it is important

to identify the level of students' commitment to their study. Learning commitment is conceptualized as a student's long-term adherence to learning [18], which is an emotional manifestation. Meanwhile, students' commitment is also considered as an attitude variable that affects their behavior [19]. Therefore, this study chose learning commitment as one of the variables in the study model.

1.5. Silent Classroom Behavior

Cultural characteristics in Asian societies are often cited as the main reason for this so-called silence and passivity [20]. Because Chinese students are influenced by traditional examination-oriented education, the teaching method is usually teacher-centered, and students listen to the teacher in class. The interaction between teachers and students is limited, and students often remain silent. However, classroom reticence behavior is an adverse factor affecting student-centered learning, which can be conceptualized as a kind of behavior in which students do not often interact with teachers or classmates in class and are quiet and reticent. This style of classroom performance often fails to bring about good learning outcomes [21], because students seem to be withdrawn and rarely speak, usually sit and observe, and show varying degrees of reserved or withdrawn attitudes. In group activities, students behave in an even more restrained and reserved way [22]. One of the greatest challenges, which results in low classroom participation and teacher frustration, is silence or failure to participate in classroom activities [23]. Therefore, silent classroom behavior was included as the outcome (dependent) variable of the study model.

1.6. Research Purpose and Contribution

Although there have been many studies focusing on college students' persistence and educational outcomes, and most of the literature has studied various factors related to college students' experience and environment, only a few studies have considered the impact of students' psychological state and environmental background on their persistence decisions [24]. In order to expand the understanding of this topic, the purpose of this study was to verify the relationship between short video addiction, learning avoidance motivation, commitment, and silent classroom behavior of Chinese vocational college students through a structural equation model under the PPC framework of the ecosystem theory.

The problems caused by short video addiction have gradually attracted the attention of researchers from all around the world. Short video addiction is an emerging research field, but the current international empirical results are quite limited. This study helps to expand the international understanding of short video addiction research issues, which is the theoretical contribution of this study.

Avoidance motivation has generally been conceptualized in the past as the motivation for people to avoid exposing themselves to failure. However, in this study, the motivation to avoid learning was redefined. Students simply avoid academic activities or tasks, and do not take their own abilities into consideration. Such a concept will be more helpful for research to explore negative learning situations, including learning-weariness behaviors, which is one of the theoretical contributions of this study.

2. Theoretical Basis and Research Hypotheses

2.1. Research Model

Bronfenbrenner's EST emphasizes the interrelationships between different processes and changes in their content [25]. The result of the interaction between the individual and the environment leads to one's development [26]. Ozaki et al. believed that both internal and external environments have important influences on college students [24], so when researchers choose research concepts and theoretical frameworks, they will not limit students' experience to the university campus. The results of interaction between people and the environment are called proximal processes. Using the proximal process concept, when college students find themselves immersed in the proximal process using short videos, they

may not intend to actively learn, which may lead to their learning avoidance motivation, commitment to learning, and silent classroom behavior. Furthermore, placing students at the center of the EST framework helps to emphasize the importance of recognizing their individual needs, particularly their role as "active" participants in the learning process and how they affect the environment [27].

Based on the above literature review, the EST explains behavior and outcomes in different educational contexts. Therefore, this study adopted the framework of ecosystem theory to discuss the phenomenon of behavioral addiction and school connection. Under the framework of the PPC model of EST, this study constructed a research model and proposed five research hypotheses to explore the relationships between the short video addictions (person), avoidance learning motivation, commitment (process), and classroom silent acts (content). In other words, the relationship between short video addiction and learning avoidance motivation and learning commitment (H1 and H2), the relationship between learning avoidance motivation and learning commitment and silent classroom behavior (H3 and H4), and the relationship between Learning commitment and Silent classroom behavior (H5) were verified and viewed in this model. The research model is represented in Figure 1.

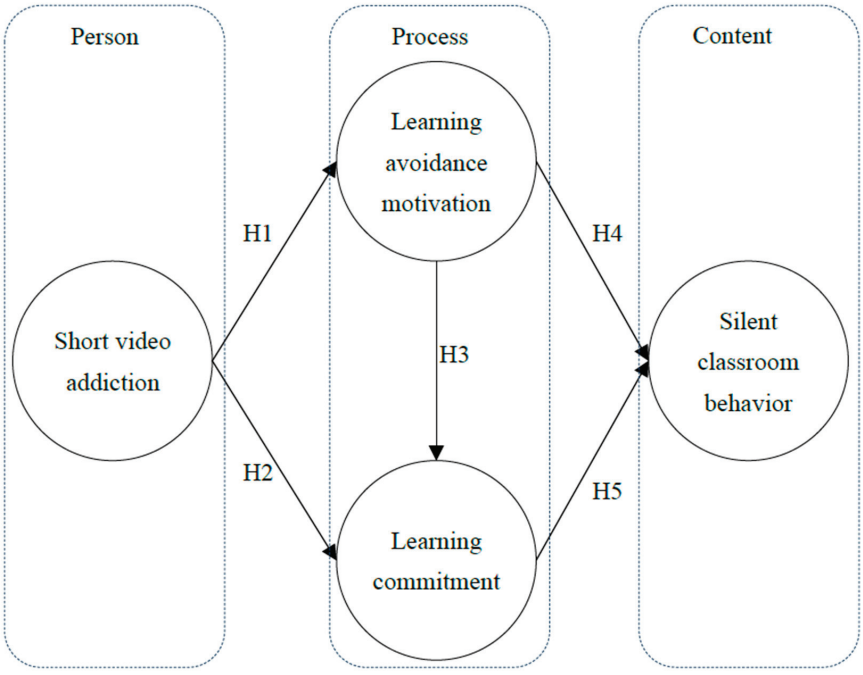

Figure 1. Research Model.

2.2. Research Hypothesis

2.2.1. The Relationship between Short Video Addiction and Learning Avoidance Motivation

Currently, there are still very few empirical studies on short video addiction, but the negative impact of addiction on learning can be found from other studies on behavioral addiction. For example, studies have noted that problematic internet usage is negatively associated with learning motivation [28]. This phenomenon indicates that it is more difficult for students to organize their learning effectively while addicted to short videos [29]. Therefore, the excessive usage of the Internet is a factor that reduces the learning motivation of adolescents [30]. Furthermore, previous research has also found that school performance

and mobile phone addiction have a strong negative correlation [31]. Studies have also found that despite the negative consequences for users, people are still willing to spend a great deal of time using short video apps [32]. In summary, when student users become addicted to short videos, they may not be interested in their studies and may have a reduced desire to learn. Therefore, this study adopted short video addiction to discuss the relationships between participants' avoidance learning motivation. The hypothesis is as follows:

H1: *Short video addiction is positively correlated with learning avoidance motivation.*

2.2.2. The Relationship between Short Video Addiction and Learning Commitment

Users claim that gaming addiction can affect their learning and thinking [33]. At the same time, there is growing evidence that Internet usage is associated with negative academic outcomes [34]. In this situation, if technology is used inappropriately, it can have poor outcomes, including altering one's daily life, even reducing sleep time, and inadvertent use can negatively affect students' learning [35]. Users in an addictive state may experience more difficulties in maintaining attention, such as impaired concentration and inability to deal with distractions [2]. However, a growing number of teenagers are addicted to the virtual world created through mobile phones, and are even becoming addicted, so it has a serious negative impact on teenagers' mentality, learning, and life [36]. Short video addiction can be described as an individual's inability to control their short video app usage, despite the fact that such usage has negative psychological and social effects [37]. Therefore, the uncontrollable usage of short videos also has adverse consequences for students' learning psychology. When student users become addicted to short videos, their engagement in learning may be reduced and they may lack enthusiasm for learning. Therefore, this study adopted short video addiction to explore the relationship between participants' short video addiction and their learning commitment, hypothesized as follows:

H2: *Short video addiction is negatively correlated with learning commitment.*

2.2.3. The Relationship between Learning Avoidance Motivation and Learning Commitment

Motivation should be considered as a key factor in the learning process [38], because motivation affects students' behavior and attitudes [30]. Motivational problems arise when individuals are unable to connect to the desired task or activity, which is defined as negative motivation or no-motivation [39]. Avoidance motivation is limited as a dependent variable because it can only lead to the absence or presence of negative outcomes by its very nature [15]. For students with high rates of task avoidance, "success" was defined in terms of minimal work expenditures rather than any external or personal measure of ability [14]. Therefore, some studies have pointed out that a high level of avoidance orientation is not conducive to students' personal learning [40]. Based on the above, when student users deliberately avoid learning tasks, their enthusiasm for learning may also decrease. Therefore, this study adopted avoidance learning motivation to explore the relationship between participants' learning commitment; the hypothesis is as follows:

H3: *Learning avoidance motivation is negatively correlated with learning commitment.*

2.2.4. The Relationship between Avoidance Learning Motivation and Silent Classroom Behavior

Motivation is closely related to student engagement in the classroom, including some school atmosphere such as educational aspirations, enjoyment of school, academic learning, and academic achievement [41]. In the field of motivational research, the study of stimuli and responses is carried out to assess the types and causes of stimuli that elicit appropriate responses to various learning situations [38]. For example, students with strong task avoidant tendencies may also not proactively seek advice from teachers and respond to assignments in an uninspired manner [40]. Especially in high-risk situations, students

usually have negative learning motivation, which is detrimental to the preparation for learning [42]. If students actively participate in the learning process, a more positive impact is generated [43]; on the contrary, if students show negative motivation, they will certainly not want to invest in learning. When student users intentionally avoid learning tasks, their performance in class may be less lively or colder. Therefore, this study adopted avoidance learning motivation to explore the relationship between participants' silent behavior in the classroom; the hypothesis is as follows:

H4: *Avoidance learning motivation is positively correlated with silent classroom behavior.*

2.2.5. The Relationship between Learning Commitment and Silent Classroom Behavior

Learner commitment may be a more critical factor in achieving learning goals than learner competence [44], because the level of commitment affects students' learning methods, which in turn affects their academic achievement [45]. Therefore, commitment is considered to be a key factor affecting student performance [46]. Because students adjust their learning commitments based on real-time assessments of events, these changes in learning commitments have corresponding effects on student behavior and achievement outcomes [47]. While some students try to do their best in situations of achievement, others will appear disengaged and just want to end the situation and get it done in an easy way [14]. Therefore, having a high level of commitment to learning enhances the elements of learning [43] and is of great importance to student retention, achievement, and success [47]. Based on the above, when student users are highly enthusiastic about learning, they may also participate more actively in class. This study adopted learning commitment to explore the relationship between participants' silent classroom behavior; the hypothesis is as follows:

H5: *Learning commitment is negatively correlated with silent classroom behavior.*

3. Materials and Methods

3.1. Study Design

This study adopted the snowball sampling method and distributed online questionnaires through the Questionnaire Star platform. The questionnaire was initially forwarded to vocational college teachers in six provinces of China (Guangxi, Guangdong, Hainan, Jiangsu, Zhejiang, Hebei) and handed out to the participants in their classes to fill out the questionnaires. It was then once again forwarded to other classmates at the same schools. Between 15 and 26 December 2022, the number of returned questionnaires was 1000.

Because the participants in this study were all adult students and the data were collected anonymously through the Internet, there was no mandatory requirement for a research ethics review. However, this study still followed international research ethics norms. During the process of recruiting participants for this study, recruitment publicity was provided, which explained the purpose of the study, data usage, participant privacy, data protection, etc. The relevant information was also revealed in the informed consent statement on the first page of the online questionnaire. Only if the participants agreed to participate in the research could they fill in the online questionnaire.

3.2. Participants

The number of participants in this study (returned questionnaires) was 1000, and a total of 54 invalid data were deleted (incomplete questionnaires). The effective research participants therefore numbered 946, giving an effective recovery rate of 94.6%. There were 445 males (47%) and 501 females (53%). There were 179 first-year students (18.9%), 434 second-year students (45.9%), 274 third-year students (29%), and 59 fourth-year students (6.2%); 78 respondents (8.3%) watched short videos 1–3 days a week, 163 (17.2%) watched 4–6 days a week, and 705 (74.5%) watched every day. On average, 66 (7%) watched short videos for less than 1 h a day, 505 (53.4%) watched for 1–3 h a day, 261 (27.6%) watched

for 3–5 h a day, and 114 watched for more than 5 h a day (12%), as shown in Table 1. The mean age of participants was 19.47 years (SD = 1.02).

Table 1. Participant Profile Analysis.

Variables	Classifications
Gender	445 males (47%) 501 females (53%).
Grades	179 first-year students (18.9%), 434 second-year students (45.9%), 274 third-year students (29%) 59 fourth-year students (6.2%);
Average number of days per week	78 respondents (8.3%) watched short videos 1–3 days a week 163 (17.2%) watched 4–6 days a week 705 (74.5%) watched every day.
Average number of hours per day	66 (7%) watched short videos for less than 1 h a day 505 (53.4%) watched for 1–3 h a day 261 (27.6%) watched for 3–5 h a day 114 watched for more than 5 h a day (12%).

3.3. Measurement

The measurements of this study included short video addiction, learning avoidance motivation, learning commitment, and silent classroom behavior. The item sources of each variable include references, modifications of questionnaires designed by other scholars, and a scale compiled for this study. When the measurement design of this study was completed, three experts in educational psychology conducted a content validity review of the questionnaire to confirm whether the content of the measurement could effectively reflect the purpose of this study. The questionnaire evaluation standard adopted a 5-point Likert scale, where 1 to 5 represented strongly disagree to strongly agree, respectively. The higher the score, the higher the degree of approval of the participant. The scales are described in the following sections. The complete questionnaire can be found in the Appendix A.

3.3.1. Short Video Addiction Scale

This study adopted the Short Video Addiction Scale of Ye et al. [48], with a total of 10 items. Example questions include: "I will put down the things that should be completed or executed and spend time watching short videos" and "I will still remember the content of short videos after turning off the platform." The higher total score related to the state of being unable to watch short videos autonomously represented a higher degree of addiction as perceived by the individual.

3.3.2. Avoidance Learning Motivation Scale

This study referred to the Question Avoidance Motivation Scale of Hong et al. [49], and revised the Avoidance Learning Motivation Questionnaire with a total of eight questions. Example questions are: "I don't like to spend energy on learning tasks" and "When I am doing homework, I will try to choose the easiest way to do it." Because this scale measured students' motivation to avoid learning tasks when they were studying, a higher total score represented a higher degree of learning avoidance motivation perceived by the individual.

3.3.3. Learning Commitment Scale

This study referred to and edited the Learning Commitment Scale of Rodríguez-Izquierdo (2020), with a total of nine items. Example questions are: "I find my studies imbued with meaning and purpose" and "I am proud to be in college." Because the scale measured students' persistence and identification with their own learning activities, a higher total score represented a higher degree of personal perceived commitment.

3.3.4. Silent Classroom Behavior Scale

In this study, a scale was developed based on silent classroom behavior, with a total of seven items. Example questions include: "I don't want to participate in classroom activities during class" and "When I encounter problems in class, I will choose to keep silent and don't want to ask the teacher." because this scale measured students' self-esteem and silent behavior performance in class, a higher total score represented a higher level of silent behavior as perceived by the individual.

3.4. Statistical Analysis

Structural Equation Modeling (SEM) is a general statistical modeling tool used to describe a large number of statistical models for assessing the validity of substantial theories with empirical data [50], which is also applicable to model and theory testing and scale development [51]. Specifically, this technique combines regression, correlation, and factor analysis simultaneously to address important problems in the social sciences, biological sciences, and humanities. Its greatest strength is the ability to manage measurement error, which is one of the greatest limitations of most studies, and thus SEM is now widely used in research [52]. As a result, the structural equation modeling software AMOS 20.0 was used to verify the paths of the research hypotheses.

4. Results

4.1. Measurement Model Evaluation

Measurement model analysis helps us understand how well the items fit each variable. Therefore, the measurement model evaluation for this study was a confirmatory factor analysis (CFA) using AMOS. The degree of fit of each measurement model is shown in Table 2. During this evaluation phase, items with a Factor Loading (FL) lower than 0.50 were deleted, as such a low FL represents poor validity. The result of the deletion of questions was that short video addiction was reduced from ten to six questions, avoidance learning motivation was reduced from eight to five questions, learning commitment was reduced from nine to six questions, and silent classroom behavior was reduced from seven to four questions.

Table 2. First order confirmatory analysis.

Adaptability	Critical Value	Short Video Addiction	Avoidance Learning Motivation	Learning Commitment	Silent Classroom Behavior
χ^2	—	39.4	5.8	32.2	6.3
df	—	9	5	9	2
χ^2/df	<5	4.38	1.16	3.66	3.15
RMSEA	<0.10	0.06	0.01	0.05	0.05
GFI	>0.80	0.99	0.99	0.99	0.99
AGFI	>0.80	0.97	0.99	0.97	0.98
FL	>0.50	0.75~0.88	0.69~0.92	0.60~86	0.83~0.96
t	>3	29.91~40.56	23.37~43.82	17.50~39.18	35.68~45.54

4.2. Reliability and Validity Analysis

In quantitative research, reliable and valid data are required to ensure that the analysis results can be trusted. Table 3 shows the mean (M), standard deviation (SD), Cronbach's α and FL for each variable. In accepted academic standards, the values of Cronbach's α should be higher than 0.70 to ensure good reliability. The values of FL should be higher than 0.50 to ensure good validity. In this study, the Cronbach's α value of the variables ranged from 0.89 to 0.94, and thus met the recommended standards. The FL values ranged from 0.76 to 0.90, as shown in Table 3.

Table 3. Reliability and validity analysis.

Construct	M	SD	α	FL
	—	—	>0.70	>0.50
Short Video Addiction	2.43	0.86	0.93	0.83
Avoidance Learning Motivation	2.49	0.85	0.90	0.81
Learning Commitment	3.36	0.70	0.89	0.76
Silent Classroom Behavior	2.58	0.811	0.94	0.90

4.3. Related Analysis

To confirm the correlation between variables, the Pearson Correlation analysis technique was applied. From Table 4, it can be seen that the results showed significant correlations among short video addiction, avoidance learning motivation, learning commitment, and silent classroom behavior.

Table 4. Pearson Correlation analysis.

Construct	1	2	3	4
1. Short Video Addiction	1			
2. Avoidance Learning Motivation	0.77 ***	1		
3. Learning Commitment	−0.50 ***	−0.45 ***	1	
4. Silent Classroom Behavior	0.64 ***	0.62 ***	−0.51 ***	1

p *** < 0.001.

4.4. Overall Fitness Evaluation

The degree of fit of the hypothesis model determines the validity of the model. Evaluation of parameter estimates was used in this study to assess model fit. The fitting index values of this study were $\chi^2 = 699.59$, $df = 184$, $\chi^2/df = 3.80$, RMSEA = 0.05, GFI = 0.93, AGFI = 0.92, NFI = 0.96, NNFI = 0.96, CFI = 0.97, IFI = 0.97, RFI = 0.95, PNFI = 0.84, and PGFI = 0.74. The results showed that the data fit well with the model.

4.5. Research Model Validation

Whether the path assumed by the research can be established needs to be verified by the model. This study adopted SEM to test the hypothesized model. The results showed that short video addiction was positively correlated with learning avoidance motivation ($\beta = 0.83$ ***), short video addiction was negatively correlated with learning commitment ($\beta = -0.40$ ***), avoidance learning motivation was negatively correlated with learning commitment ($\beta = -0.18$ **), learning avoidance motivation was positively correlated with silent classroom behavior ($\beta = 0.54$ ***), and learning commitment was negatively correlated with silent classroom behavior ($\beta = -0.28$ ***). It can be seen from Figure 2 that the five research hypotheses proposed in this study were all supported. That also meant the higher the participants' level of short video addiction tendency, the higher their avoidance learning motivation was, and the lower their level of learning commitment was. The higher the students' degree of avoidance learning motivation, the lower their learning commitment, and the more frequently silent classroom behavior appeared. However, the higher the students' learning commitment level, the less silent classroom behavior happened. In addition, the explanatory power of short video addiction to learning avoidance motivation was 69%, and f^2 was 2.23; the explanatory power of short video addiction and learning avoidance motivation to learning commitment was 31%, and f^2 was 0.45; the explanatory power of avoidance learning motivation and learning commitment to silent classroom behavior was 53%, and f^2 was 1.13. In other words, each model path had good explanatory power and effect size, as shown in Figure 2.

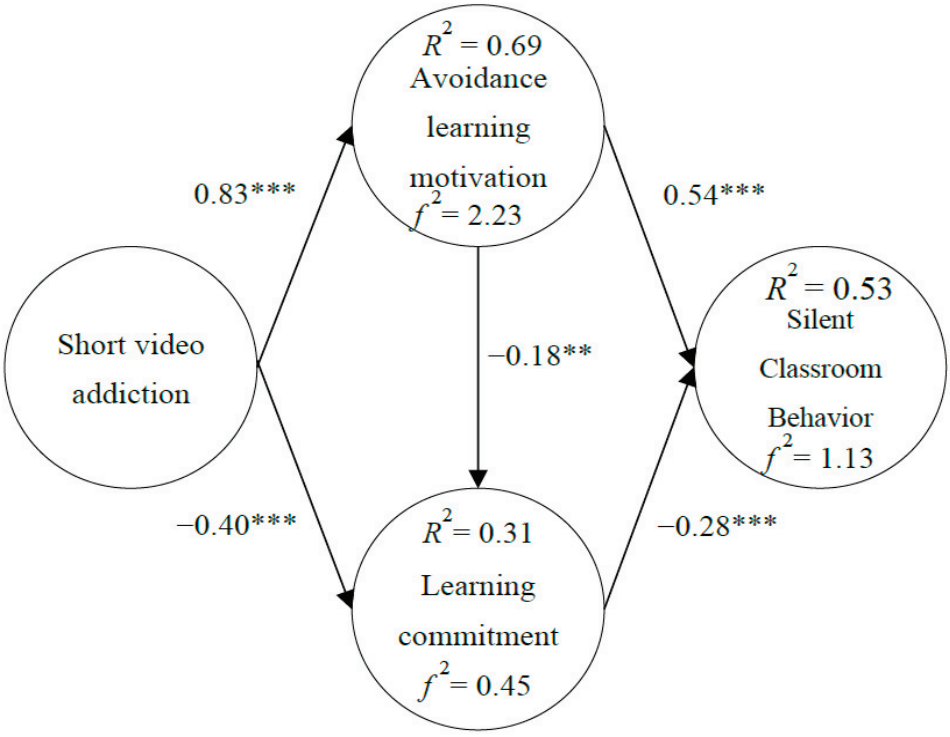

Figure 2. Research Model Validation. ** $p < 0.01$, *** $p < 0.001$.

4.6. Analysis of Indirect Effects

It could be seen from Table 5 that only short video addiction and silent classroom behavior had positive indirect effects, and the analysis of the other two indirect effects had not reached a significant level and had no statistical significance.

Table 5. Analysis of indirect effects.

	Short Video Addiction		Avoidance Learning Motivation	
	β	95% CI	β	95% CI
Learning Commitment	−0.15	[−0.37, 0.01]		
Silent Classroom Behavior	0.604 ***	[0.54, 0.67]	0.05	[−0.01, 0.01]

*** $p < 0.001$.

5. Discussion

5.1. Short Video Addiction Is Positively Correlated with Learning Avoidance Motivation

The results of the study showed that short video addiction was positively correlated with avoidance learning motivation, so H1 was supported. It could be said that when student users have short video addiction, they are not interested in their studies and reduce their desire to participate in learning. The reason for this phenomenon is that students who are addicted to short videos hope to keep watching short videos to satisfy their own entertainment, so they do not want to learn, or avoid learning tasks. The results of this study are also similar to previous studies, such as those of Reed and Reay, Truzoli et al., and Demir and Kutlu, all of which confirmed that Internet addiction has a negative impact on academic motivation [28–30]. This also makes it difficult for students with Internet addiction to carry out their learning activities effectively. In addition, the research of Bai

et al. found that there was a strong negative correlation between mobile phone addiction and students' school performance [31].

5.2. Short Video Addiction Is Negatively Correlated with Learning Commitment

The results of the study showed that short video addiction was negatively correlated with learning commitment, so H2 was supported. In other words, when student users become addicted to short videos, their recognition and persistence in learning decrease, and they lack enthusiasm for learning. The reason for this is that students who are addicted to short videos are already attached to the content of short videos and spend most of their attention on short videos. As a result, it is easy to lack enthusiasm for learning. While the results of this study coincided with past research results, such as Mo et al., there is also increasing evidence that Internet use is associated with negative academic outcomes [34]. The surveys by Zhai et al. indicated that users claimed that gaming addiction affected their learning and thinking [33]. The study by Chen et al. found that users in an addictive state had impaired concentration and an inability to process distractions [2]. Nevertheless, there are still many adolescents who are addicted to the virtual world, which has a serious negative impact on the mentality, study, and life of adolescents [36].

5.3. Learning Avoidance Motivation Is Negatively Correlated with Learning Commitment

The study results showed that learning avoidance motivation was negatively correlated with learning commitment, so H3 was supported. In other words, when student users deliberately avoid learning tasks, their sense of identity and persistence in learning also decrease. The reason for this is that when students have the idea of avoiding learning tasks, they will not want to learn more, and their enthusiasm for learning will also decrease. The findings of this study also have many similarities with previous studies. As proposed by Demir and Kutlu, motivation is a key factor influencing student behavior and attitudes [30]. Motivational problems arise when individuals fail to connect with the task or activity to be performed [39]. Elliot stated in his research that avoidance motivation due to its nature is limited as the dependent variable, because it can only happen in the absence or existence of negative outcomes [15]. Hirschfeld et al. also clearly stated that when students have a high level of avoidance orientation, it is detrimental to their personal learning [40].

5.4. Avoidance Learning Motivation Is Positively Correlated with Silent Classroom Behavior

The study results showed that avoidance learning motivation was positively correlated with silent classroom behavior, so H4 was supported. When student users deliberately avoid learning tasks, their performance in the classroom is less lively or more indifferent. When students already have the idea of avoiding learning tasks, they naturally do not want to actively participate in the interaction in the classroom. This is consistent with Collie and Martin's study (2019), which found that motivation is closely related to student engagement in the classroom, educational aspirations, enjoyment of school, academic learning, and academic achievement [41]. Additionally, Ferreira et al. indicated that the type and cause of motivation can elicit appropriate stimulus responses to various learning situations [38]. Some scholars have found that positive motivation brings positive results, and negative motivation brings negative results. Che Ahmad et al. stated that if students actively participate in the learning process, it has a more positive impact on their learning [43]. On the other hand, completely different results will be obtained in the opposite situation. Research by Hirschfeld et al. found that students with strong avoidance tendencies may not actively seek advice from teachers, and may respond to assignments in an uninspired manner [40]. Harlen and Deakin Crick also believed that when students have passive learning motivation, it hinders their learning [42].

5.5. Learning Commitment Is Negatively Correlated with Silent Classroom Behavior

The research results showed that learning commitment was negatively correlated with silent classroom behavior, so H5 was supported. In other words, when student users are

highly enthusiastic about learning, they are more active in participating and publishing in class. When students are passionate about learning, they also want to have more exchanges with teachers or classmates in class to gain more knowledge and experience. This is consistent with the views of some scholars. As indicated by Che Ahmad et al., Kim et al., and Mart, learner commitment may be a more critical factor in achieving learning goals than learner ability [43–46]. Wilkins et al. further explained that this is because the level of commitment will affect students' learning methods, which in turn will affect their academic achievement [45]. Students with high levels of commitment try to do their best in situations of achievement, but students with lower levels of commitment show disengagement and just want to end the situation quickly [14]. Griep argued that these changes in commitment to learning have corresponding effects on student behavior and achievement outcomes [47].

5.6. Research Limitations and Recommendations for Future Research

This study has several limitations. First, this was a cross-sectional design study using questionnaires to confirm the correlation between short video addiction and learning behavior. Therefore, the causal relationship between variables cannot be confirmed in this study. Follow-up research can use a longitudinal design to confirm the causality between short video addiction and different learning experience disorders. This can also help understand the impact of another element of EST, "time," on students' learning and development. Personal in-depth interviews can also be used to learn more about the thoughts and learning experiences of student users.

Second, although the issue of short video addiction has been a concern for several years, related research is only in its infancy. Therefore, follow-up researchers can explore the influence of short video addiction on student groups from different theoretical perspectives or different analysis methods. In addition, the participants in this study were Chinese vocational school students, which may limit the generalizability of the findings. Follow-up research can recruit students at different stages of study to participate in the research to expand the interpretable scope of the research.

Third, the duration of short video use does not necessarily mean that the user has become addicted, and it is also meaningful to confirm the purpose of the use. Therefore, in follow-up research, the motivation for using short videos can be used to explore the causes of short video addiction. More details are needed to confirm whether the participants have short video addiction, and which motivations are more likely to contribute to short video addiction.

Fourth, bad or negative learning behavior or mentality is an educational issue that needs to be taken seriously. However, behind the problem of poor online or offline learning effects, there are still many factors or consequences worth exploring in detail, or corresponding solutions; for example, what other factors trigger students' silent classroom behavior, and how to improve such behavior. These are worthy of further exploration in follow-up research.

6. Conclusions and Recommendations

6.1. Conclusions

Under the PPC framework based on ecosystem theory, the structural equation modeling technique was used to explore the relationship between short video addiction, learning avoidance motivation, commitment, and classroom silent behavior. The research results showed that: (1) Short video addiction was positively correlated with learning avoidance motivation, but negatively correlated with learning commitment. (2) Study avoidance motivation was negatively correlated with learning commitment, but positively correlated with classroom silent behavior. (3) There was a negative correlation between learning commitment and classroom silent behavior. The results showed that there was a negative correlation between short video addiction and students' academic behavior.

From the perspective of contemporary education, silent classroom behavior is regarded as very poor learning performance. However, previous studies on silent classroom behavior

mainly focused on how to improve students' classroom silence in the context of language classes. This directly leads to neglecting the silent behavior of students in the classroom that should be paid attention to in any classroom. The discovery of the relationship between students' attitudes and motivations and silent classroom behavior help to expand our understanding of silent classroom behavior.

6.2. Recommendations

Short video addiction, like other types of Internet addiction, is a problem that needs to be taken seriously by parents and educators because the research results show that short video addiction will have a great impact on the learning situation, including causing more negative psychological perceptions and behavior. However, it seems to be very difficult to monitor the short video app usage behavior of adult students. Therefore, it is suggested that parents and educators should appeal to student users to cultivate interest in various leisure activities and avoid relying too much on short videos for entertainment experience, so as to avoid relying on short video apps.

For students with high levels of avoidant learning motivation, teachers should help them find achievement goals to drive their desire to learn and let them gradually develop enthusiasm for learning activities. At the same time, teachers should also interview students with high levels of avoidance learning motivation to find out the reasons for their avoidance of learning tasks, in order to better help them be willing to learn.

It is generally accepted that taciturn students usually speak less and exhibit more negative forms of behaviors [53]. Therefore, teachers should adopt more learning-centered teaching methods in the classroom so that students can become the protagonists of learning. More attention can be given to students who are not highly involved in courses, and group activities can also be added to increase student participation.

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Data Availability Statement: The original contributions presented in the study are included in the article; further inquiries can be directed to the corresponding author.

Conflicts of Interest: The authors declare that they have no conflict of interest.

Appendix A. Questionnaire

No.	Items
	Short Videos Addiction Scale
1.	I watch short videos for longer than I would have expected.
2.	I will put down the things that should be completed or executed and spend time watching short videos.
3.	I get more excitement or anticipation from watching short videos than I do from other human interactions.
4.	I get complained about or blamed for watching short videos.
5.	I would be late for school or leave early or be absent because of watching short videos.
6.	I get a drop in grades due to watching short videos.
7.	I get annoyed and angry if someone interrupts me while I'm watching short videos.
8.	I would sacrifice my night's sleep for watching short videos.
9.	I will still remember the content of short videos after turning off the platform.
10.	I get depressed when not watching short videos.
	Avoidance Learning Motivation Scale
1.	I don't like to spend energy and time on learning tasks.
2.	I often want to avoid learning tasks.
3.	I don't want to put in more effort to get better academic performance.
4.	When I need to repeatedly correct my homework, I feel tempted to give up.
5.	While doing homework, I try to choose the easiest way to do it.
6.	When a classmate invites me to study together, I choose to reject the invitation.
7.	When I encounter difficulties in my studies, I am inclined to give up.
8.	When I encounter something I don't understand while studying, I don't take the initiative to find the answer.
	Learning Commitment Scale
1.	Doing homework makes me feel energetic.
2.	Studying or taking classes makes me feel physically strong and powerful.
3.	When I wake up in the morning, I want to go to class or study.
4.	I find my studies imbued with meaning and purposes.
5.	My studies inspire me.
6.	I am proud to be in college.
7.	While doing tasks related to my studies, I feel that time passes quickly.
8.	Doing homework is easy for me to get immersed in.
9.	When I study, I tend to forget everything happening around me.
	Silent Classroom Behavior Scale
1.	I don't feel like speaking up and expressing opinions during class.
2.	I don't want to participate in any activities in the class.
3.	I don't want to interact with my classmates while I'm in class.
4.	I don't want to interact with the teacher while I'm in class.
5.	When I encounter problems in class, I prefer to keep silent rather than ask my classmates for advice.
6.	When I encounter problems in class, I keep silent rather than ask the teacher.
7.	When my classmates don't understand something, I will remain silent and not take the initiative to help them, even though I know the answer.

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Systematic Review

Hikikomori: A Scientometric Review of 20 Years of Research

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Abstract: The Japanese term *hikikomori* was first used to describe prolonged social withdrawal in the 1990s. Since then, research across the world have reported similar prolonged social withdrawal in many countries outside Japan. This study systematically analyses the evolution of literature on *hikikomori* in the past 20 years to gain a better understanding of the development of the knowledge base on *hikikomori* since it garnered attention in Japan. Findings from the scientometric review indicate many perspectives on the etiology of *hikikomori* including cultural, attachment, family systems and sociological approaches. However, similarities with modern type depression, a novel psychiatric syndrome, have been proposed and there are signs of a recent paradigm shift of *hikikomori* as a society-bound syndrome rather than a cultural-bound syndrome unique to Japan. As research into *hikikomori* continues to grow, results from the review also highlight the need for a more universally shared definition of *hikikomori* in order to better consolidate cross-cultural research for meaningful and valid cross-cultural comparisons which can help to promote evidence-based therapeutic interventions for *hikikomori*.

Keywords: document co-citation analysis; country analysis; hikikomori; social withdrawal; scientometrics

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1. Introduction

The term *hikikomori* was first used to refer to an individual who has stopped going to school or work and remained at home for a duration greater than six months by Tamaki Saito in 1998 [1]. Although *hikikomori* has not been recognised as a formal psychiatric diagnosis, the Ministry of Health, Labour and Welfare in Japan released guidelines for the assessment and treatment of *hikikomori* in collaboration with a research group in 2010 [2]. Two typologies of *hikikomori* have also been proposed: (i) primary *hikikomori* where the individual did not have any comorbid psychiatric disorder causing the social withdrawal and (ii) secondary *hikikomori* where the social withdrawal can be attributed to a psychiatric disorder [3,4]. Based on an epidemiological survey conducted in Japan, the lifetime prevalence of *hikikomori* was reported to be 1.2%, and was more commonly reported in males and individuals in their 20s [5]. Similarly, another review reported the prevalence to be 0.9% to 3.8% in Japan based on the results of three population studies [6]. The *hikikomori* phenomenon has become of increasing concern in the face of what government officials have termed the 8050 crisis, referring to *hikikomori* who are turning 50 while their parents reach their 80s, creating an unsustainable situation where these elderly parents may begin to lose the ability to support themselves and their children [7]. For example, statistics released by the Japanese Cabinet Office in 2019 reported an estimated 610,000 *hikikomori* aged between 40 and 65 [8]. Hence, this situation highlights the dire need for research into better understanding *hikikomori* and formulating interventions to promote the reintegration of *hikikomori* into society, especially considering that these figures are likely to be a conservative estimate [2].

The causes and risk factors for *hikikomori* are not well understood although many studies have highlighted the male gender and insecure attachment [9]. The co-dependency

between parent and child characteristic of Japanese parent-child relationships—termed *amae* in Japanese—has been hypothesised to enable the development of *hikikomori*. Furlong [10] also discusses a number of proposed precipitating sociocultural factors in Japan including the Japanese family context characterised by a tendency of overprotection and indulgence of children, the high pressure and stakes of the Japanese education system and the rapidly contracting economy and labour market in the 1990s. More recently, Kato et al. [11] has proposed a multidimensional model of *hikikomori* with a biopsychosocial perspective, which considers both psychiatric and non-psychiatric *hikikomori* conditions.

Aims of the Study

In recent decades, *hikikomori* has garnered increasing attention not only in Japan but also globally, where countries cross Asia, Europe and North America such as South Korea, China, Italy, France, Spain and the United States of America have reported similar cases of prolonged social withdrawal [12–17]. Hence, this study aimed to identify key publications and trends in the research on *hikikomori*, the focus of these publications and gaps in the literature, which are able to contribute to greater insight into directions for future research. Research on *hikikomori* can also benefit from a consolidation of research conducted across the world to facilitate valid cross-cultural comparisons and developing a clearer and more comprehensive understanding of the etiology of *hikikomori*. In the current study, a scientometric approach to reviews will be adopted, which combines elements from scientific mapping and bibliometric analysis. [18]. Scientometrics has proved useful in reviewing the literature in fields such as neuroscience and clinical psychology (e.g., [19–21]). In the current work, an analysis of the references and relevance of publications in the existing literature was conducted using a document co-citation analysis (DCA) [20,22,23]. A country analysis was also conducted in order to identify leading countries contributing to the research and knowledge base on *hikikomori*.

2. Materials and Methods

As done in Neoh et al. [21,24], the following search string TITLE-ABS-KEY ("hikikomori") was used in the download of publications from Scopus according to standard and established scientometric procedures outlined in Chen [22]. The Scopus database was selected due to its coverage of a greater number of indexed journals and recent documents [25]. A search conducted on 9 November 2022 revealed that there was a total of 302 documents published from 1 January 2002 onward.

2.1. Data Import on CiteSpace

CiteSpace software (Version 6.1.R2 and version 6.1.R6) [26] was used to conduct the scientometric analysis in this study. Results presented in the main manuscript were obtained using the newest version of the software, while results obtained with the verison 6.1.R2 are presented in the Supplementary Materials. The same procedures as in previous studies from our team [24,27] were followed to download the articles. The downloaded articles from Scopus were imported into the software where there were 11,373 (97.36%) valid references out of a total of 11,681 references cited by the 302 articles (Figure 1).

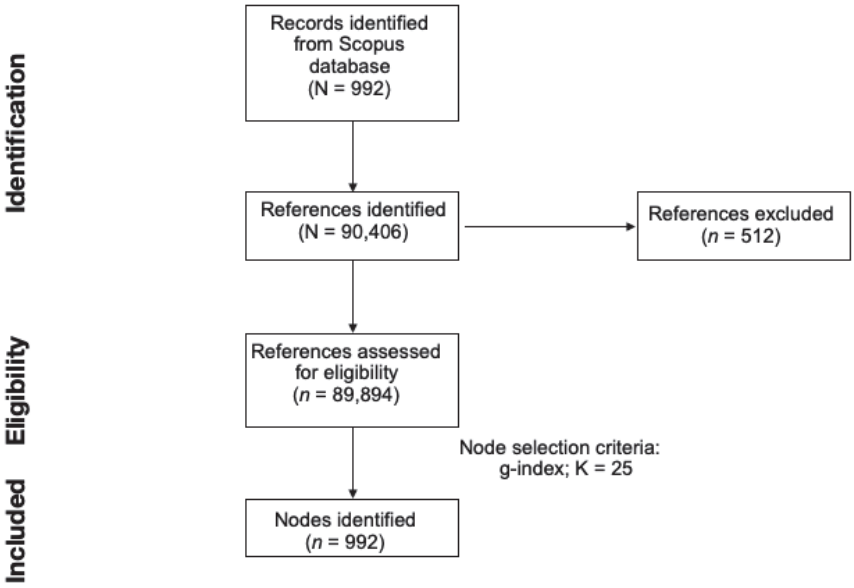

Figure 1. A flowchart of the PRISMA procedure employed in the study.

2.2. Document Co-Citation Analysis (DCA), Country Analysis and Parameter Optimisation

By conducting a DCA which is based on the frequency of papers being cited together in source articles [28], main research domains in the literature can be identified, including the construction of a network consisting of documents that have a high frequency of being cited together along with documents citing them. When articles are frequently cited together, it can be assumed that they reflect shared research trends and intellectual domains [23,29].

A parameter optimisation was conducted for the purpose of obtaining a balanced network of documents. This was achieved through the computation and comparison of multiple DCAS, which differed in terms of the settings for one of the three node selection criteria; g-index, TOP *N*, TOP *N*%, as done in [19,29–34]. The node selection criteria are predetermined parameters that define the criterion for the selection of articles for inclusion into the network, ultimately determining the generation of the final network. The g-index is a measure of the citation scores of the top publications by an author [35,36]. Given an article list ranked according to the number of received citations in descending order, the g-index is the largest number where the total number of citations received by the top g articles equals to at least g^2 [35]. TOP *N* and TOP *N*% are criteria used to select the *N* and *N*% most cited within a particular time slice, as network nodes respectively [22]. In this study, we have set the duration of the time slice to be 1 year, which means that the node selection criteria and scale factors were applied on a year-by-year basis to retrieve the maximum amount of information from the data sample.

To enable users to control the overall size of the final network, CiteSpace uses the scale factor to implement a modified version of the node selection criteria. Scale factor values refer to the selected numeric value which are employed as thresholds for the node selection criteria. For example, with $k = 1$, the standard g-index is used. Conversely, higher values of *k* correspond to a higher number of included documents. Therefore, the scale factor sets the threshold of the criteria. In order to generate the final optimal network, a number of DCAs with varying node selection criteria and scale factor values were computed [32]. A comparison of the following DCAs and their node selection criteria and scale factor values was carried out: g-index with scale factor *k* set at 25, 50 and 75, TOP *N* with scale factor *N* set at 50, 100 and TOP *N*% with scale factor *N* set at 10. The structural metrics, number of included nodes and identified clusters were compared for the determination of

the node selection criteria and scale factor to be employed for the generation of the final article network. Ultimately, a DCA with g-index with the scale factor *k* set at 50 was used.

Alongside the DCA, the involvement of countries in work on *hikikomori* was investigated through a country analysis. For the country analysis, g-index with the scale factor *k* set at 25 was the optimal parameter for the network generation. The country analysis relies on country information retrieved from the authors' affiliations in the citing documents.

2.3. Metrics

Structural and temporal metrics are used to describe the CiteSpace results. Structural metrics include the following: (i) *modularity-Q*, (ii) *silhouette scores* and (iii) *betweenness centrality*. The modularity-Q value is indicative of the degree of decomposition into single groups of nodes, otherwise known as as modules or clusters [37]. Modularity-Q values have a range from 0 to 1 where higher modularity-Q values are an indicator of a well-structured network [23]. Silhouette scores measures inner consistency of modules in terms of internal cohesion and separation from other clusters [38]. The values range from -1 to +1, with higher values being indicative of greater separation from other modules and internal consistency [39]. Betweenness centrality is a measure with values ranging from 0 to 1, which is representative of the degree to which a node serves as a connection between an arbitrary node pair in the network [22,40]. Scores closer to 1 are usually observed for high-impact works in the scientific literature [37].

Temporal metrics include (i) *citation burstness* and (ii) *sigma*. The Kleinberg's algorithm [41] is used in the calculation of citation burstness and indicates an abrupt increase in the number of citations of an article within a particular time frame [42]. The equation $(\text{centrality} + 1)^{\text{burstness}}$ was used for the calculation of the sigma value. Sigma allows the consideration of both structural and temporal properties of a node, for this reason, it indicates a document's novelty and influence on the overall network [23]. Sigma was introduced by Chen et al. [43].

For the examination of the overall configuration of the network and identified clusters, modularity-Q and silhouette scores were used. For the examination of single node characteristics, betweenness centrality and the temporal metrics were used.

3. Results

3.1. Structural Metrics

The DCA resulted in the generation of an optimised network made up of 992 nodes with 3488 links, which means there was an average of 3.52 connections with other references for each node. The network had a modularity-Q index of 0.8854 and a mean silhouette score of 0.9435, indicating high divisibility of the network into homogeneous clusters. This network resulted to be the most balanced as compared to the ones generated with g-index with scale factor *k* set at 25 (nodes = 567; links = 2110; modularity-Q = 0.7665; mean silhouette score = 0.9296; major clusters = 12) and 75 (nodes = 1332; links = 4644; modularity-Q = 0.9246; mean silhouette score = 0.9522; major clusters = 17), TOP *N* with scale factor *N* set at 50 (nodes = 218; links = 949; modularity-Q = 0.5879; mean silhouette score = 0.8724; major clusters = 7), 100 (nodes = 218; links = 949; modularity-Q = 0.5879; mean silhouette score = 0.8724; major clusters = 7) and TOP *N*% with scale factor *N* set at 10 (nodes = 218; links = 949; modularity-Q = 0.5879; mean silhouette score = 0.8724; major clusters = 7).

3.2. Thematic Clusters

16 major clusters were identified in total (Figure 2, Table 1). Based on their metrics, these 16 major clusters were automatically selected by CiteSpace from the total sample of 135 clusters. CiteSpace also automatically generates cluster labels using the log-likelihood ratio method (LLR Label). After a qualitative inspection of these CiteSpace-generated labels, the LLR labels were amended manually where necessary to better reflect the theme of the cluster, where the manually generated labels can be found in the table (Suggested Label).

Cluster #0 was the largest cluster, consisting of 102 nodes with a silhouette score of 0.92, where the mean year of publication of the constituent references was 2016. The cluster was manually labelled "Clinical features". Cluster #1 was the next largest cluster, consisting of 82 nodes with a silhouette score of 0.88, where the mean year of publication of the constituent references was 2015. The cluster was manually labelled "Risk factors". Cluster #3 was the third largest cluster, consisting of 49 nodes with a silhouette score of 0.964, where the mean year of publication of the constituent references was 2007. The cluster was manually labelled "Family factors".

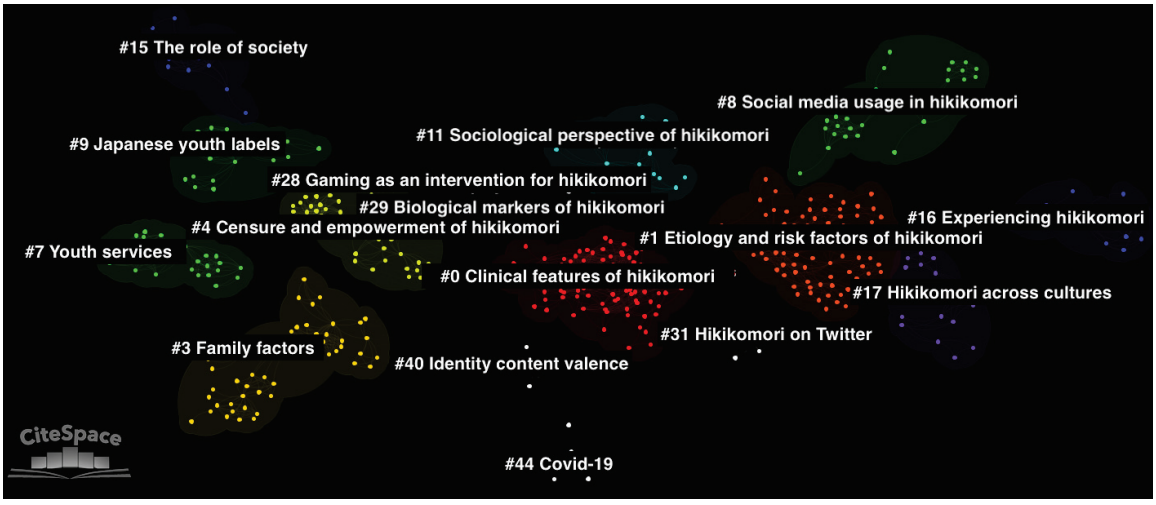

Figure 2. Document co-citation analysis network of all literature on the hikikomori with 16 generated clusters. In the network, single nodes represent individual documents.

Table 1. Structural metrics of the 16 clusters in the network. The CiteSpace software automatically generates Log-likelihood Ratio (LLR) labels.

Cluster ID	Size	Silhouette	Mean Publication Year	LLR Label	Suggested Label
0	102	0.92	2016	Psychometric properties	Clinical features
1	82	0.88	2015	Modern-type depression	Risk factors
3	49	0.964	2007	Strategic foundation	Family factors
4	44	0.959	2011	Virtual world	Censure and empowerment of hikikomori
7	32	0.984	2009	Hong Kong	Youth services
8	28	0.978	2015	Italian pediatric society	Social media usage in hikikomori
9	26	0.95	2008	Transcending label	Japanese youth labels
11	23	0.909	2014	Transcending label	Sociological perspective of hikikomori
15	17	0.996	2001	Symbolic component	The role of society
16	16	1.000	2016	Moral experience	Experiencing hikikomori
17	16	0.992	2015	Cultural idiom	Hikikomori across cultures
28	9	1.000	2014	Preventing hikikomori	Gaming as an intervention for hikikomori
29	9	0.992	2013	Severe social withdrawal syndrome	Biological markers
31	7	0.994	1999	Extent	Hikikomori on Twitter
40	4	0.997	2015	Maladaptive functioning	Identity content valence
44	4	0.992	2020	COVID-19 pandemic mental health	COVID-19

3.3. Citation Burstness

14 documents exhibited a citation burst in total (Table 2), after duplicates of the same documents were removed from the results of the citation burstness table. The strongest citation burst was observed in the article authored by Teo [44] with a score of 6.72, with the burst beginning in 2013 to 2018. There were 3 articles with the longest burst duration of 5 years: Teo [44], Teo and Gaw [45] from 2013 to 2018, and Saito and Angles [1] from 2017 to 2022. The highest sigma value of 1.36 was observed in the article authored by Teo [44]. The betweenness centrality values of these documents appear to be low, suggesting there is no document that is highly influential in the overall network of documents. Low betweenness centrality values suggest that nodes are all homogeneously

connected to each other, with no document being a common "bridge" when moving from a node to another. The results of this metric suggest that no node, if removed, would change the overall configuration of the network.

Table 2. Top 14 publications in terms of burst strength.

Reference	Citation Burstness	Publication Year	Burst Begin	Burst End	Duration	Betweenness Centrality	Sigma
Teo [44]	6.72	2010	2013	2018	5	0.05	1.35
Kato et al. [11]	5.81	2019	2020	2022	2	0.01	1.05
Furlong [10]	5.74	2008	2012	2016	4	0.00	1.02
Tateno et al. [46]	5.21	2012	2015	2019	4	0.01	1.08
Teo and Gaw [45]	5.21	2010	2013	2018	5	0.00	1.00
Kondo et al. [47]	4.66	2013	2016	2019	3	0.03	1.14
Kato et al. [48]	4.56	2018	2018	2020	2	0.03	1.15
Kato et al. [49]	4.43	2020	2020	2022	2	0.01	1.06
Teo et al. [50]	4.41	2015	2020	2022	2	0.02	1.11
Yong and Nomura [51]	4.09	2019	2020	2022	2	0.11	1.51
Krieg and Dickie [9]	3.78	2013	2016	2019	3	0.00	1.02
Chauliac et al. [13]	3.40	2017	2020	2022	2	0.01	1.03
Kato et al. [12]	3.39	2012	2018	2020	2	0.00	1.01
Saito and Angles [1]	3.14	2013	2017	2022	5	0.03	1.09

3.4. Country Analysis

The country analysis generated a network with 47 nodes (i.e., countries) and 97 links. The same results were observed with k set at 50 and 75, while smaller networks were observed when using TOP N with N set at 50 and 100 (nodes = 16; links = 23) and TOP N% with N set at 10 (nodes = 4; links = 2). In the optimal network, a total of 5 countries showed a citation burst when $\gamma = 0.60$. The parameter γ modulates the sensitivity of the node's burst detection [41]. The lower the parameter, the easier it is for a document to obtain a citation burst. Although the default value of gamma is 1, we lowered the threshold in order to obtain a good sample of documents with a burst.The five countries with a citation burst were France, the United States, Switzerland, Hong Kong and Singapore (Table 3).

Table 3. Five countries with a citation burst.

Country	Strength	Burst Begin	Burst End	Duration
France	3.33	2017	2018	1
United States	3.16	2007	2013	6
Hong Kong	2.49	2014	2018	4
Switzerland	1.93	2011	2013	2
Singapore	1.88	2018	2020	2

3.5. Differences Between Versions of Cite Space

In the current manuscript, we used two different versions of CiteSpace. The structural properties of the generated DCA network were similar between the two versions. However, the updated version allowed the identification of 16 thematic clusters in the literature as opposed to the 14 identified with the older version of the software. When comparing the clusters obtained with the two versions of the software, themes were largely stable, with some differences that emerged mainly in regard to smaller thematic clusters. The same applies to the burst and country analyses. Negligible differences in terms of clustering and individual metric values are due to continuous improvements to the software's algorithm.

4. Discussion

In this section, we will discuss clusters chronologically from the oldest to the most recent mean year of publication. The citing articles and cited references will be discussed,

where the main citing articles in each cluster will be reported along with and their coverage and Global Citing Score (GCS). A list of cited references in each cluster can be found in the Supplementary Materials. Coverage refers to the number of articles in the cluster that were cited by the citing article and GCS refers to the total number of citations received by a paper as indexed on Scopus.

4.1. Cluster #15: The Role of Society

Cluster "The role of society" included documents with an average year of publication in 2001. The major citing documents in the cluster was authored by Sakamoto et al. [52] (coverage = 14; GCS = 72). Particularly, the document presents a case of *hikikomori* in Oman, suggesting that the social commonalities between Omani and Japanese societies could reinforce the typical *hikikomori* behaviours.

4.2. Cluster #3: Family Factors

The articles citing the most references in the cluster in Cluster "Family factors" were authored by Toivonen [53] covering 15 articles and GCS of 17, Teo and Gaw [45] covering 12 articles and GCS of 130 and Umeda et al. [54] covering 9 articles and GCS of 39 (Table 4). In the literature, the family environment (e.g., parenting style, socioeconomic status) has often been cited as a risk factor for the development of *hikikomori* as well as a target for intervention. For example, the prevalence of *hikikomori* appears to be higher in middle and upper class families. It has also been argued that *amae*, a doting, indulgent and protective parenting style characteristic of parenting in Japan, may foster dependency of children on parents, which continues to be acceptable even as the child transitions to adulthood [55], leading to the acceptance of parents that their children remain at home for extended periods of time [11,12]. However, there is little systematic and empirical evidence supporting this notion as noted by Umeda et al. [54]. The role of the Japanese family context in *hikikomori* is discussed in a number of the cited references [10,56]. Other cited references included case studies where aspects of the family environment are highlighted but not statistically analysed as a factor for *hikikomori* development. For example, Hattori [57] detailed case studies of 35 *hikikomori* patients, reporting only the frequencies of symptoms and the treatment plans for these case studies. Notably, Umeda et al. [54] reported a higher likelihood of the occurrence of *hikikomori* in families where parents had a higher level of education. It was proposed that higher parental education levels imply higher incomes, possibly indicating greater financial ability to sustain the or higher parental expectations placed on children. Hence, it is clear that although parenting and the family environment have been proposed to be potentially significant contributors in the development of *hikikomori* even in the early stages of research, more well designed and empirical findings are needed to clarify this relationship to identify those at risk and inform the design of evidence-based interventions.

Table 4. Major citing articles in Cluster Family Factors.

Coverage	GCS	Citing Article
15	17	Toivonen [53]
12	130	Teo and Gaw [45]
9	39	Umeda et al. [54]
5	12	Horiguchi [58]
5	99	Teo et al. [50]
4	51	Malagón-Amor et al. [14]

4.3. Cluster #9: Japanese Youth Labels

The articles citing the most references in the cluster in cluster "Japanese youth labels" were authored by Toivonen and Imoto [59] covering 15 articles and GCS of 9 and Abel [60] covering 6 articles and GCS of 9. This cluster highlights the nature of *hikikomori* as one of many "youth problem" (*wakamono mondai*) labels in Japan, including *otaku*, *NEET* (Not in Education, Employment or Training) and *freeter* (individuals who are unemployed or do

not have full-time employment), which are recognizable and widely used. As discussed in Toivonen and Imoto [59], the use of such labels may not only pose a hindrance to research design due to the associated assumptions but often contributes to the phenomenon of "moral panic" in society, which can divert from targeted and effective interventions for *hikikomori*. Moreover, both Toivonen and Imoto [59] and Abel [60] discuss the case of *otaku* (i.e., an individual with consuming interests, such as anime or manga) and the Cool Japan initiative in terms of the fluidity of the meaning and interpretations of such social categories, where the original and mostly negative label *otaku* has started to decrease in perceived negativity [61]. Hence, this cluster appears to be comparing and contrasting societal perceptions of *otaku* and *hikikomori*. Similarly, the cited references also discuss several such labels and social categories such as *moe*, *soushoukukei otoko* ("herbivore", usually used with reference to men) (e.g., [62,63]) as well as the Cool Japan initiative. This cluster indicates the juxtaposition of *hikikomori* in relation to other similar youth labels and social categories from a more sociological perspective and how this may influence research and public policy relating to *hikikomori*.

4.4. Cluster #7: Youth Services

The articles citing the most references in the cluster in Cluster "Youth services were authored by Chan and Lo [64] covering 20 articles and GCS of 21, Krieg and Dickie [9] covering 11 articles and GCS of 50 and Wong et al. [15] covering 4 articles and GCS of 76. The main theme of the cluster seems to centre on youth services such as programs and activities that have been designed for *hikikomori* youth, with a number of these services being cited as references in this cluster (e.g., [65,66]. Notably, the major citing article by Chan and Lo [64] reviewed and compared the available services between Hong Kong and Japan, and proposed recommendations to enhance those available in Hong Kong. Specifically, Chan and Lo [64] proposed the incorporation of more therapeutic elements with youth and their families as well as the need for diversifying the range of services available in Hong Kong. The results reported in Chan and Lo [64] suggest that there may be differing perceptions of the nature of *hikikomori* in different countries which consequently shape the types of services available. Hence, this cluster shows the utility in conducting research evaluating youth services and their efficacy in reaching out and alleviating social withdrawal in *hikikomori* across different countries which can be used as a reference for the design and implementation of a holistic range of evidence-based services.

4.5. Cluster #4: Censure and Eempowerment of Hikikomori

The articles citing the most references in the cluster in Cluster "Censure and empowerment of hikikomori" was authored by Chan [67] covering 20 articles and GCS of 5, Li and Wong [68] covering 15 articles and GCS of 96, and Tajan [69] covering 9 articles and GCS of 31 (Table 5). The major citing article examines the phenomenon of *hikikomori* in Hong Kong, where it is termed *hidden youth*. Using a sociological perspective, the article cites the Social Censure Theory in arguing that negative labelling is thought to be reflective of moral judgment by the dominant social class. A key argument raised in the article is the role of the negative labelling placed on *hikikomori* in Hong Kong in exacerbating a cycle of resistance where the youth eventually recognise "being hidden"-or withdrawing-as the ultimate form of resistance to the censure placed on them. The argument is in line with the cited article by Burkley and Blanton [70] of the negative outcomes with internalising negative stereotypes, such as "behavioural assimiliation" where individuals behave in ways consistent with stereotypes and low self-esteem. Accordingly, the cited articles include initiatives such as job training for NEET individuals, where participants reported more of a need for social and emotional support and a better sense of self than increasing their employability [71]. Conversely, the cited articles also include research into the internet as an avenue where *hikikomori* can regain empowerment and a sense of self [72,73]. The characteristics of the internet grants anonymity and autonomy to youths to explore their preferred self-identity and social interactions. Hence, the cluster highlights the importance of recognising societal

judgments and censure placed on youths, which can inevitably shape how adults approach, design and treat *hikikomori* youth, as well as empowerment and disempowerment as key elements of the *hikikomori* narrative.

Table 5. Major citing articles in Cluster Censure and Empowerment of hikikomori.

Coverage	GCS	Citing Article
20	5	Chan [67]
15	96	Li and Wong [68]
9	31	Tajan [69]
6	17	Li and Wong [4]

4.6. Cluster #29: Biological Markers of Hikikomori

The articles citing the most references in the cluster in cluster "Biological markers in hikikomori" was authored by Hayakawa et al. [74], covering 9 articles and GCS of 21. The article reported possible blood biomarkers for *hikikomori* individuals, including serum uric acid levels in men and high-density lipoprotein cholesterol in women. The biomarkers tested in the study were related to avoidant personality traits, and the cited articles focused on similar studies investigating biological markers and psychiatric disorders, including uric acid in major depressive and anxiety disorders [75] and serotonin transporter promoter polymorphism [76]. The recency of this cluster is an encouraging sign of research moving towards biological markers of *hikikomori*, which holds potential as a possible diagnostic tool and could be researched further in terms of common biological markers of *hikikomori* across cultures. A common biological marker for *hikikomori* could serve as a potential basis to consolidate research on prolonged social withdrawal across countries and serve as a part of a universally shared definition for *hikikomori*.

4.7. Cluster #28: Gaming as an Intervention for Hikikomori

The articles citing the most references in the cluster in cluster "Gaming as an intervention for hikikomori" were authored by Hussain [77] with a coverage of 8 articles and GCS of 5, Kato et al. [11] with a coverage of 2 articles and GCS of 60 and Tateno et al. [78] with a coverage of 2 articles and GCS of 86 (Table 6). The cluster appears to focus on the use of gaming as an intervention for *hikikomori* with the major citing article by Hussain [77] reporting a study on the mobile application game Pokemon Go. Similarly, Kato et al. [11] also mentioned the role of Pokemon Go in motivating *hikikomori* to leave their homes, a sentiment echoed by the cited article by Tateno et al. [79]. Many of the cited articles were related to previous studies that looked at concepts of "exergaming", which combines physical activity and gaming (e.g., [80–83]). The gameplay of Pokemon Go involves physically travelling in the real world, to catch Pokemon which spawn at real world locations. The nature of this gameplay means that it holds potential in encouraging *hikikomori* to leave the confines of their homes and promoted their engagement in physical activity. Accordingly, the study by Althoff et al. [82] reported an increase in physical activity across men and women of various ages who played Pokemon Go. More research can be conducted on not only the efficacy of Pokemon Go, but also other forms of gamification involving exercise in motivating *hikikomori* to leave their homes, although it is likely that the recent COVID-19 pandemic may have stalled such research efforts.

Table 6. Major citing articles in Cluster Gaming as an intervention for hikikomori.

Coverage	GCS	Citing Article
8	5	Hussain [77]
2	60	Kato et al. [11]
2	86	Tateno et al. [78]
1	60	Stip et al. [84]

4.8. Cluster #11: Sociological Perspective of Hikikomori

The articles citing the most references in the cluster in cluster "Sociological perspective of hikikomori" were authored by Caputo [85] covering 9 articles and GCS of 2, Overell [86] covering 6 articles and GCS of 1 and Kirjavainen and Jalonen [87] covering 5 articles and GCS of 2 (Table 7). The work in the cluster seems to focus on a sociological perspective of *hikikomori*, where the main citing articles discuss *hikikomori* and their relationship with mainstream society. *Hikikomori* individuals are argued by Overell [86] to be out of place in the dominantly masculine culture in Japan while the analysis of forum posts reported in the study by Kirjavainen and Jalonen [87] indicated frustration towards society and a poorly functioning job market with difficulty finding meaningful employment. Similarly, the cited articles highlight the recession and irregular labour market in Japan [88], as well as the prevailing reality of limited upward social mobility across Western societies [89]. Hence, the cluster points towards a group of work looking into the role of societal forces that promote and enable *hikikomori*, with an emphasis on limited opportunities for productive and meaningful employment.

Table 7. Major citing articles in Cluster Sociological perspective of hikikomori

Coverage	GCS	Citing Article
9	2	Caputo [85]
6	1	Overell [86]
5	2	Kirjavainen and Jalonen [87]
3	13	Rubinstein [90]
2	5	Umemura et al. [91]

4.9. Cluster #40: Identity Content Valence

In cluster "Identity content valence", the major citing document was authored by Hihara et al. [92], covering 4 documents and GCS of 4. The document focuses on investigating the relationship between identity content valences and adaptation/maladaptation in Japanese young adults. It emerged that *hikikomori* symptoms predicted negative identity elements.

4.10. Cluster #17: Hikikomori Across Cultures

The articles citing the most references in the cluster in cluster "Hikikomori across cultures" were authored by Nonaka and Sakai [93] covering 6 articles and GCS of 5, De Luca [94] covering 6 articles and GCS of 5 and De Luca [95] covering 6 articles and GCS of 5. The focus of the work in this cluster seems to be research on the *hikikomori* phenomenon outside Japan, where it first gained interest, and the cultural dimensions associated with *hikikomori*. Although *hikikomori* in Japan has origins in Japanese mythology, similar reports of prolonged social withdrawal have also been made in France and in England in the 1950s and 1970s, where such French and English nosography was explored in greater detail in De Luca [94]. Moreover, with the publication of Saito's seminal work on *hikikomori* in English in 2012 [1], reports of prolonged social withdrawal across the world began to surface as evidenced by the cited articles [12,45,96] and the use of *hikikomori* entered the lexicon of the "mainstream" international research community. Notably, *hikikomori* is included as a cultural idiom in the DSM-5 rather than a psychiatric diagnosis, which remains an ongoing debate since a sociocultural approach towards *hikikomori* is favoured in Japan [94]. Research in cluster "Hikikomori across cultures" also allude to the need for greater consensus in the global psychiatric community as to the diagnosis of *hikikomori* and prolonged social withdrawal as a psychiatric condition in and of itself.

4.11. Cluster #1: Etiology and Risk Factors of Hikikomori

The articles citing the most references in the cluster in cluster "Etiology and risk factors of hikikomori" were authored by Chan [67] covering 29 articles and GCS of 5,

Orsolini et al. [97] covering 19 articles and GCS of 2 and Kubo et al. [98] covering 17 articles and GCS of 0 (Table 8). The main theme of this cluster appears to be risk factors and etiology of *hikikomori*. Many perspectives on the causes of *hikikomori* have been proposed including social censure [67], family environments [99,100], maternal attachment [9] but recently, there is a move towards the consideration that *hikikomori* is a society-bound syndrome rather than a cultural-bound one, likely to be the demands of modern, post-industrial societies as argued by the major citing article by Martinotti et al. [101]. Recently, researchers have proposed the similarity of *hikikomori* with a novel psychiatric syndrome, modern type depression, which made up the subject of a number of the cited articles in this cluster [102–105]. It was proposed that characteristics of modern type depression may be shared with *hikikomori* including avoidance of societal hierarchies and ranks, a preference for existence without social roles and a vague sense of omnipotence [104,105]. Moreover, many recently published citing articles also raised the relationship between *hikikomori* and modern type depression [97,101], where the major citing article authored by Kubo et al. [98] also found an association between modern type depression between *hikikomori*, where the authors proposed that both conditions may be gateways to the other.

Table 8. Top 10 major citing articles in Cluster Etiology and risk factors in hikikomori.

Coverage	GCS	Citing Article
29	5	Chan [67]
19	2	Orsolini et al. [97]
17	0	Kubo et al. [98]
15	2	Yung et al. [106]
14	2	Funakoshi et al. [107]
12	3	Martinotti et al. [101]
10	60	Stip et al. [84]
10	1	Ranieri [108]
9	0	Ari and Mari [109]
9	3	Masi et al. [110]

4.12. Cluster #31: Hikikomori on Twitter

Cluster "Hikikomori on Twitter" had an average year of publication in 2016. The major citing document in the cluster was authored by Pereira-Sanchez et al. [111], with a coverage of 7 documents and a GCS of 17. Particularly, [111] used Twitter to explore perceptions about *hikikomori* in Western countries.

4.13. Cluster #8: Social Media Usage in Hikikomori

The major citing article in cluster "Social media usage in hikikomori" was authored by Bozzola et al. [112] covering 12 articles and GCS of 21, followed by Tateno et al. [78] (coverage = 10; GCS = 86) and Stavropoulos et al. [113] (coverage = 8; GCS = 38) (Table 9). Bozzola et al. [112] reports the recommendations by the Italian Pediatric Society for device use by adolescents, where they highlighted *hikikomori* as one phenomenon closely related to device use and at high risk of internet addiction [84]. Social media and gaming applications on mobile devices appear to be commonly used applications by adolescents and is likely the case for *hikikomori* youth as well. As smartphones continue to become a more integral part of everyday life and adolescents are beginning to gain access to mobile devices at an increasingly younger age. As a result, issues of smartphone addiction and internet addiction become of serious concern, especially in *hikikomori* youth, who are reportedly spending a significant time-more than 12 h of screen time [68,84]. Accordingly, the cited articles are studies investigating smartphone addiction in youths [114,115]. The study by Tateno et al. [78] found that *hikikomori* trait had a relatively strong correlation with internet addiction, where those at high-risk for *hikikomori* spent longer times using the internet. Similarly, Stavropoulos et al. [113] found that *hikikomori* symptoms were associated with internet gaming disorder—with game playing time being a moderator of this association-

in a sample of massively multiplayer online game users. In the virtual world where online avatars and identities can be created, the virtual reality may be more appealing for *hikikomori* youth [84]. The proposed factors underlying gaming motivations by Yee [116], desire for interaction with others, gaming as a form of escapism from real life distress, immersing into a virtual identity and a desire for achievement which can be fulfilled in-game, may be rather consistent with *hikikomori* who may have experienced bullying or been ostracised in school or failed to meet expectations. With the versatility and functionality of the internet encompassing gaming, video streaming, social media, and online shopping to meet everyday needs, internet addiction is a very significant concern for *hikikomori* youth, which should be a key consideration in intervention design. Hence, at the same time that it is an encouraging sign that research in cluster "Gaming as an intervention for *hikikomori*" is looking into the viability of mobile applications such as Pokemon Go in engaging *hikikomori* youth, a balance should also be struck in terms of being aware of excessive usage and addiction to mobile devices in the design of such online or gaming intervention.

Table 9. Major citing articles in Cluster Social media usage in hikikomori.

Coverage	GCS	Citing Article
12	21	Bozzola et al. [112]
10	86	Tateno et al. [78]
8	38	Stavropoulos et al. [113]
3	7	Voiskunskii and Soldatova [117]

4.14. Cluster #16: Experiencing Hikikomori

The articles citing the most references in the cluster in cluster "Experiencing hikikomori" were authored by Hill [118] covering 5 documents and GCS of 2, Vainikka [119] covering 5 and GCS of 3 and by Bradley [120] covering 5 and GCS of 0 (Table 10). The major citing documents investigate the experience of people with *hikikomori*.

Table 10. Major citing articles in Cluster Experiencing hikikomori.

Coverage	GCS	Citing Article
5	2	Hill [118]
5	3	Vainikka [119]
5	0	Bradley [120]
3	21	Rooksby et al. [121]

4.15. Cluster #0: Clinical Features of Hikikomori

The articles citing the most references in the cluster in cluster "Clinical features of hikikomori" were authored by Amendola et al. [122] with covering 26 articles and GCS of 1, Kato et al. [11] covering 25 articles and GCS of 60 and Li and Wong [68] covering 22 articles and GCS of 96 (see Table 11). The clinical presentation of *hikikomori* seems to be the focus of this cluster, where some of the major citing articles [122,123] were evaluating the psychometric properties of Italian versions of the *Hikikomori* Questionnaire. Moreover, other citing articles discussed the clinical features of *hikikomori* [11,101,124–127], where the cited articles included those discussing the definitions and/or diagnostic criteria of *hikikomori* [11,49]. In general, there appears to be multiple operational definitions of *hikikomori* such as those outlined in Saito [2], Teo and Gaw [45], Teo et al. [50] without a standardised clinical definition. Results from the review by Nonaka et al. [124] also suggested that there may be differences in studies conducted in Japan and the rest of the world, where the authors suggested the possible influence of the researcher's perception of *hikikomori*. For example, the initial guidelines set out by the Japanese Ministry of Health, Labour and Welfare does not include functional impairment in its definition unlike the definitions proposed by Teo and Gaw [45] and Kato et al. [49]. Moreover, the comparison

between *hikikomori* in French and Japanese adolescents conducted by Hamasaki et al. [126] found that the pathology of *hikikomori* did not differ, where both French and Japanese adolescents showed high "parental psychiatric disorders", "overuse of Internet" and low "communication between parents". However, "communication with the community" only contributed to *hikikomori* severity in the French sample, suggesting cultural differences in the risk factors *hikikomori*. As such, the authors propose that *hikikomori* is a common phenotype with several possible underlying psychopathological mechanisms, similar to the conclusions drawn by Kato et al. [48]. Hence, the work in the cluster suggests that more research may be needed to determine the underlying pathologies, which may require varying strategies and interventions to alleviate.

Table 11. Top 10 major citing articles in Cluster Clinical features of hikikomori.

Coverage	GCS	Citing Article
26	1	Amendola et al. [122]
25	60	Kato et al. [11]
22	96	Li and Wong [68]
21	3	Martinotti et al. [101]
21	31	Kato et al. [128]
20	2	Nonaka et al. [124]
18	0	Hamasaki et al. [126]
18	8	Katsuki et al. [129]
15	14	Kato et al. [103]
14	10	Hamasaki et al. [125]

4.16. Cluster #44: COVID-19

Cluster "COVID-19" is the most recent cluster with an average year of publication in 2020. The major citing document in the cluster was authored by Kathirvel [130] covering 3 articles and GCS of 30. The major citing document examined the implications of the social isolation during the COVID-19 pandemic for mental health consequences.

4.17. Country Analysis

In the current work, the country analysis relies on the country included in the authors' affiliation string. The main countries included in the network were mostly post-industrial societies, which is in line with the conceptualisation of *hikikomori* as a society-bound syndrome associated with the demands of a modern society. This pattern may be indicative of the prevalence of *hikikomori* being reported in these countries, thereby generating greater research interest and work conducted.

Moreover, the years of the burst seem to suggest the role of media coverage and the presence of subject matter experts in the respective countries in spurring research into *hikikomori*. In the case of the United States, the burst occurred in 2007, which may be attributable to the publication of the book *Shutting Out the Sun* on *hikikomori* by Canadian journalist Michael Zielenziger [131], effectively introducing the phenomenon to the English-speaking community. In the case of Hong Kong, the burst occurred in 2014, which is in line with the work by Chan and Lo [64], who then continued to research the phenomenon in Hong Kong youth, suggesting the role of researchers in spearheading research into *hikikomori*. In the case of Singapore, the burst occurred in the year 2017, which coincides with a *hikikomori* symposium conducted by the National University of Singapore. It is possible that the symposium promoted knowledge sharing and collaborations on research into *hikikomori*, highlighting the role of research expertise of researchers in the countries in spearheading research.

4.18. Limitations

There are some limitations to the scientometric analysis conducted in this study. Firstly, the DCA is a quantitative analysis of the number and pattern of citations and co-citations,

and does not provide insight into the nature of the citations included in the analysis. This means that the DCA does not provide a qualitative perspective of the citation patterns and does not distinguish self-citations. Moreover, although the analysis was conducted on the vast majority of downloaded articles, there is a small percentage of data loss during the data import to CiteSpace, which may have led to the exclusion of relevant articles on *hikikomori*. Secondly, the DCA does not consider the type of article being cited such as reviews, case reports or experimental studies. Thirdly, it is important to note that the sample of documents included in the analysis reported in this study may not be exhaustive since only Scopus was used as a database for the article search and there may be articles which were not included in the current analysis.

5. Conclusions

Research on *hikikomori* focuses on both the prevalence and presentation of *hikikomori*, as well as articles exploring the causes of *hikikomori*. The results from the review suggest the growth in research conducted on *hikikomori* across the world may have culminated in a paradigm shift in recent years towards a multidimensional approach to understanding *hikikomori*, which is an important consideration for mental health practitioners and youth services in designing therapeutic interventions to encourage *hikikomori* individuals to leave the confines of their homes. As the *hikikomori* phenomenon continues to pose a serious public health problem in countries across the world, the results from the scientometric review point towards the need for greater consensus in terms of a standardised clinical definition of *hikikomori* and validated diagnostic tools and criteria. Moreover, with *hikikomori* being identified in more countries, findings from studies conducted in different countries should be consolidated to derive a clearer picture of the presentation of *hikikomori* and its risk factors, in order to better identify populations at risk.

Supplementary Materials: The following supporting information can be downloaded at: www.mdpi.com/xxx/s1, Results from the CiteSpace version 6.1.R2.: Table S1: Metrics of the 14 clusters identified with the DCA.; Table S2: Top 14 publications in terms of burst strength; Table S3: Five countries with a citation burst, and the cited references in each cluster.

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Abbreviations

The following abbreviations are used in this manuscript:

DCA	Document Co-Citation Analysis
LLR	Log-Likelihood Ratio
GCS	Global Citing Score

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Article

Marital Conflict, Family Socioeconomic Status, and Depressive Symptoms in Migrant Children: A Moderating Mediational Model

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Abstract: The present study examines the roles of parent–child communication and peer attachment in the relationships between marital conflict, family socioeconomic status (SES), and depressive symptoms in migrant children. The present study was a cross-sectional design. A total of 437 children were selected from 2 public schools of migrant children, and they were assessed on measures of marital conflict, family SES, parent–child communication, peer attachment, and depressive symptoms. Results showed that peer attachment moderates the relationships between marital conflict, parent–child communication, and depressive symptoms. That is, for migrant children with high peer attachment, marital conflict influences depressive symptoms directly, but also indirectly through parent–child communication. For migrant children with low peer attachment, marital conflict only exerts a direct influence on depressive symptoms. In addition, parent–child communication mediates the relationship between family SES and depressive symptoms, although the mediating effects were not significant for groups with a high or a low level of peer attachment. Thus, parent–child communication serves as one critical pathway, linking marital conflict, or family SES, with depressive symptoms. Furthermore, peer attachment acts as a buffer against the negative effects of marital conflict on depressive symptoms.

Keywords: marital conflict; family SES; communication; peer attachment; depression; migrant children

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1. Introduction

The psychological adaptation of migrant children is always an important research topic. In China, there is a large number of migrant children aged 0–18 years who leave their hometowns with their parents, for host cities [1–4]. These migrant children are more likely to suffer from psychological maladjustment in new cities. Depression is one of the most common internalized symptoms in migrant children in China [5–7], although other studies show no more severe depressive symptoms in migrant children than in their urban counterparts. For example, previous studies have shown that migrant children might experience higher levels of psychological, social, and emotional difficulties (i.e., depression, anxiety, aggression, and suicide) than their non-migrant urban counterparts [7,8]. Guo and colleagues (2015) reported that the rate of depression was 20.1% in a sample of 568 migrant children from 8 to 12 years of age [9].

Family socioeconomic status (SES) is usually a multidimensional construct which describes their level of access to, and control over, social and economic resources such as education, occupation, and income [10]. Family SES is considered as a risk factor for depressive symptoms. Children with low family SES are more likely to be exposed to major stressors and negative life events out of their control, and have access to less psychological support, thus increasing the risk of depression [11]. To date, there is a large number of studies which demonstrate that low SES was related to a higher risk of depression [12]. For

example, Cao and colleagues found that low family SES was related to greater depressive symptoms in adolescents [13].

Marital conflict is characterized by disagreements, arguments, and disputes between parents, and is the key element in determining child adjustment [14]. Children's exposure to destructive marital conflict is directly related to internalizing problems, both during childhood and later in life [15–18]. Within Chinese culture, family characteristics may be especially influential on children's development, particularly where adversity is involved [3]. However, during the adjustment to new and unfamiliar environments, migration increases the potential risk of suffering from a variety of stresses, and thus, of migrant parents experiencing more interpersonal conflicts. Family tension has been found to be a risk factor for psychological issues in migrant children [19].

On the other hand, the "spillover" hypothesis proposes that marital quality affects (spillover) parent–child relationship quality [20]. To date, some researchers suggest that marital conflict influences children's psychological adjustment indirectly by altering parenting practices and the quality of the parent–child relationship [20–22]. Nonetheless, little is known about the role of parent–child communication in the path from marital conflict to adolescents' development. Parent–child communication is often defined as those verbal or nonverbal communications which occur between parents and children within a family system [23]. A communication pattern between parents and children is proposed to be influenced by marital conflicts and family SES. For example, Grych (2002) showed that parents in a relationship marked by conflict, coped with this stress by often reducing the frequency of communication and providing more negative parenting interactions [24]. Additionally, low family SES was also found to increase financial stress and leave parents with less time for, and frequency of, communication with their children [25]. Less frequent or ineffective communication between parents and children was found to increase the risk of negative psychological and behavioral outcomes for children [26–30]. For example, parent–child communication played a mediated role in the relationship between the marital quality of parents and school adjustment in Korean adolescents [31]. Thus, it seems reasonable to hypothesize that marital conflict or family SES might influence depressive symptoms in migrant children through parent–child communication.

Attachment was originally referred to as a lasting affective bond established between a child and their primary caregiver [32,33]. However, with their emerging autonomy from family during later childhood and adolescence, adolescents begin to rely on peers as sources of companionship and emotional support [34–37]. Stronger attachment to peers has been found to promote adolescents' psychological adjustment, including higher self-esteem, greater life satisfaction, and fewer emotional and behavioral problems [35,38–40].

Furthermore, as peers play an increasingly important role in children's adjustment, peer attachment is more likely to shape the nature of the family life, and moderate children's experiences in the family setting. To date, fewer studies have investigated protective factors of peer attachment against the development of depression. For example, a previous study showed that peer attachment might serve as a buffer against the adverse effects of caregiver psychological distress on youth depression, as higher attachment to peers was significantly correlated with lower levels of depression [41]. Similarly, another study (2009) found that those adolescents who were suffering from interparent conflict within the family, but also had better connections with peers in school, had a higher level of positive affect than their counterparts [42]. On the other hand, according to the "compensation" hypothesis, peer attachment may act as a buffer, for the adverse effect of low-frequency and ineffective communication between parent and child, on adolescents' psychopathology, although fewer studies have investigated the protective role of peer attachment in the mediating path. For example, Zhang et al. (2017) showed that positive peer attachment may compensate for a problematic relationship with parents through the establishment of supportive relationships with peers instead [43].

Therefore, the present study examines the roles of parent–child communication and peer attachment in the relationships between marital conflict, family SES, and depressive

symptoms in migrant children. Specifically, we hypothesize that (1) parent–child communication mediates the relationship between marital conflict or SES and depressive symptoms; and (2) the direct and indirect (as mediated by parent–child communication) paths from marital conflict or SES to depressive symptoms were moderated by different levels of peer attachment.

2. Methods

2.1. Participants and Procedure

The participants of the current study comprised of 437 students (240 boys and 197 girls) attending their 4th or 5th grade (with a mean age of 10.87 years old, *SD* = 0.72). Of these participants, the majority of the children (93%) came from non-divorced families with biological, nonadoptive children. Only 12% (*n* = 51) of the fathers and 8.5% (*n* = 37) of the mothers had a college degree or higher. In addition, most families had a monthly income of more than 2280 RMB, the official low-income threshold per month for a family, whereas only a total of 34 families (7.8%) had a monthly income of less than 2000 RMB.

The participants were selected from the two public schools for migrant children in two labor-importing cities (i.e., Hangzhou and Jiaxing) in May 2016 (see Ying et al., 2023 for full details) [44]. In China, migrant schools in some cities enroll these children with lack of urban household registration status (hukou). These schools are usually considered to have inferior facilities and less well-equipped faculties [45]. After participants and their parents gave their written informed consent, a total of 444 participants sat in the classroom and took over half an hour to complete a series of anonymous questionnaires, including the Children's Perceptions of Interparental Conflict Scale (CPICS) [46,47], the Parent–Child Communication Questionnaire (PCCQ) [48], the Inventory of Parent and Peer Attachment (IPPA) [49], and the Center for Epidemiologic Studies Depression Scale for Children (CES-DC) [50]. The investigator provided participants some explanations for items with which they had difficulty understanding. A total of 437 participants completed all measures, yielding a response rate of close to 98.4%. This study was approved by the local education authorities (i.e., County Departments of Education), school principals, and the Research Ethics Committee of the research institute.

2.2. Measures

2.2.1. Family SES

Paternal and maternal education levels were coded into five categories: (a) primary school, (b) junior high school, (c) high school, (d) a bachelor's degree or higher. Family income was coded into 6 categories: (a) Below 1000 RMB, (b) 1000 RMB–2000 RMB, (c) 2000 RMB–4000 RMB, (d) 4000 RMB–6000 RMB, and (e) above 6000 RMB. In addition, according to the standard established by Shi and Shen (2007), paternal and maternal occupation were, respectively, coded into five categories: (a) casual laborer, unemployed, non-technical and agricultural laborers, (b) physical labor workers, self-employed staff, technical workers, or other similar workers, (c) clerical workers, shop assistants, skilled manual workers, and so on, (d) middle managers or professional and technical personnel, such as teachers, doctors, and technicians, and (e) government officials, senior management personnel, professional and technical personnel. In the current study, 87 (19.9%) participants did not report their household income. Thus, only paternal and maternal education levels and occupations were standardized and averaged to estimate a total measure of family SES.

2.2.2. Marital Conflict

A Chinese version of the CPICS was used to assess the frequency and intensity of overt conflict that occurs between their parents when children are present. As for children who live in single-parent families, they were asked to report their perceptions of parents' conflicts when their parents had lived together. This scale consisted of 10 items. Participants

responded to each item on a 5-point Likert scale, ranging from 1 (never) to 5 (always), with high scores indicating greater levels interparental conflict. Previous studies have shown that the CPICS has a good degree of reliability and psychometric properties [46,47]. In the present study, the Cronbach's alpha coefficient of the whole scale was 0.89.

2.2.3. Parent–Child Communication

The 23-item PCCQ was used to assess 4 aspects (i.e., open expression, listening to parents, conflict resolution, and mutual understanding) of parent–child communication [48]. Sample items included "When I am depressed or upset, I will tell my parents", and "I can handle conflicts with my parents well". Participants responded to each item on a 5-point Likert scale, ranging from 1 (not at all) to 5 (very well), with higher scores indicating greater frequency and intensity of communication between parent and child. Previous studies have shown that the internal consistency and construct validity of this questionnaire were good [26,48]. In the present study, the Cronbach's alpha coefficient of the entire scale was 0.94.

2.2.4. Peer Attachment

The 25-item IPPA was designed to evaluate peer attachment based on 3 dimensions: trust, communication, and alienation [49]. Participants responded to each item on a 5-point Likert scale, ranging from 1 (almost never) to 5 (almost always), with higher scores indicating a higher quality of relationship with peers. Previous studies have shown that the original [49,51] and the Chinese version [6] of the IPPA had satisfactory psychometric properties. In the present study, the Cronbach's alpha coefficient of the entire scale was 0.91.

2.2.5. Depression

The Chinese version [8,50] of the CES-DC [52] was used to assess the children's depressive symptoms during the previous week. Participants responded to each item on a 4-point Likert scale, ranging from 0 (not at all) to 3 (a lot), with higher scores indicating higher levels of depressive symptoms. Previous studies have found that both the original and the Chinese version of the CES-DC had satisfactory psychometric properties [8,50,52]. For the current sample, the Cronbach's alpha coefficient of the entire scale was 0.89.

2.3. Data Analysis

Firstly, the means, standard deviations, and correlation coefficients of these research variables were calculated. Then, to examine the mediating effect of parent–child communication in the relationship between marital conflict or family SES and depressive symptoms, we conducted structural equation modeling analyses with the AMOS 22.0 software using the maximum likelihood (ML) iteration procedure [53]. When these values of the Tucker–Lewis index (TLI) [54], the comparative fit index (CFI) [55], and the incremental fit index (IFI; Bollen, 1989) exceeded 0.95 [56] and the root mean square error of approximation (RMSEA) was less than 0.06 [57], the model fit with the data was viewed as being good. Then, after obtaining the best fitting model, the bootstrap-biased correction, with 5000 samples which could be performed in the bootstrap estimation procedure in AMOS 17.0 software, was calculated to test the estimated mediating effect [58–60]. The mediating effects occurred when the CI did not contain zero [61].

Finally, to further examine whether peer attachment moderated the indirect path (i.e., marital conflict or family SES-parent–child communication-depressive symptoms), we examined group invariance in the final path model. Specifically, an unconstrained model, in which the path coefficients were allowed to vary across low (below the mean on peer attachment) and high (above the mean on peer attachment) peer attachment groups, was compared by using the Chi-square difference test with a constrained model in which these path coefficients were constrained to be equal.

3. Results

Weston and Gore (2006) suggested that data are considered normal if skewedness is less than 3 and kurtosis is less than 10 [62]. Data of the present study met the criteria. The means, standard deviations, and correlation coefficients of these research variables were presented in Table 1. Marital conflict was positively correlated with depressive symptoms ($r = 0.35$) but negatively correlated with peer attachment ($r = -0.28$), and the four aspects (i.e., open expression, listening to parents, conflict resolution, and mutual understanding) of parent–child communication (r's = -0.28 to -0.49). The four aspects of parent–child communication were positively correlated with peer attachment (r's = 0.46 to 0.48) but negatively correlated with depressive symptoms (r's = -0.40 to -0.43). Family SES was significantly and positively correlated with peer attachment ($r = 0.18$) but not significantly correlated with other main study variables. In addition, the participants' age was negatively correlated with the open expression of communication ($r = -0.11$), but positively correlated with depressive symptoms ($r = 0.17$). However, gender was not significantly correlated with the main study variables.

Table 1. Descriptive statistics and intercorrelations among main variables.

Variables	Mean	*SD*	1	2	3	4	5	6	7	8	9	10
1. Age	10.87	0.72	-									
2. Gender	-	-	0.01	-								
3. Family SES	0.00	0.62	0.07	0.02	-							
4. Marital conflict	1.83	0.85	0.06	0.04	0.04	-						
5. Open expression	3.69	0.90	−0.11 *	0.02	0.05	−0.40 **	-					
6. Listening to parents	3.96	0.78	−0.09	0.04	0.08	−0.42 **	0.68 **	-				
7. Conflict resolution	3.71	0.96	−0.06	0.03	0.04	−0.49 **	0.72 **	0.75 **	-			
8. Mutual understanding	3.82	0.77	−0.08	0.03	0.05	−0.40 **	0.67 **	0.74 **	0.75 **	-		
9. Peer attachment	3.52	0.75	0.04	−0.01	0.18 **	−0.28 **	0.47 **	0.46 **	0.48 **	0.47 **	-	
10. Depressive symptoms	0.75	0.50	0.17 **	0.01	0.00	0.35 **	−0.43 **	−0.42 **	−0.40 **	−0.42 **	−0.48 **	-

Note. Gender: 1 = male; 2 = female; * $p < 0.05$, ** $p < 0.01$.

Next, structural equation modeling was performed to examine whether parent–child communications mediated the relationships between marital conflict, SES, and depressive symptoms. First, following Holmbeck's (1997) suggestions [63], we tested the direct effect of marital conflict or SES on depressive symptoms and found that both marital conflict and SES were significantly related to children's depressive symptoms. Then, we developed the fully saturated model, in which the mediator of parent–child communication was added. Specifically, in this fully saturated model, while SES and marital conflict served as two observed and exogenous variables, parent–child communication (a mediator) and depressive symptoms (an outcome variable) served as two latent and outcome variables, which were measured by their respective indicators. In addition, age has also been added into this fully saturated model as a covariate variable. The results showed that the model fitted the data well (χ^2 (37) = 101.07, $\chi^2/df = 2.732$, $p < 0.001$, CFI = 0.971, TLI = 0.957, IFI = 0.971, RMSEA = 0.063). Specifically, marital conflict was significantly and directly related to depressive symptoms and indirectly related via parent–child communication. Additionally, SES was not significantly and directly related to depressive symptoms but indirectly related via parent–child communication. The bias-corrected bootstrapping analysis showed that the indirect path from marital conflict to depressive symptoms, via parent–child communication, was significant because the 95% CI did not contain zero (coefficient = 0.60, 95% CI = [0.34, 0.94], $p < 0.001$). Similarly, the indirect path from SES to depressive symptoms, via parent–child communication, was significant because the 95% CI did not contain zero (coefficient = -0.15, CI = [-0.32, -0.02], $p < 0.05$).

Finally, to further examine whether peer attachment moderated the indirect effect, we examined group invariance in the full model, across the low and high levels of peer attachment. First, considering that higher scores indicated a good quality of peer attachment, we specified the group with high peer attachment (n = 228; above the mean) and the group with low peer attachment (n = 209; below the mean). Then, in the unconstrained model, these path coefficients were allowed to vary across the high and low levels of peer attachment. In the constrained model, these path coefficients were constrained to be equal across the two groups. The Chi-square difference test showed that the fit of the constrained model (χ^2 (87) = 154.74, χ^2/df = 1.779, $p < 0.001$, CFI = 0.963, TLI = 0.954, IFI = 0.964, RMSEA = 0.042) was significantly poorer than that of the unconstrained model (χ^2 (74) = 125.40, χ^2/df = 1.695, $p < 0.001$, CFI = 0.972, TLI = 0.959, IFI = 0.973, RMSEA = 0.040; $\Delta\chi^2$ (13) = 29.34, $p < 0.01$).

As shown in Figures 1 and 2, for migrant children with low peer attachment, only the effect of marital conflict on depressive symptoms, the indirect paths from marital conflict or SES on depressive symptoms—through parent–child communication— were not significant. However, for migrant children with high peer attachment, while the direct path from marital conflict to depressive symptoms was significant, the effect of marital conflict on depressive symptoms, through parent–child communication, was also significant. Further analysis, using the bias-corrected bootstrapping method, showed that the indirect effect from marital conflict to depressive symptoms, via parent–child communication among migrant children with high peer attachment, was significant because the 95% CI did not contain zero (coefficient = 0.58, 95% CI = [0.15, 1.17]).

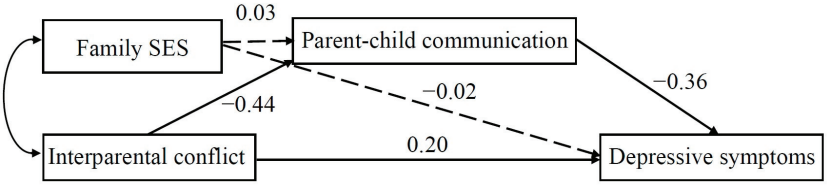

Figure 1. The path-analytic model depicting relations among interparental conflict, family SES, parent–child communication, and depressive symptoms in children with a high level of peer attachment. Note. The full arrow is the significant path; the dashed arrows are the nonsignificant paths. The values were standardized path coefficients.

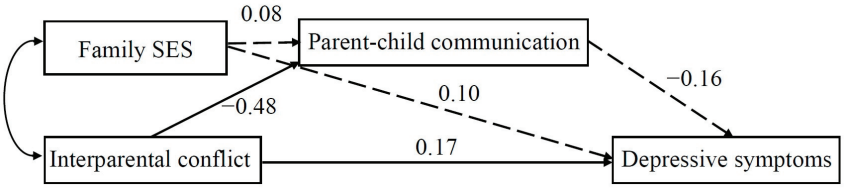

Figure 2. The path-analytic model depicting relations among interparental conflict, family SES, parent–child communication, and depressive symptoms in children with a low level of peer attachment. Note. The full arrow is the significant path; the dashed arrows are the nonsignificant paths. The values were standardized path coefficients.

4. Discussion

The current study examined the roles of parent–child communication and peer attachment in the relationships between marital conflict or family SES and depressive symptoms in migrant children. First, consistent with these previous studies [15–17], the results of the present study show that marital conflict is bivariately related to children's depressive symptoms, suggesting that there is a deleterious effect of marital conflict on depressive symptoms. Furthermore, even after the inclusion of mediators (i.e., parent–child com-

munication), the negative effect of marital conflict on depressive symptoms remained significant. Thus, these findings suggest that exposure to destructive conflict in the interparental relationship will increase the possibility of developing depressive symptoms in migrant children.

Additionally, consistent with the research hypotheses, marital conflict was found to partially relate to depressive symptoms, through parent–child communication, in migrant children. This finding offers more supports for the "spillover" hypothesis in migrant children in China. That is, the distress and frustration from marital conflict, occurring between parents, will spill over into parenting and the parent–child communication, thus leading to psychological maladjustment in children [20,64]. Communication in the parent–child relationship is related to children's adjustment. For example, positive communication, such as talking frequently and being open, listening, and being responsive, is related to a good quality of the parent–child relationship, high self-esteem, and positive psychological outcomes [26–28,30]. In a migrant family, the conflict between parents, during the adjustment to a new and unfamiliar environment, might decrease the quality and frequency of parent–child communication by reducing parents' sensitivity to the needs of their children and eliciting more negative responses from parents [24,65,66]. In turn, this can lead to a greater risk of depressive symptoms being experienced by migrant children. Thus, communication in the parent–child relationship is an important mediator in the path from marital conflict to positive psychological adjustments in migrant children.

Furthermore, the indirect path from marital conflict to depressive symptoms, via peer attachment, was found to vary across the different levels of peer attachment. That is, for migrant children with high peer attachment, marital conflict influences children's depressive symptoms directly or indirectly, through parent–child communication. There is only a direct effect of marital conflict on depressive symptoms in migrant children with low peer attachment. This completely confirmed the research hypotheses on the buffering effect of peer attachment, suggesting that peer attachment might serve as a protective factor to alleviate the negative effects of marital conflict on depressive symptoms. According to attachment theory, children resort to peers as a source of emotional support and as a secure base in the transition from later childhood to adolescence [37,67]. Thus, security in the attachment to peers and feelings of support in close relationships are beneficial to the psychological health of adolescents [36]. However, after entering cities, migrant children need to rebuild close peer relationships to meet these developmental demands, such as gaining attention and emotional support. Social rejection by local peers, and the movement of parents' worksite from one site to another, harm their relations with peers and foster a lack of belonging [3,68]. As a result, when exposed to marital conflict, migrant children with high peer attachment are more likely to maintain open and effective communication with their parents, which, in turn, alleviates the severity of depressive symptoms. On the contrary, the finding of the only direct effect of martial conflict on depressive symptoms suggests that migrant children with low peer attachment have greater vulnerability in the face of interparent conflicts, and are more likely to report depressive symptoms.

In addition, consistent with a previous study [69], the results of the current study indicated that SES affected depressive symptoms through parent–child communication, suggesting that parent–child communication plays a similar mediating role in the relationship between family SES and depressive symptoms. According to the conservation of resources theory [70], the low level of family SES increases financial stress, leaves parents with less time, and leads to a reduced frequency of communication with their children, all of which increases migrant children's susceptibility to depressive symptoms. However, the mediating effect of parent–child communication, in such cases, is reduced within both groups with a high and a low level of peer attachment. This finding suggests that, in spite of children with high or low peer attachment, marital conflict—instead of family SES—exerts a greater influence on depressive symptoms, through parent–child communication.

Finally, consistent with a previous study [71], the results of the present study show that age is significantly and positively correlated to depressive symptoms. This finding

suggests that depressive symptoms gradually become more prevalent during the transition from childhood to early adolescence. Thus, it might be necessary to devise age-appropriate interventions for depressive symptoms in migrant children. In addition, consistent with previous studies [72,73], this finding shows that age is negatively and significantly correlated to the open expression of parent–child communication. One possible explanation is that, as children increasingly develop individuality, they tend to keep secrets from their parents, in order to meet their need for autonomy, leading to a reduction in the frequency and intensity of open expression. In addition, the results of the present study show that maternal educational level is significantly and positively related to peer attachment and mutual understanding within parent–child communication. It is because maternal education shapes a set of proximal and distal parenting practices (e.g., high warmth and acceptance), which, in turn, increases mutual understanding between parent and child, as well as the possibility of building an affective bond to peers [74].

4.1. Limitations of the Study

Several limitations were worthy of be note. The first limitation was that all variables were assessed using self-reporting measures, which might bolster the relationships among these constructs, due to a common reporting method variance. Second, marital conflict was reported by adolescents but not by their parents; a previous study indicated that adolescents might tend to report a higher level of marital conflict than their parents [75]. Additionally, the data of the present study came from a convenience sample, which did not allow the research to control possible confounding variables, such as ethnicity, class, and school. Other important variables, such as perceived discrimination, were not included in the current study. Thus, generalizing the findings should be performed with caution. Finally, the correlational nature of our data did not allow us to draw a causal inference regarding the relationships between marital conflict and depressive symptoms.

4.2. Implications for the Practice

The findings of the present study provide some important information for school psychologists, or psychological service providers, to alleviate the depressive symptoms of migrant children in China. Specifically, the findings of the present study suggest that, for migrant children living in families experiencing high levels of conflict, parents might utilize clear, direct, and responsive communication to promote their children's psychological adjustment. Thus, improving parents' communication skills might be an appropriate target for alleviating the internalizing symptoms among migrant children [76]. For example, parents were trained to react promptly and sensitively to a child's needs, feelings, and interests, and develop positive communication skills (e.g., listening and being open). Similarly, in the community, psychological service providers should provide some courses for migrant parents to improve the quality of their communication with children. In addition, of the array of potential resources, schools are a suitable location for interventions. As for those migrant children experiencing low peer attachment, school-based interventions, such as peer tutoring, were also used to alleviate the detrimental effect of marital conflict on depressive symptoms, by the development of supportive and accepting relationships with peers [77].

5. Conclusions

In summary, the findings of the current study have shown that marital conflict, instead of family SES, exerts more influence on depressive symptoms, through parent–child communication. Furthermore, peer attachment moderated the relationships between marital conflict, parent–child communication, and depressive symptoms in migrant children. That is, for migrant children with high peer attachment, marital conflict directly influences children's depressive symptoms, but also indirectly influences them through parent–child communication. For migrant children with low peer attachment, marital conflict exerts a direct influence on depressive symptoms.

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

Data Availability Statement: Due to ethical restrictions, some access restrictions apply to the data underlying the findings. However, reasonable requests to access the datasets should be directed to the corresponding author after obtaining the permission from Zhejiang Sci-Tech University, China and signing the usage agreement for research purpose.

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

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Article

Professional Identity and Career Adaptability among Chinese Engineering Students: The Mediating Role of Learning Engagement

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Abstract: Due to the rapid development of science and technology, economic development has changed dramatically, resulting in the transformation of career characteristics. Individuals need to convey a higher career adaptability than ever before in order to face the rapid changes brought by development. Especially for college students in the critical period of career development, having good career adaptability is of great significance to their future career choice and development. This study conducted a cross-sectional survey of 692 engineering undergraduates at a top engineering university in China and used the data to investigate the relationship between the professional identity (professional interest, professional strength, career prospects, and professional satisfaction) and career adaptability of college students, as well as to discuss the mediating role of learning engagement in the relationship between professional identity and career adaptability. The results of the correlation analysis showed that professional identity was positively correlated with career adaptability. The mediation effect model indicated that learning engagement played a mediating role in the relationship between the professional identity and career adaptability of Chinese college students. In other words, professional identity had a direct positive impact on career adaptability, while professional identity, mediated by learning engagement, had a positive impact on career adaptability. The study recommends that colleges provide students with a more conducive academic environment and more opportunities for career practice. We also encourage educators to provide more emotional support and identity for students to enhance students' career adaptability by creating a favorable academic and emotional atmosphere.

Keywords: professional identity; career adaptability; learning engagement; college students; mediation effect model

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1. Introduction

With the rapid development of society, the future development of individuals is faced with various unpredictable changes, and it is necessary to improve career adaptability to promote better development in a changing career path. Career adaptability is a core competence of individuals to achieve career success [1]. This concept originated from the revision of vocational maturity theory [2]. In 1981, Super and Knasel further stated that career adaptability refers to an individual's ability to cope with changes in occupational roles and to balance stress in the work environment [3]. Super et al. [4] noted that career adaptability was the ability to respond appropriately to uncertain reality, and that the interaction between individuals and the environment should be highlighted. Since then, the concept of career adaptability has gradually replaced vocational maturity. Savickas subsequently expanded the concept of career adaptability [5–7] and defined it as an individual's ability to prepare and cope with predictable career tasks, career roles, and career changes or

unpredictable career problems. In 2005, Savickas constructed a career adaptability model from four dimensions: concern, control, curiosity, and confidence, and each dimension contained a question [7]: Do I have a future? Who owns my future? What do I want to do in the future? Can I do it?

In recent years, academia has paid much attention to the construction of career adaptability and its influence mechanism, but most studies have focused on the predictive effect of career adaptability on outcomes. For instance, from the perspective of concept and experience, Hirschi et al. [8] explored the relationship between different operating modes of career adaptability in terms of attention, control, curiosity, and confidence. Other scholars have explored the prediction of career adaptability on outcome variables such as career choice [9], life satisfaction [10], personal growth, and well-being [11].

College is a critical period for the development and transformation of career roles [12]. College students need to adjust themselves so that they can smoothly transition from students to professionals and gradually meet the requirements of their careers and complete career activities. Career adaptability is a significant ability to help college students develop and plays a role in college students' career construction and decision-making [13,14]. Therefore, career adaptability is a critical variable for observing the lifelong career development of college students [1]. Engineering students account for 34.02% of Chinese college students, which represents a significant group for national development, and good career adaptability is particularly critical for their employment. Most studies take all students as samples, but there are few studies on this large group. Therefore, this study aims to know more about the career adaptability of engineering students in China.

Career adaptability in college is affected by various factors in study and life [15–17]. In China, when choosing college majors after high school graduation, students are usually restricted by the enrollment plan of colleges and disturbed by the ranking of colleges and the popularity of majors. Under such complicated conditions, many students end up choosing majors that they do not like. Low professional identity directly leads to a decrease in their learning engagement during college, which may affect the development of their career adaptability. Based on this, the present study focuses on college students' professional identity and explores the influence mechanism of professional identity and learning engagement on career adaptability.

1.1. The Relationship between Professional Identity and Career Adaptability

Salling Olesen [18] defined professional identity as the balance and consistency that an individual could feel toward his or her major in real life. Professional identity is a significant tool to judge an individual's career development [19], which affects his or her future career choice and attitude toward the careers to be engaged. Welmond's [20] study revealed that students could combine the professional knowledge they had learned with their interest, had a positive desire to explore their future career, and expected to make contributions to their professional field. In the existing research, we noticed some relevant evidence. For instance, Šverko and Babarović [21] applied the Personal Globe Inventory Scale, the HEXSCO-60 Scale, and the Career Adapt-Abilities Scale (CAAS) to a sample of 981 high school graduates and discussed the relationship between interest and career adaptability. The results suggested that career adaptability and general interests had a weak positive correlation. People who showed higher interest in prestigious careers tended to have higher career adaptability, and were more curious about future career options, more confident in pursuing professional tasks, more concerned about their careers, and more willing to prepare for their future careers.

Ledyandini et al. [22] used quantitative methods in a study of students majoring in accounting at Gorontalo Provincial College, aiming to determine the effect of gender, financial reward, and professional identity on career choice, and they discovered that the simultaneous variables of gender, financial reward, and professional identity had a significant positive effect on the choice of accounting career. Leung et al. [23] conducted a two-stage test for college students in Hong Kong. They completed adaptive readiness

(interest and competence flexibility) and adaptability resource (Career Adapt-Ability Scale, CAAS) measures in their sophomore or junior year, respectively. The adapting responses (life-skills competencies) and adaptation result (presence of life purposes, career decision-making difficulties) measures were conducted at the end of the senior year. The results showed that interest could prompt the stimulation of adaptive resources and that adaptive resources could directly or indirectly promote adaptive responses. From the perspective of reinforcement sensitivity theory (RST), Corr and Mutinelli [24] explored the relationship between the related factors of career (career adaptability, career optimism, and perceived knowledge) and three main systems of the reinforcement sensitivity theory of personality (Behavioral Approach System, Fight-Flight-Freeze System, and Behavioral Inhibition System). The results indicated that three related factors of career were positively correlated with Behavioral Approach System scores, mainly with reward interest. Burnik and Košir [25] introduced a novel industrial design program that provided students with industrial experience in the study. The students who participated in the program showed a higher professional responsibility than the average level, which indicated that understanding career prospects and building professional identity had a positive effect on students' future career adaptation and choice. Urbanaviciute et al. [26] discussed the relationship between occupational barriers and vocational identity commitment based on a sample of Lithuanian undergraduates and explored the mediating role of academic major satisfaction. The results revealed that perceived occupational barriers were negatively correlated with academic major satisfaction, and occupational barriers were negatively correlated with vocational identity commitment through academic major satisfaction. In other words, when the students had higher academic major satisfaction, they would have lower perceived difficulty in achieving career goals and better adapt to their future career.

In the present study, we discuss the relationship between professional identity and career adaptability. Professional identity is a variable composed of professional interest, professional strength, career prospects, and professional satisfaction. According to the review of the literature, we notice that although there are some relevant empirical studies, there is still a lack of direct research on the relationship between the professional identity and career adaptability of engineering college students.

1.2. The Mediating Role of Learning Engagement

In a few previous studies, we noticed some empirical evidence that learning engagement is related to occupational adaptability and professional identity. For instance, Rossier et al. [27] conducted a study on Swiss individuals and discovered that career adaptability resources and work outcomes (e.g., career involvement) had a positive correlation. Tladinyane and Merwe [28] also discovered a significant relationship between career adaptability and career engagement. Reinforcement theory proposes that continuous stimulation leads to changes in cognitive and behavioral responses in the brain and increases the possibility of such behavior. Investing time in professional learning is an effective means of consolidating students' professional development. Learning in class and self-study after class can both consolidate the professional knowledge that they have acquired, thus playing a positive role in career adaptability [29]. Kumar and Choudhury [30] noticed that the time that students spent on homework each day positively affected their learning ability. Xiuyun [31] revealed the influence mechanism of professional cognition on decision-making difficulties in the career. These studies suggest that higher professional identity leads to lower difficulty in making decisions. In other words, when college students learn more about their majors, they have a higher professional identity. A high professional identity makes college students more enthusiastic about learning and more committed to learning, and gives them more professional advantages than other students in future career selection. Based on the job demands–resources model, Gupta [32] investigated the mediating effect of career engagement on the perceived career support and career performance of young knowledge workers as well as the mediating effect on career adaptability and career performance. The results showed that career engagement, career adaptability, and career

performance were significantly positively correlated. However, Cotter and Fouad [33] did not find a significant correlation between career adaptability and career engagement in their research on layoff survivors.

There are some definitions of learning engagement. The study uses Kuh's [34] definition that "the time and energy students devote to educationally sound activities inside and outside of the classroom, and the policies and practices that institutions use to induce students to take part in these activities". Under this definition, we use "study in class" and "study after class" as components of learning engagement. Although previous studies helped us find a positive correlation between learning engagement, professional identity, and career adaptability, few studies focused on the mediating effect of learning engagement on professional identity and career adaptability and more efforts are still needed, which can prompt school administrators to better serve the needs of student growth and development.

1.3. Research Design

In previous studies, we notice that the sub-factors that constitute professional identity (professional interest, professional strength, career prospects, and professional satisfaction) are positively correlated with career adaptability. These results arouse our interest in the direct relationship between professional identity and career adaptability. Therefore, we propose the following hypotheses:

Hypothesis 1. *Professional identity and career adaptability are significantly positively correlated, and the improvement of professional identity significantly leads to the improvement of career adaptability (professional identity → career adaptability).*

Since existing studies have paid little attention to the role of learning engagement in the relationship between professional identity and career adaptability, we further explore the mediating role of learning engagement and clarify the relationship between professional identity and the career adaptability of engineering students, as well as the mediating role of learning engagement. We propose the following research hypothesis:

Hypothesis 2. *The improvement of learning engagement significantly promotes the improvement of career adaptability (learning engagement → career adaptability), and learning engagement plays a mediating role between professional identity and career adaptability (professional identity → learning engagement → career adaptability).*

Previous studies have discovered that career adaptability is correlated with gender. Most studies indicated that gender differences exist in career adaptability [35,36], while a few studies stated no significant gender differences [1]. Previous studies have also shown the possibility of differences between ages [24,37]. In this study, these two variables are set as control variables in the model construction. According to the relevant theories and literature, a theoretical framework is formed (Figure 1).

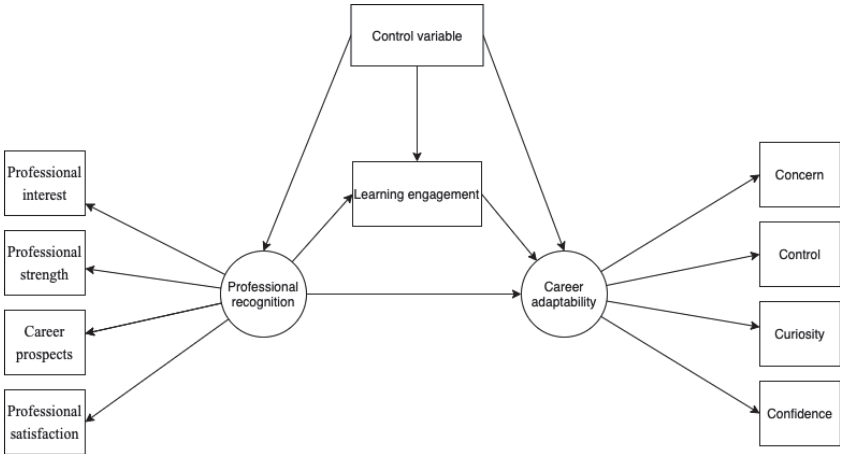

Figure 1. Theoretical research framework.

2. Methods

2.1. Participants

The study used data from an online survey of engineering undergraduates in China. The survey adopted a stratified random sampling method. Five engineering schools were randomly selected from 25 engineering schools of the university. The participants were randomly selected according to the size of schools and the number of students in different academic years, as well as stratified by average education level and population proportion. The questionnaire had six parts, including students' basic information, experience before college, course learning, college satisfaction, physical and mental health, and employment after graduation, aiming to understand the quality of engineering education in China and to provide relevant data support and policy suggestions for the reform and development of China's emerging engineering education. The study selected a university participating in the survey as a sample and included 692 samples for analysis. The average age of students who participated in the survey was 20.8. There were 153 females and 539 males, accounting for 22.11% and 77.89%, respectively. Seventy-six students were in their first year, accounting for 11.03%. Two hundred and forty students were in their second year, accounting for 34.83%. Two hundred and thirty-one students were in their third year, accounting for 33.53%. One hundred and forty-two students were in the fourth year, accounting for 20.61%. Six hundred and eight students were of Han nationality, accounting for 87.9% of the sample, while 84 students were ethnic minorities, accounting for 12.1%. There were 439 students without siblings and 253 students with siblings, accounting for 63.4% and 36.6%, respectively. One hundred and ten students came from rural areas and 582 students from urban areas, accounting for 15.9% and 84.1%, respectively.

2.2. Measures

Professional identity. In the study, three items including "strong professional interest", "high professional strength", and "good career prospects", and 10 items of "high professional satisfaction" were used to constitute the latent variables of professional identity. Each item was evaluated on a seven-point scale, with 1 representing "strongly disagree" and 7 representing "strongly agree". The average score of these items was calculated to measure students' professional identity. When the average score was higher, the professional identity was higher. The reliability coefficient α of the professional identity scale was 0.921.

Learning engagement. The study used learning time to measure students' learning engagement. The questionnaire asked students about their average weekly learning time, including study in class (experimental courses and practice courses) and study after class (homework, reading, etc.) [38–40]. By adding students' study in class and after class, a continuous variable ranging from 0 to 66 was obtained as a proxy variable for learning engagement.

Career adaptability. The items in the career adaptability scale were from the scale compiled by Sibunruang et al. [41], including four subscales of attention, control, curiosity, and confidence and three items for each subscale. Attention was measured using items such as "I will think about what my future looks like", control was measured using items such as "I can make my own decisions", curiosity was measured using items such as "I will seek opportunities for personal growth", and confidence was measured using items such as "I will do things carefully". A 7-point Likert scale was used, with 1 representing "disagree" and 7 representing "very agree". The average score was calculated to measure the career adaptability of engineering students, and a higher average score indicated higher career adaptability. The reliability coefficient α of the career adaptability scale was 0.955.

2.3. Data Analysis

First, Stata 16.0 was used for descriptive statistical analysis of professional identity, learning engagement (including study in class and study after class), and career adaptability of engineering college students. The mean, standard deviation, minimum, maximum, kurtosis, and skewness of these variables were calculated. Second, we used Stata 16.0 to conduct a correlation analysis on professional identity, learning engagement, career adaptability, and other variables. Finally, we constructed the mediation model in Mplus 8.3 and empirically examined the mediating effect of learning engagement on the relationship between professional identity and career adaptability.

3. Results

3.1. Descriptive Statistics

Table 1 shows the mean, standard deviation, minimum, maximum, skewness, and kurtosis of career adaptability, learning engagement, and professional identity. Descriptive statistics reveal that the average score of self-reported career adaptability is 61.909, which is higher than the medium level, indicating that students generally think they have relatively good career adaptability. The average learning engagement is 36.142, of which the average weekly study in class is 18.934 h, and the average study after class is 17.208 h. The average score of professional identity was 70.595. Specifically, the average score for engineering students' professional interest is 4.710, the average score for professional strength is 5.354, the average score for career prospects is 4.585, and the average score for professional satisfaction is 55.947. The results show that the mean values of professional identity, professional interest, professional strength, career prospects, and professional satisfaction, which constitute the variables of professional identity, are all higher than the medium level. Students are satisfied with their majors and recognized for their professional strength. Although the students are interested in the majors, the degree of interest is moderate. According to the rating of career prospects, students are generally not very confident about the career prospects of their major.

Table 1. Descriptive statistics of career adaptability, learning engagement, and professional identity.

Variables	N	Mean	Standard Deviation	Min	Max	Skewness	Kurtosis
Career adaptability	692	61.909	12.156	12	84	−0.549	4.370
Learning engagement	692	36.142	14.002	0	66	−0.048	2.815
Study in class	692	18.934	9.480	0	33	−0.255	2.171
Study after class	692	17.208	9.160	0	33	0.264	2.126
Professional identity	692	70.595	12.281	13	91	−0.653	3.716
Professional interest	692	4.710	1.544	1	7	−0.604	3.037
Professional strength	692	5.354	1.461	1	7	−1.049	3.898
Career prospects	692	4.585	1.429	1	7	−0.544	3.161
Professional satisfaction	692	55.947	10.234	10	70	−0.649	3.668

3.2. Correlation Analysis

Table 2 shows the correlation coefficients of career adaptability, learning engagement, and professional identity (professional interest, professional strength, career prospects, and professional satisfaction). The results indicate that career adaptability is significantly positively correlated with the professional identity of Chinese engineering students ($p < 0.01$). In other words, both professional identity and career adaptability change in the same direction. When professional identity increases by one unit, career adaptability increases by 43.9%. Career adaptability is significantly positively correlated with learning engagement ($p < 0.01$), which means that when learning engagement increases by one unit, career adaptability increases by 21.1%. Career adaptability factors (concern, control, curiosity, confidence) are also significantly positively correlated with learning engagement and professional identity. In addition, professional identity is significantly positively correlated with learning engagement ($p < 0.01$). When professional identity increases, learning engagement will also increase. The above verifies Hypothesis 1. The results suggest that career adaptability is positively correlated with students' professional interest, professional strength, career prospects, and professional satisfaction ($p < 0.01$). Learning engagement is also positively correlated with students' professional interest, professional strength, career prospects, and professional satisfaction ($p < 0.01$). Other variables also show a significant positive correlation.

Table 2. Correlation analysis of career adaptability, learning engagement, and professional identity.

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Career adaptability	1										
2. Learning engagement	0.211 ***	1									
3. Professional identity	0.439 ***	0.217 ***	1								
4. Attention	0.890 ***	0.203 ***	0.355 ***	1							
5. Control	0.909 ***	0.166 ***	0.421 ***	0.730 ***	1						
6. Curiosity	0.945 ***	0.202 ***	0.412 ***	0.774 ***	0.829 ***	1					
7. Confidence	0.923 ***	0.201 ***	0.428 ***	0.735 ***	0.789 ***	0.870 ***	1				
8. Professional interest	0.283 ***	0.218 ***	0.513 ***	0.244 ***	0.258 ***	0.255 ***	0.282 ***	1			
9. Professional strength	0.262 ***	0.178 ***	0.585 ***	0.195 ***	0.247 ***	0.262 ***	0.263 ***	0.538 ***	1		
10. Career prospects	0.266 ***	0.125 ***	0.556 ***	0.225 ***	0.238 ***	0.261 ***	0.255 ***	0.585 ***	0.553 ***	1	
11. Professional satisfaction	0.410 ***	0.185 ***	0.961 ***	0.330 ***	0.398 ***	0.382 ***	0.398 ***	0.306 ***	0.401 ***	0.360 ***	1

Note: *** $p < 0.01$.

3.3. Mediation Model

The study controlled for gender and grade and used a mediation model and bootstrap methods to investigate the mediating role of learning engagement between professional identity and career adaptability. The model fit index was good, with Chi square = 144.245, degree of freedom = 37, RMSEA = 0.065, CFI = 0.970, TLI = 0.956 [42,43]. Table 3 shows the results of the model. In the mediation model, the direct effect of professional identity on career adaptability was 0.407 ($p < 0.001$), the confidence interval was [0.330, 0.544], and the direct effect was significant. The indirect effect was 0.030 ($p < 0.05$), and the confidence interval was [0.013, 0.057], indicating a significant indirect effect. Gender ($p > 0.1$) had no significant impact on career adaptability, while grade ($p < 0.05$) had a significant effect on career adaptability (Figure 2). The above results indicate that learning engagement plays a mediating role in the relationship between career adaptability and the professional identity of Chinese engineering students, which supports Hypothesis 2. Specifically, professional identity has a positive effect on career adaptability through the mediating effect of learning engagement.

Table 3. Mediating effect of learning engagement on the relationship between professional identity and career adaptability among engineering students.

Pathways	Estimate	95%CI		Standard Error	Estimate/Standard Error	*p* Value
		Lower	Upper			
Direct effects						
Professional identity → Career adaptability	0.407	0.330	0.544	0.054	7.557	0.000
Indirect effects						
Professional identity → Learning engagement → Career adaptability	0.030	0.013	0.057	0.010	2.897	0.004

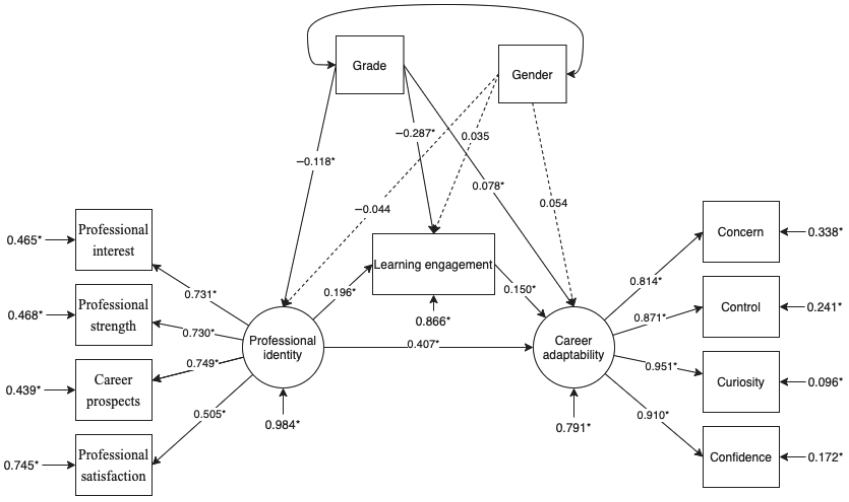

Figure 2. Mediation effect model. Note: * $p < 0.05$.

4. Discussion

This study examined the relationship between the professional identity and career adaptability of Chinese engineering students and identified the mediating role of learning

engagement between professional identity and career adaptability. These findings provide new and valuable evidence and supplement the literature from the perspective of engineering education in China.

The results of the descriptive analysis show that the average values of career adaptability, professional identity, and explicit variables (professional interest, professional strength, career prospects, professional interest, professional strength, career prospects, and professional satisfaction) that constitute the latent variables of professional identity are higher than the medium, which suggests that the satisfaction of Chinese engineering students with their majors and career development is generally positive. In the report on learning engagement, the average weekly time spent on study (including study in class and study after class) of Chinese engineering students is 36.142 h. The average time spent on study was 5.163 h every day, and the average time in class was approximately one hour longer than the time after class.

The results of the correlation analysis show a significant positive correlation between professional identity and career adaptation, confirming previous research [22,25]. Specifically, professional interest has a significant positive correlation with career adaptation, which is consistent with previous studies [21,23,24]. According to self-determination theory [44], when students' self-determination is supported, they will actively learn what they are interested in. This brings some enlightenment to educators: we can explore some new forms of educational practice by promoting the internalization of students' external motivation and enhancing students' internal motivation to make students more interested in their major to improve their career adaptability. Professional strength, career prospects, and professional satisfaction are also found to be significantly positively correlated with career adaptability. This is in line with previous studies [25,26].

The study also confirmed the mediating role of learning engagement in the relationship between the professional identity and career adaptability of Chinese engineering students. Based on the mediation effect model, we discovered that professional identity had a direct positive effect on the development of career adaptability after controlling for gender and grade. This finding reaches the same conclusion as previous studies [30,32]. Moreover, it is also found that professional identity can indirectly affect career adaptability through learning engagement, which supports the viewpoint of Rossier, Zecca, Stauffer, Maggiori, and Dauwalder [27]. The reinforcement theory of Skinner [29] seems to explain this result that continuous learning stimulation strengthens students' professional knowledge and ability, thus achieving the improvement of career adaptability. However, Cotter and Fouad [33] did not find a mediating effect of learning engagement in their study, and we suppose that it might be related to the samples they used in the study that were relatively special (layoff survivors). In addition, unlike previous studies, no gender difference was obtained in this study. Previous studies suggested that gender differences in career adaptability were caused by differences in social support [35,36], and perceived social support promotes the stability of adolescents' career decisions by providing emotional or tangible support to adolescents [45]. Most studies believed that women generally had better career adaptability, because women were usually more sensitive to their own needs than men, resulting in them feeling more social support [46]. However, no significant effect of gender on career adaptability was discovered in this study, which supports the view of [1] and adds literature to the uncertain gender differences in career adaptability. In this study, the grade has a significant positive impact on career adaptability, which means that older young people have high career adaptability, and this is consistent with previous studies [24,37]. These findings can be explained using the motivational theory of longevity development [47], in which an individual's primary control capacity (i.e., the ability to align the environment with the self) decreases with age, and an individual's secondary control capacity (i.e., the desire to align the self with the environment) increases with age to compensate for the decrease in the former.

Based on the above findings, we suggest that universities should provide more courses for students [48] to help students develop human capital and professional identity. Vo-

cational practice should be appropriately increased in future education. Career-oriented activities can increase students' learning engagement and improve their career awareness and adaptability. At present, some good cases can be learned from. For instance, the Youth@work game introduced by Hummel et al. [49] provides an attractive and inspiring professional game to enable teenagers to obtain vocational learning support, which can improve students' career adaptability in terms of attention, control, confidence, etc. Immersive professional activities can be a way for students to develop a good sense and thus increase their interest in their major. Skills-based activity is also a good way that companies can provide job opportunities for students, and students can accumulate professional practical experience in advance, which is beneficial to both sides. Moreover, project-based learning has shown positive effects in previous practices. In other words, educational organizers can enhance students' professional identity and learning engagement through richer teaching content and more effective teaching forms, and improve students' career adaptability through real assessment and effective guidance.

In addition, based on the affect infusion model [50] and affective events theory [51], the emotions that people experience in the environment can affect their satisfaction. Accordingly, studies have shown that a positive environment [52] and emotional experience [53] are related to students' professional satisfaction and professional identity. Therefore, we suggest that schools explore a more conducive academic environment for student development, such as student services, library resources, and other aspects that can be further improved. We also suggest that educators (especially supervisors and counselors) establish a strong emotional relationship with students, encourage students, and enhance students' professional identity by creating a good emotional environment to improve students' career adaptability. This study can provide enlightenment and reference for future educational practice.

5. Limitations

The study has a few limitations. First, the study was carried out based on cross-sectional data. In future studies, we plan to use longitudinal data to examine how variables change over time. Second, the samples in the study are merely from engineering students in Beijing, China, so caution should be exercised when applying these findings to students from other regions or disciplines. Third, the data are from the self-report questionnaire of students, which may lead to some bias in the results.

6. Conclusions

First, the study confirms that there is a significant positive correlation between professional identity and career adaptability among Chinese engineering students. Students' professional interest, professional strength, career prospects, and professional satisfaction are also significantly positively correlated with their career adaptability. Second, the professional identity of Chinese engineering students can positively predict career adaptability, with learning engagement playing a mediating role. It is suggested that colleges pay more attention to subject construction and improve their overall strengths to improve career adaptability among students. Educators of higher education should establish a good emotional connection with students and create a supportive academic and emotional atmosphere to enhance their identity and satisfaction with their majors, enabling students to have higher expectations for future employment. In addition, we recommend that universities explore more diversified methods to help students understand their majors more comprehensively to improve their career adaptability.

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Health-Related Behavior and Psychosocial Characteristics of Adolescent Female Smokers in Korea, Compared with Adolescent Male Smokers

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Abstract: This study aimed to investigate the relationship between health-related behavior and psychosocial characteristics among adolescent female smokers in South Korea using data from the 17th Korea Youth Risk Behavior Web-based Survey (KYRBWS) conducted in 2021. The analysis participants comprised 2407 adolescent smokers who were currently smoking, out of a sample of 54,835 participants. The characteristics of adolescent female smokers were examined by comparing them with those of adolescent male smokers. The results showed that male and female adolescent smokers accounted for 69.2% and 30.8% of the sample, respectively. Multiple logistic regression analysis identified school type, subjective socioeconomic status, physical activity, breakfast consumption, alcohol consumption, sexual experience, stress, generalized anxiety, and suicidal ideation as significant factors associated with adolescent female smokers. These findings provide important foundational data for the development of smoking-cessation programs and policies tailored specifically to adolescent female smokers.

Keywords: adolescents; female; health behavior; psychosocial characteristics; smoking

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1. Introduction

Smoking is a leading cause of preventable deaths and diseases worldwide [1]. According to the World Health Organization (WHO), smoking causes approximately 8 million deaths annually, including 1.2 million deaths from secondhand smoke exposure, as of 2022 [2]. In Korea, direct smoking caused approximately 58,036 deaths in 2019 (50,942 males and 7094 females), resulting in a socioeconomic cost of 12.2 trillion KRW, which caused increased economic losses and healthcare expenses [3]. Since the implementation of the National Health Promotion Act in 1995, the Korean government has taken institutional measures to reduce smoking rates, such as raising cigarette prices, mandating smoking education, establishing smoke-free areas, and providing various programs through the National Smoking Cessation Support Center [4]. Consequently, the smoking rate among males had declined from 42.2% in 2013 to 31.3% in 2021. However, the smoking rate among females has remained nearly unchanged, at 6.2% in 2013 and 6.9% in 2021 [5].

The smoking rate among adolescents is 4.5%, with males and females at 6.0% and 2.9%, respectively, indicating that the smoking rate among females is approximately half of that among males [6]. Although this rate has decreased from 11.2% in 2019, prior to the COVID-19 pandemic, the male-to-female ratio of smoking adolescents has increased, at 9.3% and 3.8% for males and females, respectively [7]. Particularly concerning is the increasing trend of smoking among female students; however, male students have also shown similar smoking rates in 2021 and 2020, necessitating measures to address this issue. In the East Asian cultural context, female adolescent smokers tend to smoke alone in personal spaces more often than male adolescents do [8], and there is a tendency to conceal

or underreport smoking behavior [9,10]. Therefore, smoking among female adolescents is underreported and initiated at an average age of 13.5 years during early adolescence [11], which is a significant health concern.

Smoking during adolescence has a more pronounced impact on cellular and tissue damage, compared with that during adulthood, because of the developmental characteristics of growing adolescents [12]. Exposure to toxic substances in cigarettes, such as nicotine, tar, carbon monoxide, and other carcinogens, can lead to the development of chronic diseases [12], increasing the risk of respiratory problems and cardiovascular diseases, such as hypertension, myocardial infarction, and stroke [13]. One-third of adult smokers who began smoking during adolescence have a higher risk of smoking-related diseases, including lung cancer and cardiovascular diseases, leading to increased mortality [14]. On examining the gender-specific risks of smoking, evidence shows that women face a higher risk of mortality due to lung cancer, oral cancer, and cardiovascular diseases caused by smoking [14,15]. Furthermore, smoking among female adolescents has been found to influence women-specific health issues such as premenstrual syndrome [16] and decreased bone density [17], emphasizing the need for special attention to this population.

Adolescent smoking also affects their mental health. The concentration of cotinine, a nicotine metabolite, has been associated with symptoms of major depressive disorder, generalized anxiety disorder (GAD) [18], stress, suicide attempts, and other mental health problems [19]. Adolescence, characterized by rapid physical development and excessive social demands, is a vulnerable stage in which individuals are more susceptible to temptations such as smoking [20]. Although the psychological characteristics of adolescents may predispose them to smoking [20], the harmful substances associated with smoking can contribute to a vicious cycle of negative effects on mental health [18], which is believed to be more detrimental during adulthood.

Previous research has extensively investigated various smoking-related characteristics among adolescents, including smoking experience and frequency, exposure to secondhand smoke [21], dual-smoking behavior [4,22], smoking-affecting factors [23], and smoking cessation [13]. Additionally, factors associated with smoking, such as health-related [24] and psychosocial characteristics [25,26], were examined with respect to gender. These studies have revealed gender differences in health behaviors such as smoking, alcohol consumption, and physical activity [25], as well as variations in smoking patterns and influential factors based on gender [10]. However, limited research has focused on the psychosocial characteristics of adolescent smokers according to gender. Considering that psychosocial characteristics among adolescents can serve as causal factors for smoking, it is essential to explore this relationship comprehensively.

Therefore, this study aimed to examine the characteristics of adolescent female smokers in South Korea using the raw data from the 17th Korea Youth Risk Behavior Web-based Survey (KYRBWS) conducted in 2021. Using adolescent male smokers as a reference group, this study sought to analyze the health behaviors and psychosocial factors of adolescent female smokers. The specific objectives of this study were as follows:

1. To assess the health-related behaviors and psychosocial characteristics of adolescent female smokers in South Korea.
2. To analyze the factors associated with the health-related behaviors and psychosocial characteristics of adolescent female smokers, using male smoking adolescents as a reference group.

2. Methods

2.1. Study Design

This secondary data analysis utilized data from the 17th KYRBWS in 2021, in order to compare gender-related factors based on the health-related characteristics and psychosocial characteristics of adolescent smokers [6]. Among the entire dataset, the analysis focused on adolescent smokers who are currently smoking, and the characteristics of female adolescent smokers were analyzed based on male adolescent smokers as a reference.

2.2. Data and Study Population

The KYRBWS is an annual survey conducted by the Korea Centers for Disease Control and Prevention since 2005 to assess health behaviors and trends among Korean adolescents. The survey is an anonymous, self-administered online questionnaire, with participation from students in grades 1 to 3 of middle school and those in high school. The survey was conducted in April 2021, and the target population included students enrolled in middle and high schools nationwide. The sampling process involved population stratification, sample distribution, and sample extraction.

In the stratification phase, the national population was divided into 117 strata based on 39 regional districts and school levels (middle schools, general high schools, and specialized high schools). The 39 regional districts were classified as metropolitan cities, medium-sized cities, and rural areas within 17 cities and provinces, considering factors such as geographic accessibility, number of schools and population, living environment, smoking rate, alcohol consumption rate, and other relevant factors.

In the sample distribution phase, 400 middle schools and 400 high schools were selected, and the sampled schools were allocated proportionally to match the composition ratio of the population based on the stratification variables. Sample extraction followed a two-stage cluster sampling method, in which schools were sampled as primary units, and one class per grade was randomly selected from the sampled schools. The survey included 796 participating schools (399 middle schools and 397 high schools). Among these schools, a sample class was selected, and all students in the selected sample comprised a total of 50,066 participants. However, in the final analysis, 54,848 students participated in the survey, resulting in a participation rate of 92.9%. Students who were chronically absent, those with disabilities preventing their participation, and those with dyslexia were excluded [6]. From the overall collected sample, the criteria for inclusion in this analysis were students who responded "yes" to the question "Have you smoked cigarettes on one or more days in the past 30 days?" These students were considered current smokers. The criteria for exclusion were students who had not smoked cigarettes in the past 30 days. Consequently, a total of 2407 participants were included in the analysis, consisting of 1630 male adolescents and 777 female adolescents.

2.3. Measures

The 2021 KYRBWS comprised 113 items distributed across 16 domains. Among these items, 19 were selected for analysis: seven items related to demographic characteristics, four assessing smoking-related characteristics, five exploring health-related behaviors, and three examining psychosocial characteristics. In instances where the original dataset contained a large number of categories with uneven distributions, posing challenges in terms of comparability with previous studies, we mitigated this limitation by referring to relevant research conducted on a similar cohort [22] and reconfigured the categories into two to three meaningful groupings.

2.3.1. Demographic and Sociological Characteristics

Demographic and sociological characteristics included gender, school type, academic performance, subjective economic status, change in economic status after COVID-19, residential area, and living arrangements with parents.

Gender was categorized as "male" and "female". The school type was divided into three categories: middle school, high school, and special high school. Academic performance and subjective economic status were reclassified into three categories: "high" for the highest category, "medium" for the middle categories, and "low" for the lowest categories. Economic status changes due to COVID-19 were categorized as "affected" (significantly worsened due to COVID-19) and "not affected" (no significant change or improvement). Residence area was categorized as "large cities" (metropolitan cities with a population of more than 500,000), "medium and small-sized cities" (total population of less than 500,000 or around 100,000), and "province cities" with a rural area. Living arrangements with

parents were categorized as "living with family" and "not living with family", including cases of living with relatives, boarding, living alone, living in dormitories, and living in childcare facilities.

2.3.2. Smoking-Related Characteristics

The smoking-related characteristics included age at smoking initiation, e-cigarette use, smoking-cessation attempts, and secondhand smoke experience at school. Age at smoking initiation was classified into three categories: "before middle school", "during middle school", and "during high school". E-cigarette use was determined by the question, "In the past 30 days, how many days did you use nicotine-containing e-cigarettes?" Those who responded with "1 day or more" were classified as "yes". Smoking-cessation attempts were assessed using the question, "Have you attempted to quit smoking in the past 12 months?" Secondhand smoking experience at school was determined by the question "In the past 7 days, how many days did you inhale tobacco smoke from other people smoking indoors at school?" Those who responded with "1 day or more per week" were classified as "yes".

2.3.3. Health-Related Behavior

Health-related behavioral characteristics included subjective health status, physical activity, breakfast consumption frequency, current alcohol consumption, and sexual experiences. For subjective health status, participants were asked, "How do you rate your health?" Responses such as "very healthy", "healthy", and "normally healthy" were classified as "healthy", while "unhealthy" and "very unhealthy" were classified as "unhealthy". Physical activity was assessed using the question, "In the last 7 days, how many days did you spend more than 60 min a day on physical activities that increased your heart rate or made you go out of breath?" Responses were categorized as "none in the past 7 days", "1–4 days per week", and "5 or more days per week". Breakfast consumption frequency was determined by the question, "How many days in the past 7 days did you eat breakfast?" Responses were categorized as "did not eat in the past 7 days", "1–4 days per week", and "5 or more days per week". Current alcohol consumption was assessed using the question, "How many days in the past 30 days did you drink one or more drinks of alcohol?" Those who responded with "once or more per month" were classified as "yes". Sexual experience was determined by the question, "Have you ever had sexual intercourse?" Responses such as "yes" and "no" were classified accordingly.

2.3.4. Psychosocial Characteristics

Psychosocial characteristics examined in this study encompassed GAD, stress, and suicidal ideation. GAD was evaluated using the seven-item generalized anxiety disorder (GAD-7) screening tool. The GAD-7 is a self-report questionnaire specifically designed to identify individuals with GAD and measure the severity of their symptoms. Comprising seven items related to anxiety or worry, respondents rated each item on a scale ranging from 0 to 3. The total GAD-7 score ranges from 0 to 21, with scores falling within different ranges, indicating varying levels of anxiety severity: 0–4 (normal), 5–9 (mild), 10–14 (moderate), and 15–21 (severe) [27]. A score of 10 or higher is considered indicative of GAD, with a reported sensitivity of 89% and a specificity of 82%. Previous studies have demonstrated high internal consistency (Cronbach's α) for the GAD-7, ranging from 0.915 to 0.924 [28,29]. In this study, the GAD-7 exhibited excellent internal consistency, with a Cronbach's α value of 0.93.

The perceived level of stress was assessed through a single question: "How much stress do you usually feel?" Participants were given response options ranging from "not at all" to "a little", which were classified as "no", while "a lot" and "very much" were classified as "yes". The stress perception item, consisting of a single question, has been utilized in previous studies as a tool to examine the factors influencing adolescent smoking [30].

Suicidal ideation was assessed using the question, "Have you seriously thought about committing suicide in the past 12 months?" Participants' responses were categorized either as "no" or "yes" based on their answer to this question.

2.4. Data Collection

The Youth Health Behavior Survey (KYRBWS) is an annual publication of data that has been conducted since 2005 to assess the health behaviors and trends among Korean adolescents. During data collection, unique numbers were used to ensure the anonymity and confidentiality of participants' personal information. Consent to participate in the study was obtained from all participants. This study utilized the 17th KYRBWS statistical data from 2021, which were downloaded and used in accordance with the regulations for the public release and management of raw data.

The 17th KYRBWS survey was conducted through an anonymous self-administered online questionnaire among middle and high school students nationwide as of April 2021. The sampling process was conducted in three stages: population stratification, sample distribution, and sample extraction, as described in the research subjects section.

Prior to data collection, sample schools and sample classes were selected, and student demographics were registered. Survey support teachers from the sample schools were then selected and trained. The survey support teachers explained the importance of the study and the participation process to the participants and conducted the survey with students who submitted signed consent forms. The survey was conducted using an online survey program (accessed through the "Nuri House"), and to facilitate the survey, it was administered using school computers or mobile devices (such as tablet PCs or smartphones). The entire survey process took approximately 45 to 50 min.

2.5. Statistical Analysis

This study utilized the raw data from the 17th Youth Health Behavior Survey (KYRBWS), which employed a complex sampling design. To ensure accurate statistical analysis, it is recommended to use statistics that incorporate the complex sampling design. Data analysis was conducted using complex sampling with strata, cluster weights, and finite population correction factors (FPC) to ensure population representativeness. The raw data from the 17th KYRBWS provided integrated strata, cluster variables, weights, and FPC, which were considered. The IBM SPSS Statistics 27.0 program (IBM Corp., Armonk, NY, USA) was used for the analysis, with a significance level of $p < 0.05$ applied for hypothesis testing.

Before conducting the analysis, the basic assumptions for logistic regression analysis, which was used to achieve the objectives of this study, were checked. Logistic regression analysis is a non-linear regression analysis where the independent variables are continuous and the dependent variable has a binary outcome. Unlike discriminant analysis, logistic regression does not require the normality assumption of the sample for the dependent variable with a binary outcome [31]. Discrete independent variables were analyzed by applying dummy coding. To assess the adequacy of the logistic regression model in the sample, the −2 Log Likelihood (2642.594), Chi-square (χ^2 =385.259, $p < 0.001$), and Hosmer–Lemeshow test (χ^2 =11.072, $p = 0.198$) were examined, indicating that the model was a good fit.

The specific analysis methods are as follows:

1. The demographic characteristics, smoking-related characteristics, health-related behaviors, and psychosocial characteristics of the participants were analyzed using frequency (sample size) and percentages (applying weights).
2. The demographic characteristics, smoking-related characteristics, health-related behaviors, and psychosocial characteristics of smoking adolescents were analyzed based on gender using the Rao-Scott χ^2-test.
3. Multiple logistic regression analysis was conducted to analyze health-related behaviors and psychosocial characteristics of adolescent female smokers, with adolescent male smokers as the reference group.

3. Results

3.1. Participant Demographics and Smoking-Related Characteristics

Table 1 presents the participant demographics and smoking-related characteristics. The distribution of participants across different school levels was as follows: middle school (21.1%), high school (51.6%), and specialized high school (27.3%). The majority of the participants (54.3%) had low academic performance, and most reported their subjective economic status as moderate (68.6%). Regarding the economic impact of COVID-19, 60.9% reported no change, while 39.1% perceived a worsening of their economic situation. The participants primarily resided in small and rural areas (55.4%), and 92.5% lived with their parents.

Table 1. Demographic and smoking-related characteristics of the participants (n = 2407).

Variables	Categories	*n* (%)
School	Middle school	570 (21.1)
	High school	1192 (51.6)
	Specialized high school	645 (27.3)
Academic performance	High	194 (8.0)
	Middle	904 (37.7)
	Low	1309 (54.3)
Perceived SE status	High	274 (11.9)
	Middle	1663 (68.6)
	Low	470 (19.5)
COVID-19 related SE change	Yes	952 (39.1)
	No	1455 (60.9)
Region of residence	Metropolitan city	940 (38.2)
	Medium and small city	1254 (55.4)
	Province	213 (6.4)
Residential with parents	None	189 (7.5)
	Yes	2218 (92.5)
Time of initiation smoking (n = 2400)	Before middle school	381 (16.6)
	Middle school	1681 (69.7)
	High school	338 (13.7)
Use electronic liquid cigarette	None	515 (20.6)
	Yes	1892 (79.4)
Attempt smoking cessation (n = 2403)	None	763 (32.1)
	Yes	1640 (67.9)
Second-hand smoking in school	None	1934 (79.5)
	Yes	473 (20.5)

n (%) = *n*: unweighted; %: weighted; SE = socioeconomic.

Regarding smoking-related characteristics, the most common age of smoking initiation was that during middle school (69.7%), and 67.9% of the participants reported using liquid electronic cigarettes. Many adolescents used both liquid electronic and conventional cigarettes. Smoking-cessation attempts were reported by 67.9% of the participants, and 20.5% had experienced secondhand smoke at school.

3.2. Participants' Health-Related Behaviors and Psychosocial Characteristics

Table 2 shows the health-related behaviors and psychosocial characteristics of the participants. Most smoking adolescents (87.7%) perceived themselves as healthy. Regarding physical activity, 50.3% reported engaging in physical activity 1–4 days a week. Breakfast consumption frequency was low, with 69.6% reporting eating breakfast less than 4 days a week. Of the participants, 64.6% reported current alcohol consumption, and 38.7% reported having sexual experiences.

Table 2. Health-related behaviors and psychosocial characteristics of the participants (n = 2407).

Variables	Categories	M ± SD or *n* (%)
Subjective health status	Healthy	2112 (87.7)
	Unhealthy	295 (12.3)
Physical activity per week	None	758 (32.0)
	1–4 days	1205 (50.3)
	≥5 days	444 (17.7)
Frequency of eating breakfast per week	None	691 (27.9)
	1–4 days	1005 (41.7)
	≥5 days	711 (30.4)
Current alcohol consumption	None	855 (35.4)
	Yes	1552 (64.6)
Sexual activity	None	1489 (61.3)
	Yes	918 (38.7)
GAD (n = 1821)	M±SD	5.25 ± 5.44
	Normal	740 (39.9)
	Mild	624 (35.1)
	Moderate	264 (14.3)
	Severe	193 (10.7)
Perceived stress	None	1201 (49.7)
	Yes	1206 (50.3)
Suicidal ideation	None	1804 (75.0)
	Yes	603 (25.0)

n (%) = *n*: unweighted; %: weighted; M ± SD = Mean ± Standard deviation; GAD = Generalized Anxiety Disorder.

Among the psychosocial characteristics of smoking adolescents, the average GAD score was 5.25 ± 5.44. Most participants (39.9%) fell within the normal range, but 25.0% had moderate or higher levels of anxiety. A significant number of participants (50.3%) reported experiencing stress, and 25.0% reported having suicidal ideation.

3.3. Gender Differences in Characteristics of Smoking Adolescents

Table 3 illustrates the gender differences in demographic and smoking-related characteristics among smoking adolescents. Significant differences were observed in school type (χ^2 = 48.588, $p < 0.001$), subjective economic status (χ^2 = 22.924, $p < 0.001$), changes in economic status due to COVID-19 (χ^2 = 14.192, $p < 0.001$), and co-residence with parents (χ^2 = 5.378, p = 0.039). However, no significant differences were found in the smoking-related characteristics.

Gender differences in health-related behavioral characteristics showed significant differences in subjective health status (χ^2 = 20.492, $p < 0.001$), physical activity (χ^2 = 135.747, $p < 0.001$), breakfast consumption frequency (χ^2 = 33.848, $p < 0.001$), current alcohol consumption (χ^2 = 9.002, p = 0.002), and sexual experience (χ^2 = 21.964, $p < 0.001$). Psychosocial characteristics also exhibited differences in GAD (χ^2 = 61.511, $p < 0.001$), perceived stress (χ^2 = 105.218, $p < 0.001$), and suicidal ideation (χ^2 = 125.057, $p < 0.001$) (Table 4).

Table 3. Demographic and smoking-related characteristics by gender among smoking adolescents (n = 2407).

Variables	Categories	Male (*n* = 1630) *n* (%)	Female (*n* = 777) *n* (%)	Rao-Scott χ^2 (*p*)
	Demographic characteristics			
School type	Middle school	331 (17.7)	239 (28.9)	48.588 (<0.001)
	High school	888 (55.7)	304 (42.5)	
	Specialized high school	411 (26.6)	234 (28.6)	
Academic	High	138 (8.4)	56 (7.2)	0.960 (0.638)

Table 3. *Cont.*

Variables	Categories	Male (n = 1630) n (%)	Female (n = 777) n (%)	Rao-Scott χ^2 (p)
performance	Middle	615 (37.7)	289 (37.7)	
	Low	877 (53.9)	432 (55.1)	
Perceived SE status	High	215 (13.8)	59 (7.6)	22.924 (<0.001)
	Middle	1120 (68.1)	543 (69.6)	
	Low	295 (18.1)	175 (22.8)	
COVID-19 related SE change	Yes	597 (36.6)	355 (44.7)	14.192 (<0.001)
	No	1033 (63.4)	422 (55.3)	
Region of residence	Metropolitan city	648 (39.2)	292 (35.8)	4.018 (0.383)
	Medium and small city	829 (54.1)	425 (58.5)	
	Province	153 (6.7)	60 (5.7)	
Residential with Parents	Yes	1512 (93.4)	706 (90.7)	5.378 (0.039)
	None	118 (6.6)	71 (9.3)	
Smoking-related characteristics				
Time of initiation Smoking (n = 2400)	Before middle school	270 (17.1)	111 (15.4)	2.572 (0.306)
	Middle school	1140 (69.8)	541 (69.3)	
	High school	214 (13.1)	124 (15.3)	
Use electronic liquid cigarette	None	337 (20.2)	178 (21.5)	0.539 (0.447)
	Yes	1293 (79.8)	599 (78.5)	
Attempt smoking cessation(n = 2403)	None	517 (31.7)	246 (33.2)	0.467 (0.532)
	Yes	1111 (68.3)	529 (66.8)	
Second-hand smoking in school	None	1312 (79.8)	622 (78.8)	0.303 (0.632)
	Yes	318 (20.2)	155 (21.2)	

n (%) = n: unweighted; %: weighted; SE = socioeconomic.

Table 4. Health-related behaviors and psychosocial characteristics by gender among smoking adolescents (n = 2407).

Variables	Categories	Male (n = 1630) n (%)	Female (n = 777) n (%)	Rao-Scott χ^2 (p)
Health-related behaviors				
Subjective health status	Healthy	1465 (89.7)	647 (83.1)	20.492 (<0.001)
	Unhealthy	165 (10.3)	130 (16.9)	
Physical activity per week	None	403 (25.2)	355 (47.4)	135.747 (<0.001)
	1–4 days	849 (53.1)	356 (43.8)	
	≥5 days	378 (21.7)	66 (8.8)	
Frequency of eating breakfast per week	None	449 (26.1)	242 (31.9)	33.848 (<0.001)
	1–4 days	642 (39.8)	363 (45.8)	
	≥5 days	539 (34.1)	172 (22.3)	
Current alcohol consumption	None	621 (37.3)	234 (31.0)	9.002 (0.002)
	Yes	1009 (62.7)	543 (69.0)	
Sexual activity	None	1061 (64.4)	428 (54.4)	21.964 (<0.001)
	Yes	569 (35.6)	349 (45.6)	
Psychosocial characteristics				
GAD (n = 1821)	Normal	520 (45.0)	220 (30.9)	61.511 (<0.001)
	Mild	389 (35.5)	235 (34.5)	
	Moderate	128 (11.7)	136 (18.9)	
	Severe	83 (7.8)	110 (15.7)	
Perceived stress	None	696 (42.8)	505 (65.4)	105.218 (<0.001)
	Yes	934 (57.2)	272 (34.6)	

Table 4. *Cont.*

Variables	Categories	Male (n = 1630) n (%)	Female (n = 777) n (%)	Rao-Scott χ^2 (p)
Suicidal ideation	None	1336 (81.6)	468 (60.2)	125.057 (<0.001)
	Yes	294 (18.4)	309 (39.8)	

n (%) = n: unweighted; %: weighted; GAD = Generalized Anxiety Disorder.

3.4. Smoking-Related Factors among Adolescent Female Smokers

To examine the characteristics of adolescent female smokers among Korean smoking adolescents, a multiple logistic regression analysis was conducted, with adolescent male smokers serving as the reference group (Table 5). The analysis designated demographic, health-related characteristics, and psychosocial characteristics as independent variables and smoking characteristics based on gender as the dependent variable, examining statistically significant results through cross-analysis.

Table 5. Multiple logistic regression for predictors of female adolescents with smoking (n = 2407).

Variables	Categories	aOR	(95% CI)	p
	Demographic characteristics			
School type	Specialized high school (Ref.)	1		<0.001
	High school	0.67	(0.43, 1.04)	
	Middle school	1.54	(0.96, 2.48)	
Perceived SE status	High (Ref.)	1		<0.001
	Middle	2.50	(1.69, 3.69)	
	Low	2.00	(1.27, 3.13)	
COVID-19 related SE change	Yes (Ref.)	1		0.100
	No	0.82	(0.65, 1.04)	
Residential with parents	Yes (Ref.)	1		0.495
	No	0.85	(0.53, 1.36)	
	Health-related behaviors			
Subjective health status	Unhealthy (Ref.)	1		0.678
	Healthy	1.07	(0.79, 1.45)	
Physical activity per week	None (Ref.)	1		<0.001
	1–4 days	0.43	(0.34, 0.54)	
	≥5 days	0.19	(0.13, 0.28)	
Frequency of eating breakfast per week	None (Ref.)	1		0.003
	1–4 days	0.96	(0.76, 1.21)	
	≥5 days	0.67	(0.47, 0.86)	
Current alcohol consumption	None (Ref.)	1		0.012
	Yes	1.34	(1.07, 1.68)	
Sexual activity	None (Ref.)	1		0.021
	Yes	1.34	(1.05, 1.71)	
	Psychosocial characteristics			
GAD	Normal (Ref.)	1		0.013
	Mild	1.16	(0.89, 1.50)	
	Moderate	1.52	(1.06, 2.18)	
	Severe	1.93	(1.27, 2.92)	
Perceived stress	None (Ref.)	1		0.014
	Yes	0.74	(0.58, 0.94)	
Suicidal ideation	None (Ref.)	1		<0.001
	Yes	1.69	(1.34, 2.13)	

Notes. The reference group was male adolescents with smoking; aOR = adjusted odds ratio, CI = 95% confidence interval; GAD = Generalized Anxiety Disorder; SE = socioeconomic; Ref = reference.

The analysis revealed statistically significant variables for demographic characteristics, health-related behaviors, and psychosocial characteristics. Among the demographic characteristics, compared with adolescent male smokers, females in high school had a lower

odds ratio (OR) of 0.67 (95% CI = 0.43–1.04), and females in middle school had a higher odds ratio of 1.54 (95% CI = 0.96–2.48). Regarding subjective economic status, rather than being in the "high" group, females were more likely to be in the "middle" group with an odds ratio of 2.50 (95% CI = 1.69–3.69) and in the "low" group with an odds ratio of 2.00 (95% CI = 1.27–3.13).

Regarding health-related behaviors, females had lower odds ratios in physical activity compared with the "no activity" group: 0.43 (95% CI = 0.34–0.54) for the "1–4 days per week" group and 0.19 (95% CI = 0.13–0.28) for the "5 or more days per week" group. Breakfast consumption frequency showed that females had lower odds ratios compared with the "no consumption" group: 0.96 (95% CI = 0.76–1.21) for the "1–4 days per week" group and 0.67 (95% CI = 0.47–0.86) for the "5 or more days per week" group. Current alcohol consumption and sexual experience were both higher among females compared with males, with odds ratios of 1.34 (95% CI = 1.07–1.68) and 1.34 (95% CI = 1.05–1.71), respectively.

Among the psychosocial characteristics, females had higher odds ratios for GAD compared with the "normal" group: 1.16 (95% CI = 0.89–1.50) for the "mild" group, 1.52 (95% CI = 1.06–2.18) for the "moderate" group, and 1.93 (95% CI = 1.27–2.92) for the "severe" group. Perceived stress was lower among females in the "yes" group than in those in the "no" group, with an odds ratio of 0.74 (95% CI = 0.58–0.94). Females had higher odds ratios for suicidal ideation compared with the "no" group, with an odds ratio of 1.69 (95% CI=1.34–2.13).

4. Discussion

This study examined the health-related behaviors and psychosocial characteristics of female adolescent smokers using data from the 17th KYRBWS (2021). Among the 2407 adolescent smokers, 69.2% were male and 30.8% were female. No significant differences in smoking-related characteristics were found based on the gender of smoking adolescents. Comparing our findings with those of a study by Lee and Song [13], which explored factors related to smoking-cessation attempts by gender among smoking adolescents using data from the 16th Youth Health Behavior Survey (2020), similar results were observed. However, variations between genders were observed regarding the age of smoking initiation, e-cigarette use, and exposure to indirect smoking at school.

In 2020, the proportion of smoking initiation before middle school was 15.7% (17.7% for boys and 10.6% for girls) [13]. By 2021, this proportion increased to 16.6%, with a decrease of 17.1% for boys and an increase to 15.4% for girls. These findings suggest that girls tend to initiate smoking at a relatively younger age compared to boys. Furthermore, the rate of e-cigarette use significantly increased from 41.8% in 2020 (35.7% for boys and 40.0% for girls) [13] to 79.4% in 2021 (79.8% for boys and 78.5% for girls). Smoking-cessation attempts decreased from 69.6% in 2020 (69.2% for boys and 69.4% for girls) [13] to 67.9% in 2021 (68.3% for boys and 66.8% for girls), with a greater decrease observed among girls.

These findings align with those by Kim [32], who reported lower smoking-cessation attempt rates and higher failure rates among women [33,34]. Kim [32] attributed the higher failure rates among women to concerns regarding menstrual cycles, weight gain, and depression. Additionally, lack of family support due to the stress caused by withdrawal symptoms during smoking cessation, which often went unnoticed by family members, also played a role. A review [15] indicated that women face more challenges in achieving long-term smoking cessation compared with men. The interpretation of this gender difference in epidemiological studies varies, considering multiple biological, psychological, and social factors across different times and locations. Therefore, gaining a comprehensive understanding of the smoking behaviors of female adolescent smokers is crucial for the development of effective intervention strategies targeting this population.

Regarding school level, high school students (78.9%) were found to smoke more than middle school students (21.1%), which is consistent with previous studies [30,35]. However, the proportion of middle school girls among female adolescent smokers was significantly higher (28.9%) than that of boys (17.7%). According to the 2021 Youth Smoking Rate Trends

Survey conducted by the Korea Centers for Disease Control and Prevention, the overall smoking rates among male and female students were 6.0% and 2.9%, respectively. Among high school students, the smoking rate was 10.0% among boys, which was more than twice the rate among girls (4.2%). However, among middle school students, the difference was smaller, with smoking rates of 2.1% and 1.6% among boys and girls, respectively. These findings support that the proportion of male adolescent smokers is higher than that of female adolescent smokers; however, the gender difference gradually decreased in middle schools.

A study analyzing smoking-cessation trends among 50,228 smokers from 17 European countries found that those who started smoking before the age of 16 were less likely to quit smoking [36]. Another study of 2536 Malaysian adolescents revealed that those who started using e-cigarettes before the age of 14 had a 1.3 times lower smoking-cessation attempt rate than those who started using e-cigarettes after the age of 14 [37]. Furthermore, younger age at smoking initiation is associated with lower quitting rates [38] and a higher risk of relapse after quitting [39]. Therefore, additional efforts should be made to prevent female adolescent smokers from starting to smoke, and tobacco control strategies should be implemented to delay or deter smoking initiation in this population [36].

Compared with male adolescent smokers, female adolescent smokers had an intermediate or low subjective socioeconomic status, and a higher proportion of female students experienced economic difficulties due to COVID-19. However, in the multivariate analysis, subjective economic status emerged as the only significant variable, indicating that the perception of household economic level during normal times is more important than the short-term changes in economic status due to crises such as COVID-19. Previous studies have identified both low [40,41] and high [37] household socioeconomic status as factors influencing adolescent smoking, with many consistently reporting that a higher allowance [35,41] is associated with lifetime and current smoking. Therefore, it is necessary to avoid categorizing adolescents from low socioeconomic backgrounds as being at risk of smoking.

Green et al. [40] reported that smoking typically begins during adolescence and is patterned based on socioeconomic position. They found that socioeconomic disadvantages were associated with higher rates of smoking initiation and escalation among British adolescents aged 11–15, with greater inequality in smoking initiation observed at younger ages, suggesting that interventions should focus on reducing inequality in smoking initiation among early adolescents. Gwon and Jeong [41] reported that adolescents who received more allowances were more likely to engage in lifetime and current smoking. They found that a higher household economic status was associated with a higher likelihood of lifetime smoking, and current smoking was more likely among those from households with varying or higher economic statuses. As a certain level of economic resources is required for adolescents to purchase tobacco products, it has been reported that adolescents who smoke either receive a larger allowance from their parents or purchase cigarettes through means such as part-time jobs. Therefore, prevention and smoking-cessation education for female adolescent smokers should strategically consider various factors, including socioeconomic status and participation in part-time jobs.

Regarding health-related behaviors, a lower proportion of female adolescent smokers engaged in physical activity and ate breakfast, compared with male adolescent smokers. This finding is similar to that of Kaczynski et al. [42], who reported that male adolescent non-smokers engage in more physical activity to reduce the harmful effects of smoking and that skipping breakfast is associated with smoking, alcohol use, and sedentary behavior. The results of this study support those of previous research indicating gender differences in breakfast-skipping [43]. A study conducted on students (n = 318) in grades 9 through 12 in three schools in southwestern Ontario found a significant difference between male non-smokers (60.4%) and currently smoking students (31.9%) in terms of eating breakfast daily; however, there was no statistical difference among female students, who had concerns about weight gain [43].

Korean adolescent smokers were found to have a significantly lower likelihood of consuming fruits, vegetables, and dairy products; however, they consumed significantly more fast food compared with non-smokers [44]. Adolescence is an important period for the formation of health-related habits such as exercise and proper nutrition, which have long-term effects on lifelong health [45]. Adolescents may lack deep awareness of health-related issues, leading to neglect of health management and engagement in unhealthy behaviors. This study found that female adolescent smokers had lower rates of health-promoting behaviors such as physical activity and eating breakfast compared with male adolescent smokers. Therefore, paying attention to female adolescent smokers and supporting them in developing healthy lifestyles is important. In particular, nutritional deficiencies related to reproductive health promotion is necessary in addition to the increased nutritional requirements during adolescence.

Smoking among adolescents not only poses health risks but is also correlated with other addictive behaviors and deviant actions, such as alcohol consumption and drug abuse [30,46,47]. The association between smoking and alcohol consumption is well documented, with higher alcohol consumption being positively linked to increased smoking rates [48]. A study investigating the risk ratio of smoking in relation to health behaviors revealed that individuals with a history of alcohol consumption had a 7.5 times higher risk of smoking. Furthermore, as alcohol consumption frequency increased, the smoking rate increased, reaching 82.6% among adolescents who reported almost daily alcohol consumption [35]. Research that examines the connection between smoking and sexual behavior indicates that smoking is associated with a 1.47 times higher likelihood of early sexual intercourse among Ethiopian women aged 15–24 [49]. In Korea, female adolescent smokers were found to exhibit behavioral characteristics linked to the use of oral contraceptives [50], emphasizing the necessity of approaching the challenges faced by female adolescent smokers from a reproductive health perspective. Particularly in Korean society, where female smoking is often viewed negatively, female adolescent smokers may conceal their smoking behavior [9]. Therefore, this study shows that female adolescent smokers exhibited higher rates of alcohol consumption and sexual experiences compared with their male counterparts, which underscores the importance of thoroughly examining not only their health-risk behaviors, but also their deviant actions.

Female adolescent smokers showed lower stress levels but higher rates of GAD and suicidal ideation, compared with male adolescent smokers. Previous studies have found that psychological and social characteristics such as stress [13,25,51,52], anxiety [25,52], and suicide [51] were statistically related to adolescent smoking behavior. Wiggert et al. [53] reported that anxiety plays an important role in smoking tendencies and relapse, and that smoking cravings increase in response to stress among individuals with high trait anxiety. Research shows that adolescents smoke to regulate unpleasant emotions, such as stress, anxiety, and suicidal thoughts, and to obtain temporary emotional stability [35]. Particularly in Korea, recent social factors such as educational culture focused on entrance exams, weakened family bonds, and unguarded exposure to addictive media have exacerbated psychological and social problems of adolescents [51]. While female adolescent smokers choose smoking to gain temporary emotional stability and alleviate their psychological and social problems, their adolescent characteristics of viewing smoking as a rebellious behavior can worsen anxiety and stress reactions. Specifically, the higher prevalence of GAD among female adolescent smokers in this study indicates the need to recognize it as a psychological problem characterized by difficulty in control, persistent worry, and anxiety [54], rather than perceiving them as passive personalities or well-behaved students, which makes early detection difficult [55]. There is an urgent need to understand the psychological and social characteristics of female adolescent smokers and provide the necessary interventions, especially considering their high suicidal ideation.

This study offers valuable insights into the relationship between health-related behaviors and the psychological and social characteristics specific to female adolescent smokers, emphasizing the significance of incorporating sex-specific factors in evaluating such as-

pects. Based on these findings, it is evident that the development and implementation of smoking-cessation programs for adolescent smokers should address sex-specific smoking-related factors.

5. Limitations

It is important to note that this study was based on cross-sectional data from a single year, limiting its ability to establish causality, despite identifying associations between variables. Moreover, the use of secondary data variables has certain limitations. Therefore, future research should aim to conduct longitudinal studies that explore the causal factors influencing smoking among female adolescent smokers, considering diverse variables such as parental smoking, peer smoking, depression, and other factors related to adolescent smoking.

Furthermore, the stress variable used as a psychosocial characteristic factor in this study consisted of a single question, which may compromise the validity of the tool. Although it has been used as a factor influencing adolescent smoking in previous secondary data analyses [30], it is necessary to confirm the relationship with female adolescent smokers using a tool with higher validity and reliability in the future.

6. Conclusions

This study examined the smoking-related characteristics of female adolescent smokers compared with those of their male counterparts. The findings revealed that the majority of female adolescent smokers were middle school students, with a significant portion reporting subjective socioeconomic statuses categorized as intermediate or low. They exhibited lower levels of physical activity and breakfast consumption, while demonstrating higher rates of health-risk behaviors such as current alcohol consumption and sexual activity. Moreover, female adolescent smokers showed a higher prevalence of GAD compared with male adolescent smokers, and the smoking rate increased with higher levels of anxiety. Although they perceived lower stress levels, they also reported a higher frequency of suicidal ideation. Consequently, comprehensive health education programs should be designed to encompass reproductive health promotion behaviors, including physical activity, breakfast habits, alcohol consumption, and sexual education. Moreover, attention should be paid when addressing psychological and social concerns, such as anxiety and suicide. To improve smoking prevention among female adolescent smokers, it is necessary to develop tobacco control strategies and programs to delay or deter smoking initiation in this population.

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Relationship between Harsh Parenting and Aggressive Behaviors in Male Juvenile Delinquents: Potential Mediating Roles of Peer Victimization and Hostile Attribution Bias

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Abstract: Harsh parenting can be regarded as a harsh behaviors, feelings, and attitudes toward children in the process of parenting. According to the theory of intergenerational transmission of violence, harsh parenting is an important factor affecting children's aggressive behavior, but the theory does not clarify the specific action path between harsh parenting and aggressive behavior. In order to reveal the relationship between harsh parenting and the aggressive behavior of juvenile delinquents, 604 male juvenile delinquents (N = 604; M_{age} = 16.57 years; SD = 0.612 years) were investigated using the Harsh Parenting Questionnaire, the Buss–Perry Aggression Questionnaire, the Multidimensional Peer Victimization Scale, and the Word Sentence Association Paradigm for Hostility in Chinese. Analysis using structural equation modeling procedures showed that (a) all variables were positively associated with each other; (b) the partial indirect effect of harsh parenting on aggressive behaviors was determined through the mediators of peer victimization and hostile attribution bias independently; and (c) the partial indirect effect was determined through the mediators of peer victimization and hostile attribution bias sequentially. The results suggest that harsh parenting can explain the highly aggressive behavior of male juvenile delinquents. Moreover, harsh parenting may also predict the risk of peer victimization and hostile attribution bias, thereby predicting the development of highly aggressive behaviors.

Keywords: harsh parenting; aggressive behavior; peer victimization; hostile attribution bias; male juvenile delinquent

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1. Introduction

Adolescence is an important stage of transition and development in life. Aggressive behavior presents a gradually increasing trend with the entry of individuals into adolescence and reaches a peak in adolescence [1,2]. Aggressive behavior is any behavior directed toward another individual that is carried out with the proximate (immediate) intent to cause harm [3]. Aggressive behavior not only violates social norms but also has negative effects on physical and mental health, academic progress, emotional regulation, behavior shaping, personality development, and social adaptation after adulthood [4]. More dangerously, aggressive behavior may increase the risk of crime in male adolescents [5]. A survey's results showed that the amounts and severity of aggressive behavior in juvenile delinquents are higher than that in common adolescents of the same age [6]. Moreover, the data in China's White Paper on Juvenile Prosecutorial Work (2021) showed that in 2021, the number of juvenile suspects reviewed and prosecuted by the procuratorial organ included 19,061 for larceny; 9049 for affray; 7591 for rape; 7186 for robbery; and 6902 for provocation as the top five, accounting for 25.8%, 12.2%, 10.3%, 9.7%, and 9.3% of the total, respectively, and four of the five types involve violent or aggressive behavior [7].

According to the theory of intergenerational transmission of violence, harsh parenting may explain why children show severe aggressive behavior and even violent behavior [8]. In particular, harsh parenting may transmit an aggressive pattern of interpersonal interaction to children, who easily internalize this pattern into their own behavior and apply it to a broader process of interpersonal interaction after long-term reinforcement of this pattern [9]. Harsh parenting refers to the harsh treatment of children in the process of parenting, including through behavior, emotion, and attitude [10]. Harsh parenting includes physical aggression in the form of spanking, slapping, pinching/twisting, and hitting with objects; verbal aggression in the form of abuse, sarcasm, and scolding; mental aggression in the form of ignorance, neglect, and exclusion; and over-control in the form of supervision and obedience. The significant positive correlation between harsh parenting and aggressive behavior in elementary, middle, and college students has been widely discussed [11–13]. However, there are few studies on the relationship between harsh parenting and juvenile delinquents' aggressive behavior. Considering the importance of clarifying the causes of the violent criminal behavior of juvenile delinquents, the current study aimed to explore the relationship between harsh parenting and the aggressive behavior of juvenile delinquents. Therefore, we propose the first hypothesis that harsh parenting can directly and positively predict aggressive behavior (H1).

However, the theory of intergenerational transmission of violence has not clarified the specific action path of harsh parenting on children's aggressive behavior. According to the social information processing model [14], harsh-parenting parents are unable to show reasonable emotional and behavioral control strategies to children, which may lead to emotional disorders and impulsivity in children, forming aggressive hostile attribution bias, and responding with irrational aggressive behaviors. Parents' physical and verbal aggression might cause children to be overly vigilant to potentially threatening social cues, develop hostile attribution bias, and thus experience difficulty controlling angry responses and exhibiting aggressive behavior [15]. Hostile attribution bias is a tendency to attribute hostile intentions to peers in ambiguous circumstances [16]. Although existing studies have not directly explored the mediating role of hostile attribution bias between harsh parenting and aggressive behavior, the relationship between harsh parenting and hostile attribution bias, and the relationship between hostile attribution bias and aggressive behavior has been fully verified in previous studies. For example, Milner et al. (2017) conducted six studies demonstrating that reducing harsh parenting can reduce children's hostile attribution bias [17]. Perhamus and Ostrov (2021) showed that children's hostility attribution bias could positively predict their subsequent aggressive behavior in a longitudinal study [18]. Accordingly, we propose the second hypothesis that hostile attribution bias plays a mediating role in the relationship between harsh parenting and aggressive behavior (H2).

According to the developmental cascade model of adolescent aggression [19], the evolution of individual aggression or violent behavior is influenced by early family factors (e.g., harsh parenting) and school factors (e.g., peer victimization); moreover, family factors have a progressive influence on individuals through school factors. In particular, after experiencing harsh parenting, children transfer the negative emotions learned from parent–child interactions to peer situations, which leads to poor peer relationships. In sum, the cumulative negative experiences at the family and school levels further magnify the individual's cognitive bias and, eventually, lead to the outbreak of severe aggressive behavior. Peer victimization is defined as physical or psychological injury from peers in the forms of physical aggression, verbal aggression, and relational aggression [20]. While previous studies have not specially examed the connection between harsh parenting and aggressive behavior through the pathways of peer victimization and hostility attribution bias, it is possible that physiological or neurological disorders resulting from harsh parenting may provide an explanation for this relationship. For example, Lewis et al. (2021) found that children who experience long-term exposure to harsh parenting tend to remain highly alert to anger signals during adolescences. This heightened alertness triggers the individual's

sympathetic-adrenal-spinal system and HPA axis system, leading to the frequent release of catecholamine and cortisol [21]. Following psychological and physiological changes, adolescents who have experienced harsh parenting display heightened sensitivity to stressful situations, such as peer victimization. This, in turn, exacerbates the hostile attribution bias and leads to the expression of anger through aggressive behavior. Therefore, we propose the third and fourth hypotheses: (H3) peer victimization plays a mediating role in the relationship between harsh parenting and aggressive behavior; and (H4) peer victimization and hostility attribution bias play a chain mediating role between harsh parenting and aggressive behavior.

2. Materials and Methods

2.1. Participants

A total of 630 male juvenile delinquents were randomly recruited from juvenile prisons in a Chinese province. The participants' age ranged from 15 to 17, with a mean age of 16.57 years (SD = 0.61). The mean age at which they entered prison was 16.31 (SD = 0.78). Among the participants, 221 (36.6%) had at least one parent who had migrated for work, resulting in them being stay behind. After eliminating the answers of participants who did not answer carefully or missed more than half of the questions, the final valid sample size was 604, corresponding to a retention rate of 95.87%. The main types of crimes committed by these juvenile delinquents include robbery (51%), rape (25%), intentional injury (13%), theft (2%), intentional homicide (2%), etc. On average, they committed 1.03 crimes (SD = 0.21) and had an initial term of sentence with a mean of 3.63 years (SD = 2.61).

2.2. Measures

Harsh parenting. Harsh parenting was assessed by the Chinese version [22] of the Harsh Parenting Questionnaire [23]. This questionnaire consisted of 4 items (e.g., "Dad hit me or kicked me.") rated on a five-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). A high mean score indicates serious harsh parenting for all items. The structure validity of the Chinese version was found to be good in the current study, as confirmed by the results of confirmatory factor analysis ($\chi^2/df = 43.41$, CFI = 0.96, TLI = 0.92, SRMR = 0.03, RMSEA = 0.08, 95%CI RMSEA = [0.06, 0.11]). The Cronbach's alpha coefficient for the total questionnaire was 0.77, while for the father's and mother's versions, it was 0.69 and 0.67, respectively.

Aggressive behavior. Aggressive behavior was assessed using the Chinese version [24] of the Buss-Perry Aggression Questionnaire [25]. The sub-scale of physically aggressive behavior (e.g., "Once in a while, I cannot control the urge to strike another person.") and the sub-scale of verbally aggressive behavior (e.g., "I tell my friends openly when I disagree with them.") were used to measure aggressive behavior. A high mean score on all items indicates serious aggressive behavior. Confirmatory factor analysis was conducted to assess the structure validity of the Chinese version, yielding good results ($\chi^2/df = 66.191$, CFI = 0.93, TLI = 0.91, SRMR = 0.03, RMSEA = 0.04, 95%CI RMSEA = [0.03, 0.05]). The Cronbach's alpha coefficient for the sub-scale of physically aggressive behavior was 0.61, while for the sub-scale of verbally aggressive behavior, it was 0.64. The total questionnaire had a Cronbach's alpha coefficient of 0.68.

Peer victimization. As sub-scales of the Chinese version of the Multidimensional Peer-Victimization Scale [26], physical victimization (e.g., "Beat me up.") and the sub-scale of relational victimization (e.g., "Tried to make my friends turn against me.") were used to assess peer victimization. Serious victimization was indicated by a high mean score for all items. In the current study, confirmatory factor analysis was conducted to assess the structure validity of the Chinese version. The results showed good validity ($\chi^2/df = 149.80$, CFI = 0.93, SRMR = 0.04, RMSEA = 0.06, 95%CI RMSEA = [0.05, 0.08]). The Cronbach's alpha coefficient for the sub-scale of physical victimization was 0.63, while for the sub-scale of verbal victimization, it was 0.80. The total questionnaire had a Cronbach's alpha coefficient of 0.81.

Hostile attribution bias. Hostile attribution bias was assessed using the Chinese version [27] of the Word Sentence Association Paradigm for Hostility [16]. The sub-scale of hostile attribution bias, which contained 16 distinct ambiguous sentences (e.g., "Someone is in your way"), followed by either a hostility-related word (e.g., "inconsiderate") or a benign word (e.g., "unaware"). Each sentence was randomly presented twice. A high mean score on the sub-scale indicated a high level of hostile attribution bias for all items. The data were subjected to confirmatory factor analysis, which demonstrated good structural validity for the Chinese version ($\chi 2/df = 141.78$, CFI = 0.93, TLI = 0.92, SRMR = 0.04, RMSEA = 0.03, 95%CI RMSEA = [0.02, 0.04]). The Cronbach's alpha coefficient for the sub-scale was 0.72.

2.3. Procedure and Statistical Analysis

Questionnaires were distributed to each block in cooperation with the prison guards, with the assistance of two doctoral psychology students. These participants were instructed to read the instructions carefully before completing the scale. During the testing process, if the subjects had any doubts about the questionnaire questions, they were allowed to ask the interviewer questions at any time. The test lasted for approximately 30 min, and the questionnaires were collected by the researcher upon completion. The study was approved by the Ethics Committee of the Faculty of Psychology, Tianjin Normal University. All participants signed a written consent form prior to the study. The data were subsequently analyzed using SPSS 18.0 and Mplus 7.0 through descriptive analysis, correlation analysis, and multiple mediation analysis.

3. Results

3.1. Common Method Bias

Harman's single-factor test was utilized to test the common method bias when the data were collected. The results revealed that 13 factors exhibited an eigenvalue exceeding 1. However, the initial factor solely accounted for 12.41% of the total variance, which falls beneath the critical standard of 40%. Hence, no significant common method bias was observed.

3.2. Descriptive Statistics and Correlations

In Table 1, we display the means, standard deviations, and correlations of the research variables. For the demographics, the results of correlational studies revealed several significant correlations between demographic variables, such as age and initial term of sentence, age and age to enter prison, degree of education and age to enter prison, degree of education and mothering harsh parenting, type of crime and count of crime, type of crime and age to enter prison, type of crime and mothering harsh parenting, count of crime and initial term of sentence, count of crime and fathering harsh parenting. For the study variables, there were significant positive correlations among one another.

Table 1. Descriptive statistics and correlations of measures (N = 604).

	M ± SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1.Age	16.57 ± 0.61	1													
2.DE	0.96 ± 0.42	0.1 *	1												
3.TOC	0.05 ± 0.23	0.01 *	0.01	1											
4.COC	1.03 ± 0.21	0.08	0.05	0.25 ***	1										
5.ITS	3.63 ± 2.61	0.14 ***	0.02	−0.10 *	0.12 ***	1									
6.AEP	16.30 ± 0.78	0.55 **	0.16 **	0.14 ***	0.03	−0.06	1								
7.SD	0.37 ± 0.48	−0.06	−0.02	0.05	0.02	−0.01	−0.01	1							
8.FHP	7.68 ± 2.618	−0.004	0.05	0.14	0.16 ***	−0.02	−0.01	0.04	1						
9.MHP	6.92 ± 2.518	0.00	−0.08 *	0.09 *	0.00	−0.03	−0.02	0.02	0.56 ***	1					
10.HAB	46.43 ± 9.848	−0.06	0.07	−0.01	0.01	−0.03	−0.07	0.03	0.14 ***	0.10 *	1				
11.PAB	16.18 ± 4.227	0.03	−0.02	0.07	0.00	−0.07	0.05	−0.01	0.25 ***	0.19 ***	0.26 ***	1			
12.VAB	13.15 ± 3.091	−0.02	0.04	0.05	−0.05	−0.06	0.01	−0.04	0.18 ***	0.20 ***	0.19 ***	0.46 ***	1		
13.PV	5.96 ± 1.831	−0.02	0.06	0.00	−0.02	0.02	−0.02	0.00	0.22 ***	0.21 ***	0.10 *	0.20 ***	0.23 ***	1	
14.RV	15.50 ± 4.617	−0.002	0.01	−0.05	0.05	0.03	−0.05	0.01	0.16 ***	0.19 ***	0.16 ***	0.17 ***	0.26 ***	0.43 ***	1

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. DE, degree of education; TOC, type of crime; COC, count of crime; ITS, initial term of sentence; AEP, age to enter prison; SD, stayed behind; FHP, fathering harsh parenting; MHP, mothering harsh parenting; HAB, hostile attribution bias; PAB, physical aggressive behavior; VAB, verbal aggressive behavior; PV, peer victimization; RV, relational victimization. Type of crime was coded as 0—violent crimes (e.g., intentional injury, intentional murder, and rape); 1—economic crimes (e.g., stealing, organized prostitution, and drug trafficking); 2—others. Degree of education was coded as 0—primary school; 1—junior high school; 2—senior high school.

3.3. Mediation Model Analysis

The hypothesized mediation model was examined using SEM. The final model, which is presented in Figure 1, exhibited a good fit with the data, CFI = 0.98, TLI = 0.94, RMSEA = 0.06, and SRMR = 0.06. The results of bootstrap test showed that the direct effect of harsh parenting on aggressive behavior was positive and significant (β = 0.28, $p < 0.001$, 95% CI [0.15, 0.42]), and the total indirect effect of harsh parenting on aggressive behavior via the two mediators were positive and significant (β = 0.1, $p < 0.001$, 95% CI [0.06, 0.16]). The mediating effects of peer victimization and hostile attribution bias are presented in Table 2 and Figure 1.

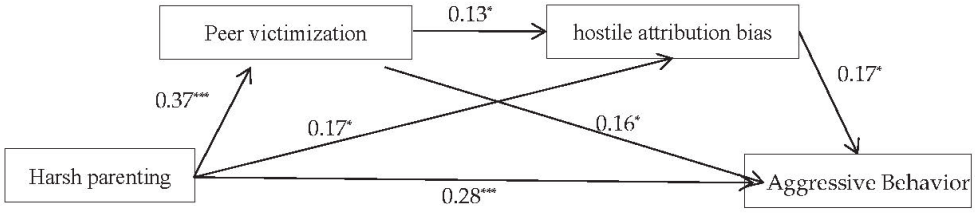

Figure 1. Final model illustrates the chain mediation of peer victimization and hostile attribution bias on the association between harsh parenting and aggressive behavior. * $p < 0.05$; *** $p < 0.001$.

Table 2. Testing the mediation effect of HP on AB.

Effect	β	*p*	95% CI	Ratio of Total Effects
Direct Effect				
HP→AB	0.28 ***	<0.001	[0.15, 0.42]	74.32%
Indirect Effect				
HP→PV→AB	0.06 *	<0.01	[0.03, 0.11]	15.95%
HP→HAB→AB	0.03 *	<0.05	[0.01, 0.07]	7.57%
HP→PV→HAB→AB	0.01 *	<0.05	[0.002, 0.02]	2.16%
Total Mediation Effect	0.10 ***	<0.001	[0.06, 0.16]	25.68%

Note: HP, harsh parenting; PV, peer victimization; HAB, hostile attribution bias; AB, aggressive behavior; TIE, total indirect effect. * $p < 0.05$; *** $p < 0.001$.

4. Discussion

In this study, we sampled male juvenile offenders as research subjects to investigate the relationship between harsh parenting and aggressive behavior. Previous research

has mainly focused on general samples of children, adolescents, and adults rather than specifically examining individuals with severe aggression. Our findings indicate that harsh parenting directly predicts aggressive behavior in juvenile delinquents. Additionally, we identified the partial mediating effect of peer victimization and hostile attribution bias between harsh parenting and aggressive behavior. Importantly, we also observed a chain mediating effect, whereby peer victimization and hostile attribution bias mediate the relationship between harsh parenting and aggressive behavior.

The finding that harsh parenting might positively predict aggressive behavior is consistent with previous studies and confirms H1. It suggests that the more serious the harsh parenting experienced by juvenile delinquents, the easier it is for them to observe, learn, and imitate their parents' aggressive behavior, and that they may then apply those scripts to interpersonal communication. For instance, Liu et al. (2022) recruited 235 Chinese adolescents as participants to investigate the relationship between harsh parenting and aggressive behavior [13]. They found that harsh parenting significantly predicted aggressive behavior among children. Similarly, Cortes Hidalgo et al. (2022) used rest-state fMRI to scan 2410 children at age 10 who experienced maternal harsh parenting, and they observed smaller total gray, cerebral white matter, and amygdala volumes, which are associated with aggressive behavior [28]. Additionally, preventing harsh parenting can decrease aggressive behavior in children. Milner et al. (2017) showed that using evaluative conditioning (EC) improved parents' attitudes towards upbringing, reduced the demand for educating children, and avoided harsh parenting [17]. These changes can foster positive attachment between parents and children, leading to a warmer perception of society and reducing the inclination towards violence. However, there is currently limited research on the relationship between harsh parenting and aggressive behavior among juvenile delinquents. Future studies should focus on investigating this link among juvenile delinquents, adult delinquents, and individuals prone to high aggression. Longitudinal research is particularly needed to explore the family factors contributing to aggressive behavior in these populations.

Our results supported the dynamic cascade model [19], which suggests that the evolution of individual aggressive behavior or violence is influenced by early factors of family and school. According to this model, factors of family have a progressive impact on individuals through factors of school. In line with this, our second finding revealed a partial mediating effect of peer victimization between harsh parenting and aggressive behavior. Specifically, harsh parenting was found to positively predict peer victimization, which in turn predicted aggressive behavior. This finding supports the H3 hypothesis and is consistent with existing literature. For instance, Perry et al. (2021) conducted a longitudinal study examining the relationships between family violence, peer victimization, and aggressive behavior across different stages of childhood and early adolescence [29]. They found that family violence significantly predicted both peer victimization and aggressive behavior. The inability of children with harsh parenting to establish healthy attachments with their parents may hinder their ability to develop healthy attachments with their peers [30]. Consequently, these children may become more vulnerable to exclusion or even serious violations by other children. Unfortunately, negative experiences from both parents and peers can trigger thoughts of retaliation, leading to aggressive behavior towards these assailants.

Several studies have demonstrated that harsh parenting is a predictor of emotional regulation disorders and selective attention to hostile information, leading to internal problems (such as social anxiety) and external problems (such as aggressive behavior) [31] Especially, parents' harsh parenting can be viewed as an unsatisfied signal towards children, which induce them to become more sensitive to exclusion, and prone to express hostility in ways of aggressive behaviors or violence. Additionally, Zhao et al. (2021) recruited 76 male juvenile delinquents as participants and confirmed the relation between hostile attribution bias and aggressive behavior [6]. Following up on these findings, our study confirmed the partial mediating effect of hostile attribution bias between harsh parenting and aggressive

behavior (H2), which supports the social information processing model [14]. This finding adds to the existing literature, as previous studies have not specifically explored this mediating effect. Given these findings, it is important to recognize the effects of reducing hostile attribution bias in preventing aggressive behavior.

The results of the current study also support the idea of a developmental cascade model of adolescent aggression [19]. The model suggests that negative daily events, such as harsh parenting and peer victimization, activate negative self-schema, leading individuals to feel hostility around the world and initiate negative perspectives about the future. This increases their hostile attribution bias towards the external environment. Additionally, harsh parenting and peer victimization may activate threatening schema and aggravate thoughts of hostility, ultimately enhancing aggression in interpersonal communication. Our study supported this idea and confirmed the chain mediating effects of peer victimization and hostile attribution bias between harsh parenting and aggressive behavior (H4), indicating that harsh parenting positively predicts hostile attribution bias, peer victimization, and, subsequently, aggressive behavior. Individuals who experience harsh parenting tend to be more sensitive to stressful environments, overreacting to environmental stimuli. This can result in peer rejection, victimization, and the formation of a hostile attribution bias towards external environmental information. Ultimately, these individuals may exhibit serious aggressive behavior or even violent criminal behavior [32]. A genetic study conducted by Brody et al. (2014) further suggests that harsh parenting can impair the short allele carried by 5-HTTLPR, leading individuals to overreact to the external environment. In particular, threatening stimuli become a priority and cannot be overridden, increasing the risk of aggressive behavior [33]. It should be noted that previous empirical studies have not explored the chain mediating role of peer victimization and hostile attribution bias between harsh parenting and aggressive behavior.

The current study has a few limitations. First, the study is based on self-reported data, which is susceptible to social desirability biases, particularly given the negative nature of the topics being investigated, such as harsh parenting, peer victimization, hostile attribution bias, and aggressive behavior. Second, the cross-sectional design of the study prevents the examination of causal relationships among the variables in the model. However, it is worth noting that no longitudinal study on the relationship between harsh parenting and aggressive behavior has been conducted to date. Third, the current study only explores the dimensions of physical and verbal aggression from the aggressive behavior form, omitting the investigation of the motivation for aggressive behavior (i.e., proactive aggression and reactive aggression [34]). Future research should consider reporting variables from various perspectives, such as including reports from parents regarding harsh parenting and reports from peers regarding peer victimization. Additionally, future studies should employ longitudinal designs to investigate the long-term effects of harsh parenting on aggressive behavior and the mediating role of peer victimization and hostile attribution bias. It may also be beneficial to include other types of aggressive behaviors to examine the differential influence of different forms of harsh parenting on various aggressive behaviors.

5. Conclusions

In the present study, we investigated the relationship between harsh parenting and aggressive behavior in male juvenile delinquents. Our findings indicated that harsh parenting increased the likelihood of aggressive behavior in male adolescents. Specifically, the negative effects of harsh parenting on aggressive behavior could be explained by peer victimization and the development of a hostile attribution bias.

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Data Availability Statement: The data from this study will not be disclosed in order to protect the privacy of the juvenile delinquents involved. However, if you are interested in accessing the data, you can contact the author.

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Article

Empowering Novice Teachers: The Design and Validation of a Competence Model to Manage Verbal Aggressive Behaviour in the Classroom

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Abstract: (1) Background: Dealing with students' maladaptive behaviour in the classroom, such as verbal aggressive behaviour, is challenging, particularly for novice teachers. They often encounter limited opportunities for training and practice in handling such incidents during their pre-service education, rendering them ill-equipped and uncertain when confronted with instances of verbal aggression during their initial teaching experiences. This article reports on the design and validation of a verbal aggression management competence model to guide and substantiate novice teachers' immediate reactions. (2) Methods: The model's construction and validation processes were informed by a dual-pronged approach, encompassing a literature analysis to explore theoretical concepts and semi-structured interviews involving 32 educational experts to validate its practical applicability. (3) Results: The design and validation processes resulted in a comprehensive competence model consisting of concrete steps to be taken during or immediately following an incident and overarching attitudes to be adopted throughout the incident managing process. (4) Conclusions: This study contributes a structured framework to empower novice teachers, offering tools to address verbal aggressive behaviour within the classroom environment. Furthermore, it highlights the potential of incorporating this model into teacher education programs, facilitating the competence development of future teachers, and fostering conducive learning environments.

Keywords: verbal aggression management; competence development; classroom management; competence development; validation

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1. Introduction

Worldwide, students' aggressive behaviour in schools remains a topic of concern (e.g., [1,2]). Incidents of aggression significantly affect the learning environment, including students' and teachers' well-being [3]. Therefore, teachers must effectively manage these incidents [4,5]. How teachers understand the nature of classroom management (CM) strategies [6] or make adequate management decisions [7] appears dependent on their professional development. Although teacher education programmes (TEPs) cover CM, novice teachers struggle with students' behaviour management [8]. They report feeling ill-prepared and experiencing a theory–practice gap when applying what they learned during training in actual classroom situations [6,9]. This experience stems from two interconnected elements. First, practical experiences are substantial in developing competences [10,11]. However, due to organisational, ethical, and financial constraints, TEPs rarely offer practice opportunities in authentic, real-life settings. Second, prevention is central to most teacher educational literature, emphasising school- or classroom-level approaches [4,12]. Consequently, far less is published on how to react in a structured way to students' aggressive behaviour. CM courses, for example, favour introducing universal prevention management strategies instead of teaching specific skills and providing training opportunities to preservice teachers to handle classroom disruptions or misconduct [13,14]. Although prevention

is crucial, teachers will likely encounter maladaptive behaviour requiring immediate reactive strategies [15]. In general, maladaptive behaviour can be understood as 'behaviour that undermines the individual well-being and group functioning' [16] (p. 257). Within the educational context, maladaptive behaviour pertains to 'any type of behaviour by students in a classroom or school environment that violates a written or unwritten social norm or school rule' [17] (p. 602). The classification of such behaviours is primarily influenced by cultural norms, with aggression often being identified as a specific manifestation of maladaptive behaviour. However, to the best of our knowledge, no state-of-the-art, comprehensive, and validated competence model is available to guide teachers' responses to classroom aggression, predominantly verbal aggression [18,19]. Novice teachers primarily rely on their prior school experiences and attitudes/beliefs to respond to verbal aggression incidents as they have not had the opportunity to discover which strategies are successful [20,21]. This introduces the aim of the present study to design and validate a verbal aggression management competence (V-AMC) model, assisting novice teachers whose behavioural repertoire to deal with students' verbal aggressive behaviour (VAB) is still limited.

1.1. Aggression in the Classroom

The concept of aggression has been studied in various disciplines, such as psychology, education, health, and criminology [22–24]. It is, however, a complex construct challenging to define [25]. Furthermore, the common usage of the term 'aggression' may not always align with its scientific interpretation [26]. In the present study, we adopt the social-psychological perspective as articulated by Allen and Anderson, in which aggression, carried out by one or more persons, is characterised as observable and intentional behaviour aimed at causing harm to another individual who is motivated to avoid that harm [27,28]. This perspective provides a framework for understanding and analysing aggressive behaviours within educational settings and allows distinguishing 'aggression' from broader phenomena such as antisocial behaviour [29] or specific subsets of aggression such as violence [30] or bullying [31].

Various classifications are available regarding aggression. In this study, we focus on verbal aggression—characterised by using words to attack others (e.g., insulting, swearing, name calling, threatening; [32])—as this type of aggression is the most prevalent in school settings [33,34]. The choice to highlight only verbal aggression builds on several reasons. Typically, aggression incidents follow a cyclical process, conceptualised as the 'assault cycle' (see [35]), consisting of five interrelated phases: trigger, escalation, crisis, recovery, and post-crisis depression. Intervening as early as possible, preferably during the trigger or the escalation phase, is recommended to avoid further escalation [36]. During these phases, rational argumentation-based intervention is still possible. In the subsequent crisis phase, arousal increases, and emotions get the upper hand, which makes rational and constructive control of the situation less likely [37]. Verbal aggression peaks during the escalation phase, highlighting the importance of verbal aggression management strategies [38]. However, selecting and applying such strategies necessitate mastering well-developed competences. Since VAB might be a precursor of physical aggression [33], early intervention also reduces the likelihood of physical consequences.

Another reason to focus on VAB is its impact on adolescents. Adolescence, encompassing the period between 11 and 19 years old, is a sensitive period. It is marked not only by biological changes but also by the development, i.e., improvement or deterioration, of social skills and cognitive control [39,40]. The transition to adulthood, and consequently, these developments, unfolds gradually, leading to further categorisation into early (11–13 years), middle (14–17 years), and late adolescence (17–19 years; [41]). Although exhibiting both verbal and physical aggression [42], adolescents tend to express more verbal threats and abuse as they mature [43]. Such VAB is triggered by different factors. In addition to biological, sociological, economic, and psychiatric factors, research highlights situational elements, such as sudden changes in the environment, invoking the display of aggressive behaviour [22]. Moreover, social status and peer acceptance are pivotal, especially during

middle adolescence, making these young people sensitive to social pressure and peer opinions [39]. This explains why the display of aggressive behaviour might result in positive peer status and popularity [44,45]. Aggression can, therefore, be seen as social conduct influenced by adolescents' social context [46,47]. Models help map this intricate synergy. For instance, social-ecological models focus on the interplay of individual characteristics and contextual systems [48], whereas cognitive-ecological models stress the cognitive processing of experiences resulting from this interplay [22]. Emphasis on those social and cognitive underpinnings must be considered in determining adequate CM strategies.

1.2. Teachers' Role in Aggression-Related Classroom Management

Models explaining the origins and triggers of aggression have helped to develop a range of prevention strategies to be adopted in educational environments (e.g., [49,50]). However, schoolwide prevention or intervention programmes appear to have a minor impact on reducing adolescents' aggression [51,52]. Nonetheless, Wilson and colleagues' meta-analysis of school-based bullying interventions revealed that high-intensity one-on-one interventions administered by teachers were the most effective [53]. Although focusing on bullying, these findings align with more recent research suggesting that teachers influence their students' use of aggression [17,54]. Teachers interact directly with students during teaching activities and seem critical in impacting students' social context in schools [5]. In addition, teachers are accountable for developing and maintaining a safe learning environment to ensure student learning [6,55]. Appropriate CM decisions enable them to maximise instructional time and minimise the likelihood of disruptive behaviour [12]. Next to preventive strategies, however, effective CM also requires reactive strategies [11]. As stressed above, unaddressed aggressive behaviour disrupts relationships among students and between students and the teacher, thus affecting the classroom atmosphere [56]. Furthermore, it might result in negative consequences for teachers (e.g., stress, burn-out) and students (e.g., academic failure, feelings of unsafety; [4,8]). This reinforces the importance of timely and effective intervention when aggression occurs [57].

Few concrete tools for dealing with VAB are discussed in educational research. A recent literature review on verbal aggression in schools pointed out that interventions focusing on reducing VAB, or empirical studies mapping self-reported reaction strategies to VAB are scarce to non-existent [34]. However, substantial research into aggression in other socio-economic areas resulted in mechanisms guiding practice [58]. In healthcare or law enforcement settings, for example, de-escalation is the recommended first-line strategy for tackling VAB during the escalation phase [59,60]. De-escalation, a psychosocial intervention, entails verbal and non-verbal communication strategies to negate, prevent, or manage a (potentially) aggression situation [61–63]. Furthermore, de-escalation helps minimise an incident within ten minutes but is less suitable as a long-term solution [64].

Aggression is a cross-sectional phenomenon, suggesting de-escalation strategies can also be applied in a range of disciplines within the public sector (which also includes education) where aggression occurs frequently [65,66]. Existing de-escalation strategies are generally broadly defined and seem to vary across disciplines. As a result, no standardised protocol exists [37,60]. Nonetheless, some general features related to aggression management may be deduced. This enables translation and adaptation to the educational field while considering domain-specific features [24]. Such strategies can assist teachers in responding to VAB as active teacher responses remain scarce [67]. Many teachers believe ignoring VAB is an effective tactic [54], and responding appropriately seems challenging [68]. In addition, CM-related reactions are mostly intuitive, resulting from personal experiences, professional development workshops, interpretations from field observations, etc. [69,70]. It is, therefore, not surprising that novice teachers indicate they feel incompetent in implementing them [9,71]. Though these strategies are on the agenda of teacher education curricula, these programs often do not provide preservice teachers with sufficient preparation for effective CM [10]. This is partly explained by the complex nature of (aggression management) competence development [72].

1.3. Competence Development

Interacting with an individual displaying aggressive behaviour during an incident is challenging [73], and being confronted with aggressive behaviour can evoke a sense of surprise and being overwhelmed [74]. Thinking about and practising ways to react before encountering aggression are prerequisites to successfully handling the behaviour [73]. In addition, repeated practice related to real-life situations is also a precondition for acquiring such complex competence [75]. To explain this development process, we build the model of Blömeke and colleagues, viewing competences as evolving along a continuum [76]. When dealing with an aggression situation, teachers build on their cognitive (i.e., knowledge and skills) and affective-motivational (i.e., values and beliefs) dispositions. These dispositions result from earlier experiences and influence teachers' thoughts and reactions [77]. This processing of experiences is often described as the formation of cognitive event schemas [78].

Schemas are mental structures resulting from the organisation and elaboration of information as perceived in the environment. These processes connect ideas and concepts about, e.g., behaviour and help develop meaning [79]. Applied to social interactions, cognitive schemas represent experienced and expected events and actions, helping to comprehend and respond to novel situations. Moreover, schemas can be interconnected, resulting in internal scripts defining a procedural sequence of reactions (i.e., 'if-then' events; [22]). These scripts serve as guides [80] to deploy situation-specific skills, also called PID-skills (i.e., perception of classroom events, interpretation of that perception, and decision-making; [81]). These PID-skills are central to the competence continuum, connecting dispositions to observable behaviour.

Applied to aggression management competences, we argue that novice teachers' dispositions are insufficiently developed to deal with students' aggressive behaviour. This assumption is based on the discussion held in the introductory section of this paper, where it was highlighted that TEPs do not focus on theoretical frameworks regarding responsive strategies concerning aggression and the lack of authentic, real-life practice opportunities. In addition, novice teachers have difficulties in noticing (i.e., selectively attending to information in classroom situations) and reasoning about (i.e., interpreting noticed information based on existing knowledge) events [82,83]. This noticing and knowledge-based reasoning, conceptualised as professional vision [84], improves when teachers are sufficiently exposed to authentic classroom situations that help develop relevant competences [83]. As suggested by Carmien and colleagues, it seems feasible to provide teachers with external scripts designed by professionals and researchers to compensate for their lack of internal scripts [85]. These external scripts offer teachers tools for reading and interpreting classroom happenings [86]. In other words, external scripts enrich the knowledge base of novice teachers, contributing to an increased professional vision and, thus, active engagement in competence development.

Dealing with VAB encompasses a tension between general and situation-specific responses. Each situation involving aggression is unique and influenced by personal and situational factors [30,87]. These factors might provoke VAB or increase the chance of an aggressive reaction. Triggered by different elements, such as biological features, social environments, or previous experiences, they pose a challenge in devising a cohesive approach. The external script must, therefore, be applicable across situations but also consider situation specificity. This assumption aligns with a social-cognitive approach whereby cognitions are seen as providing stable behavioural patterns across a range of settings but are frequently accompanied by situational peculiarity [30]. In this approach, how people interpret and respond to incidents in the environment is contingent on particular situational (social) elements within that environment as well as on knowledge (cognitive) components they have acquired and integrated into their habitual responses. In addition, these processes are impacted by and affect emotions [30]. However, to our knowledge, such external VAB management scripts do not yet exist. This introduces the objective of the present study, which is to develop a coherent competence model acting as an external script to guide

teachers' immediate responses to students' VAB in the classroom. This research objective is addressed by the following research questions (RQs):

- RQ1: Which elements can be identified in the literature to develop a competence model that helps direct teachers' immediate response to students' VAB?
- RQ2: What is the validity of the competence model considering educational experts' experiences in dealing with students' VAB?

2. Materials and Methods

Various data collection methods were used to construct a coherent and grounded 'Verbal Aggression Management Competence' model. Literature covering several domains was consulted to answer the first research question. Given the second research question, validation interviews were used to capture the experiences of educational professionals. The participants and procedures are discussed in detail below.

2.1. Participants

Present study aimed to involve teachers and other educational professionals working with secondary school students in Flanders, such as social workers, psychologists and psycho-pedagogical counsellors working in student counselling centres (CLBs), and student counsellors at secondary schools. Given the intention to validate the model's practical applicability in today's classroom context (RQ2), individuals who are actively engaged in teaching and/or possess practical experience in dealing with verbal aggressive behaviour from adolescents were targeted. Participants of the validation study were recruited by publishing a call for participation in online educational communities via social media since the COVID-19 context resulted in modifying traditional sampling procedures. In addition, researchers sent targeted e-mails to learner guidance centres and requested acquaintances to address their network. In the call, an informative video outlined the general purpose of the study, followed by an invitation to participate in an online interview. Those interested were invited to register online and provide demographic information. After registration, 41 volunteers were screened based on the following criteria: having job-related experiences with students in middle adolescence, employment in Flanders, and having direct experience with students' VAB. These criteria were deliberately chosen as students in middle adolescence constitute the target audience to which the model will be applied. Since the study was conducted in Flanders, this specifically implies students in the second and third grades. Nine participants were excluded based on the eligibility criteria, resulting in a selection of 32 participants who were interviewed between April and June 2020. Table 1 outlines their key characteristics.

Table 1. Participants' demographics.

Demographics	Indicators	Teachers (n = 25)	Other Educational Professionals (n = 7)
Gender	Male	6	1
	Female	19	6
Education type *	General	9	1
	Technical	17	5
	Art	1	0
	Vocational	12	5
	Special Education	2	2
Mean years of experience (SD)		11.69 (10.42)	10.4 (6.55)

* The frequencies reported in this table reflect the number of participants meeting the criteria. Participants with experiences in multiple education types were categorised under each type that applies, raising the overall total.

2.2. Procedure

2.2.1. Designing the V-AMC Model (RQ1)

Following the aforementioned social-cognitive focus, key elements of social-cognitive problem-solving models (e.g., [88,89]) served as a blueprint for model construction. These models represent a stepwise method to solve conflicts peacefully and are mostly part of a curriculum focusing on social skills training to prevent students' anti-social behaviour. Next, literature concerning aggression, CM, and other relevant sources (i.e., workshops, prevention programmes, and local government initiatives) was consulted. The following search terms were combined to identify relevant articles: 'aggression', 'training', 'teacher', 'managing', 'class', and 'student'. To further refine the search, articles focusing on VAB of adolescent students expressed in the classroom, towards each other or towards the teacher, were selected. Combining the results of both steps helped establish categories addressed in our competence model. As a final step in the design process, de-escalation methods applied in healthcare and law enforcement settings were consulted and translated to the educational field. As mentioned in the introductory section, extensive research on aggression has been conducted in these sectors where first-line strategies focusing on the de-escalation of an incident are already developed and widely implemented.

2.2.2. Validating the V-AMC Model (RQ2)

To ensure the validity of the V-AMC model, a multimodal format was adopted. A first validation strategy applies to methodological triangulation. Since this triangulation is seen as beneficial for theory development [90], we adopted validation interviews, i.e., 'a dialogue between interviewee and interviewer intended to confirm, substantiate, verify, or correct researchers' findings' [91] (p. 107). Each interview took place via videoconferencing, with an average duration of one hour and a half. A semi-structured interview guide, consisting of three main sections, was used to guide data collection. The first section focused on the participant's demographic background. The second section elaborated on experiences with students' aggressive behaviour. Both open-ended questions and a simulation video were used to identify corresponding strategies. The third section focused on the initial version of the V-AMC model. Participants were asked to provide feedback based on their experiences. The interview concluded with an open question to identify essential topics not yet covered. Each interview was recorded via the recording function in the videoconferencing platform and transcribed verbatim. Thematic analysis, serving as an explanatory tool [92], was adopted to direct the research given the second research question. Coding of semi-structured interviews followed a two-step procedure congruent with Saldaña's approach [93]. First, the primary researcher selected and coded units of analysis of each interview, i.e., excerpts in which participants elaborated on responding strategies and provided feedback on elements of the V-AMC model. Next, a deductive approach was adopted. To identify strategies and attitudes adopted by the participants, a coding instrument (Appendix A) was developed. Coding categories in the instrument mirrored the steps and attitudes as described in the initial version of the model, and an additional category was created to cluster excerpts that did not fit in the existing framework. Subsequently, these excerpts were coded inductively by initially clustering them by theme and developing (sub)categories to delineate the themes of the newly created clusters. During multiple iterations, these categories were examined and revised. All transcripts were processed using QSR NVivo 12. To ensure reliability, a random sample reflecting 35% of the interviews was double-coded by two independent researchers. Intercoder reliability resulted in a Kalpha of 0.91, which can be considered 'excellent' reliability [94]. The primary researcher coded the remaining excerpts.

A second validity strategy involved triangulation by experts. Peer debriefing by an expert panel (n = 4) was undertaken routinely throughout the study to add credibility to the validation process [95]. Experts with several years of research experience in health care (n = 2) and education (n = 2) gathered to discuss results and offer modifications. This additional phase ensured that the primary purpose of the research was preserved and retained a critical eye throughout the process.

3. Results

3.1. Designing the V-AMC Model (RQ1)

The first research question aimed at identifying elements from the literature to guide the design process. Inspired by the model of Blömeke and colleagues [76] and the social-cognitive approach to behaviour [30], the V-AMC model was subdivided into steps that can be taken during and immediately after an incident of VAB and teacher attitudes during such incidents. These attitudes influence day-to-day educational practices but play a specific role in addressing students' VAB. Connected to the competence development continuum, the steps correspond to knowledge and skills deployed in a particular situation (i.e., cognitive disposition), while the attitudes encompass beliefs and emotions associated with comprehending the situation (i.e., affective-motivational disposition; [96]). This is depicted in Figure 1. Both dispositions strengthen the knowledge base from which teachers draw when using their PID-skills regarding an incident. We reiterate that the V-AMC model is not intended as a one-size-fits-all model. Some steps of the competence model might (not) be applicable in a particular situation. In addition, the model does not lend itself to strict or blind adherence. It does not provide a rigid step-by-step approach for dealing with every VAB-related incident and is, therefore, not to be considered a protocol.

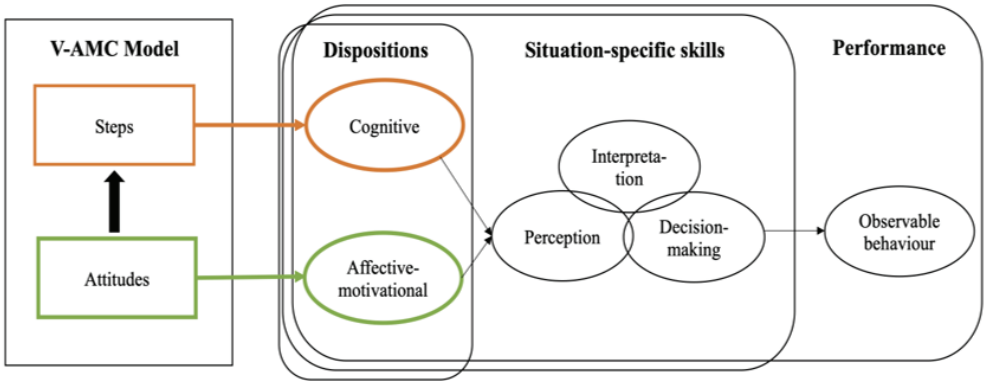

Figure 1. V-AMC model related to the competence development continuum.

3.1.1. Steps

The steps of the V-AMC model were developed with social-cognitive problem-solving models in mind (see Figure 2), containing a three-phased classification: the initial phase (containing step 1), the de-escalation phase (containing steps 2 to 4), and the follow-up phase (containing steps 5 to 7).

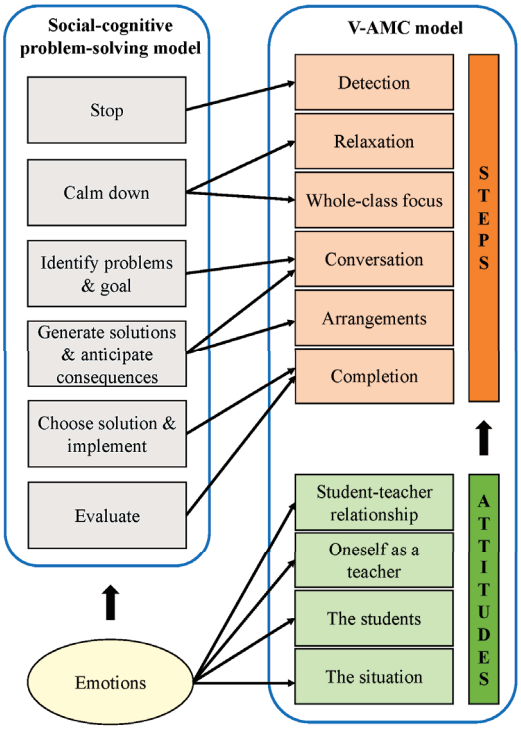

Figure 2. V-AMC model related to elements of social-cognitive problem-solving models.

Step 1: Detection. Perceiving and identifying early warning signs as possible precursors to VAB contribute to both prevention and intervention, enhancing the success of subsequent strategies [97,98]. Warning signs are either person-related, manifesting as (non-)verbal cues, or contextualised, affecting a group. They often occur concurrently and should be considered in relation to students' standard behaviour. Therefore, this step focuses on detecting deviations in situations and behaviour [99].

Step 2: Relaxation. A first de-escalation strategy is calming students down by redirecting their attention to help them regain control. Depending on the situation, a range of activities can be employed. The primary purpose of these activities is to create distractions by diverting students' attention to a less emotionally charged topic or away from stimuli eliciting a reaction [98,100]. The least intrusive strategy is addressing students by name and describing the current situation. This might help orient, regain attention, and refocus on the present [101,102]. Additionally, humour can alleviate tension. Considering it might also provoke students [98], the strategy's appropriateness should always be assessed. If redirection strategies fail to produce the desired effect, maintaining students' mental and physical safety in the classroom becomes the main concern [103]. Since environmental factors influence the success of de-escalation techniques, this can be accomplished by removing triggering factors or relocating agitated students [100,104]. Retaining a safe distance with respect for students' personal space during removal contributes to a non-threatening atmosphere [60,101]. Moreover, granting time and space to calm down facilitates subsequent steps towards positively handling the situation. Allowing students to choose a time-out period can be advantageous as it supports autonomy [24,105]. Although removing students might benefit all parties involved, forced removal can be perceived as a punishment or humiliating, encouraging further escalation [59,60,102]. It is therefore advisable to properly frame reasons for removal and emphasise the measure's calming function as beneficial. Another disadvantage is that removal may be counterproductive, negatively reinforcing

VAB. Removal exempts students from participation in classroom events, which might result in long-term academic lag. When used frequently as the sole 'consequence' of VAB, it might encourage students to exhibit this behaviour more often [106]. If the classroom setting permits physical flexibility, inclusion time-out where students are faced away or secluded from their classmates while remaining in the classroom is preferable [104,107].

Step 3: Whole-class focus. Teachers are responsible for all their students in the classroom. Therefore, they should not focus exclusively on agitated students while forgetting the others [107]. Employing class-wide instructional activities requiring group focus or seeking the assistance of a third party (e.g., a colleague) to supervise the class or escort agitated students to a low-stimulus location [63] may be considered.

Step 4: Evaluation of the situation. After respecting the aforementioned time-out period, initiating a conversation with the students is advisable. It is up to the teacher to decide when this conversation can occur, considering the severity of the incident and the time available for all parties. If it is noticed that students experience a class-wide problem, pausing and having a group discussion about the issue is recommended. When the situation is problematic for a limited number of students, one-to-one conversations outside class hours are preferable since students are more receptive to teachers' arguments in a private setting [108]. A full-fledged discussion may be postponed, eliminating interference with classroom activities. Key to the conversation is problem identification, i.e., determining the cause of the aggressive behaviour, and problem-solving, i.e., negotiating agreements and proposing solutions [100,105]. Using close-ended questions reduces the participation barrier. Once there is a verbal response, it is advisable to proceed with open-ended questions, allowing students to engage in information-rich and direct dialogue. Additionally, it is beneficial to allow students time to express their feelings, explain their opinions, and point out their requests [63,105]. Opportunities to express a solution or agree on handling the situation and future conduct might be addressed. Given the dialogical nature of the conversation, all parties should support the agreements [59].

Step 5: Establishing rules of conduct. The emphasis on general rules of conduct stems from preventive CM strategies (e.g., [55]). Investing in the joint creation of clear, concrete, and observable rules and procedures at the start of a semester contributes to efficient CM and immediately informs students which behaviour is (not) expected [109]. Students demonstrating VAB violate mutually agreed rules. The teacher is responsible for emphasising this by clearly disapproving of the behaviour and specifying which practices cannot be tolerated. In addition, students can be reminded about the repercussions they agreed upon earlier [110]. In terms of behaviour management, the general rules can provide a framework or foundation for teachers to assess the VAB and disapprove of actions that do not comply with the rules [109]. Furthermore, they also offer the opportunity to be modified in consultation with the student (see step 4). If necessary, feedback can also be provided to the entire class about what just happened, how it was addressed by the teacher, and what agreements were made. It is advisable to check in collaboration with the class group whether the rules are still relevant and appropriate and where adjustments may be needed.

Step 6: Completion. The purpose of this competence model is to guide teachers in their immediate response to incidents of VAB. It attempts to handle the situation as efficiently as possible, consuming only limited teaching time. The preceding steps contribute to this. However, these steps do not necessarily eliminate the need for additional follow-up [24]. For example, one-to-one conversations with students usually occur after regular class time. The content of these conversations has already been addressed in step 4. It may also be necessary to involve parents, school administration, or educational counselling services to resolve the issue. This after-school follow-up, which is not solely a teacher's responsibility, is not explicitly included in the current V-AMC model as it is designed to guide immediate responses from teachers, preferably within the allocated class time. As soon as other people become involved, a shared responsibility (and reaction) arises, wherein the teacher can seek assistance. This is, however, beyond the scope of this model's objective and, therefore,

not further elaborated upon in this article. Not only follow-up regarding the students is important, but self-care is also an essential aspect. Experiencing VAB can have a lasting emotional impact on teachers, particularly novice teachers. Left unaddressed, it can result in feelings of incompetence, uneasiness, stress, and fear of future incidents, negatively affecting teachers' performance and mental health [111,112]. Therefore, (self-)debriefing and discussing the incident with colleagues is recommended [113]. In addition to its emotional advantages, debriefing facilitates the exchange of good practices. If debriefing with colleagues is impossible, teachers should at least engage in self-debriefing. Reflection on actions and reactions before, during, and after the event helps them identify what went well and what needs improvement [114]. This evaluation of the experiences, in turn, can enhance the cognitive and affective-motivational dispositions of the novice teacher, resulting in alternative strategies to be applied in a subsequent incident.

3.1.2. Attitudes

Besides steps, the V-AMC model also addresses teachers' attitudes. Considered transversal, these attitudes act on each step of the competence model.

Attitudes related to the student–teacher relationship. Investing in a supportive student–teacher relationship helps prevent disruptive behaviour [115] and facilitates effective management of arising problem situations [55]. Founded on mutual trust, respect, support, empathy, and concern, such a relationship reduces the likelihood of aggressive behaviour and provides students with alternative ways of communication [37,59]. Teachers who consistently exhibit these relational qualities and effectively manage disruptive behaviours are considered 'good' teachers whose students feel safe at school and in the classroom [116]. This perceived safety encourages students to express their frustration differently, removing the need for VAB. A positive relationship can also facilitate communication with the student(s) exhibiting VAB [63], increasing the likelihood of a constructive conversation. In addition, it offers teachers insight into which strategies are likely to be effective with particular students and which to avoid [37]. Furthermore, teachers function as a model for their students. Students of teachers who support and positively communicate with them are more inclined to mirror these behaviours in interactions with their peers, resulting in fewer aggressive responses [102,117]. Therefore, early and continuous investments in friendly, respectful, and empathic interactions are invaluable [63,72].

Attitudes related to oneself as a teacher. Interacting with aroused or aggressive students requires a high degree of self-awareness regarding one's verbal and non-verbal actions. Regardless of the situation, maintaining composure is recommended [63]. Teachers radiating calmness seem in charge, contributing to students' sense of safety in the classroom [98,105]. Addressing students in a controlled manner [118], using clear and respectful language [107], applying a gentle and soft tone with a low but clear volume [103], and maintaining a neutral facial expression [63] favour a calm demeanour. In addition, consistency between body language and speech is conducive to interaction [60,101], as is adopting an open, non-threatening posture [63,105].

Attitudes related to the students. Although calmness is recommended, it does not equate to passively enduring VAB. Being firm yet compassionate, setting limits, and consistently enforcing the class rules all contribute to students' sense of safety in the classroom [107,116]. Allowing feelings about students to interfere with situational management is strongly discouraged [59,103]. This also implies minimising judgements about students based on prior interactions or their 'reputation' [63]. Comparisons to siblings, events, or other students are off-limit since this aggravates the situation and creates an unsafe environment [101].

Attitudes related to the situation. Seeing the incident as a confluence of situational factors instead of a personal attack can assist the teacher's decision-making process. Interpreting students' VAB as out of control or as the result of a crisis helps detach emotionally from the incident [59,105]. Although not easy, it is advisable to close the incident without resentment and to pay extra attention to encouraging students' positive behaviour [101].

3.2. Validating the V-AMC Model (RQ2)

The second research question sought to validate the V-AMC model through interviews with educational professionals (n = 32). Analysis of the interview data resulted in renaming some categories, articulating pre-existing implicit steps more explicitly, eliminating steps not agreed upon, and adding two substeps and two attitude-related components to the V-AMC model. These modifications and the final V-AMC model can be examined in Figure 3. The additional steps and attitudes will be elaborated upon further below. It is important to note herein that these additions are also substantiated by recent literature on classroom management.

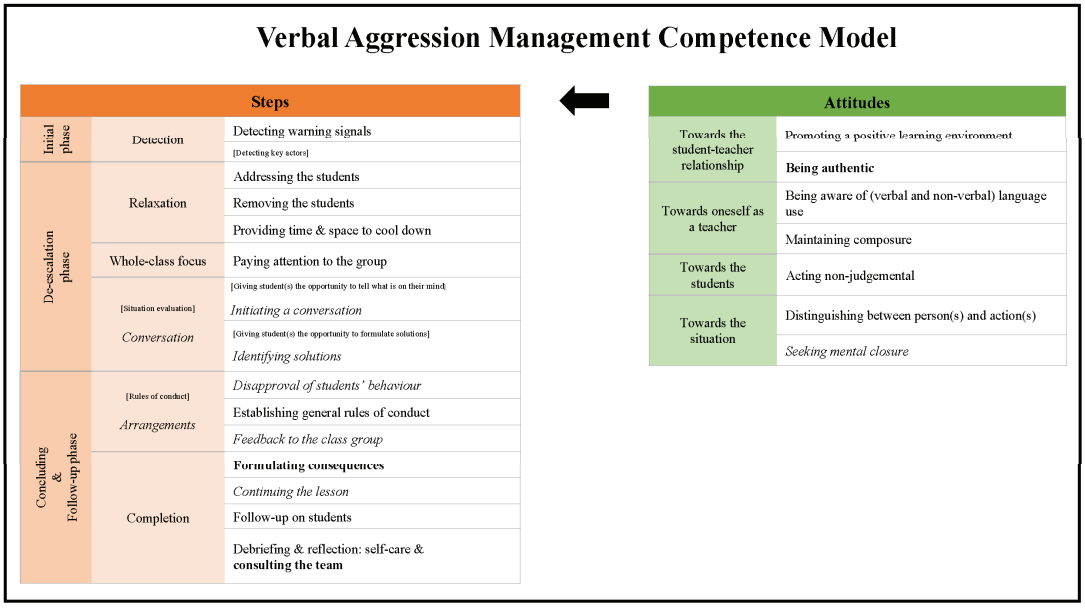

Figure 3. The V-AMC model resulting from RQ1 and RQ2. Elements in *italics* are formulated more explicitly, elements in [square brackets] are omitted in the final model, and elements in **bold** are added to the final model after the validation step.

The first substep, categorised under step 6, pertains to formulating consequences following acts of VAB. While participants endorsed the elements of the competence model, it was commonly mentioned that proper repercussions should follow students' VAB. Several explanations were provided. First, attaching consequences was considered by the participants as imperative to VAB as such behaviour could not be left unpunished. Although consequences should ideally be implemented as the final step, the repeated enactment of the same behaviour—after being already addressed—necessitates the imposition of consequences that are disadvantageous/undesirable for the student [110]. Second, interviewees reported a signalling function towards all students demonstrating this behaviour would not be tolerated in the classroom. This is in line with step 5 where behavioural guidelines are translated into general rules of conduct. These rules entail specific expectations from both students and teacher(s). Deviating from these rules, and thus engaging in behaviour that falls outside the parameters of the agreements, inevitably leads to certain consequences [119]. Alternatively, as one teacher puts it,

> *'I think it is vital that students know the clear consequences when rules are established and not followed. (. . .) Rules are set, but what happens afterwards? That is frequently unclear to them.'*

This approach holds the student accountable for their actions, as the consequences to be endured result from an informed decision [110].

The second substep, which is also aligned with the sixth step of the model, involves consultation of the team. The school team's support was a recurring theme throughout the interviews. Although interviewees acknowledged it is difficult for novice teachers to admit things are not going smoothly in their classroom, the majority emphasised the importance of engaging in dialogue with colleagues about their challenges.

> *'Sometimes it can be helpful to have a colleague who also teaches in the same class, saying, 'I did this' or 'That did not work' or to hear that other colleagues find it challenging as well. Sometimes, it helps to know that it is not just you.'*

These conversations were considered beneficial for venting feelings and viewed as opportunities to exchange experiences and harmonise to align school-level practices and policies. However, according to some participants, the school's culture is crucial in determining whether or not teachers disclose encountered incidents. According to one interviewee,

> *'A school culture also does many things (. . .). The culture at school, the team that supports you, and the administration that must always be on your side are ultimately very important as well. That feeling of safety.'*

Another participant commented,

> *'Being supported by an entire culture and everything around it. If the culture says, 'making mistakes is not allowed', you have a problem since you will never be able to bring change.'*

The third element added to the model relates to teachers' attitudes concerning the student–teacher relationship. Most interviewees indicated that teachers should remain authentic to who they are and the values they consider important. Not only does this demonstrate humanity and, by extension, the possibility of making mistakes, but, as one teacher stated,

> *'That can also help enormously in creating a safe situation. You have to dare to show humanity!'*

Students easily recognise whether their teacher is not sincere or feigning, hence resulting in consequences that are contrary to the teachers' original objectives [120]. According to the interviewees, being authentic also eliminates the need to challenge this:

> *'Do not be the super-strict teacher if that does not work for you. Students sense the difference, that you are not authentic, and they will take advantage of that. Moreover, you will not be able to maintain this.'*

It was also suggested that authenticity implies being truthful about emotions and, more concretely, about the impact of the displayed behaviour. However, participants indicated that it is difficult to discern how much feelings and information should be shared:

> *'I frequently tell things about myself or what I have experienced, so they know me reasonably well. The bits about my private life I keep limited. (. . .) Without divulging everything, I also demonstrate that I am only human.'*

> *'I believe there is a narrow line in giving too much information. Indeed, I think it is appropriate to say: 'Look, folks. Today is not my day. I will do my very best. Try your best as well.'. That approach differs from starting with: 'I will not do my best because my cat died.'*

4. Discussion

Although reacting appropriately to students' VAB is crucial, TEPs seem to appear inadequate in preparing preservice teachers to manage students' maladaptive behaviour effectively [10,121]. Linked to competence development, it is argued that novice teachers lack internal cognitive scripts to deal with this behaviour. Combining literature with semi-structured validation interviews, the present study aimed to develop a competence model serving as an external cognitive script to guide teachers' responses [85]. Based on the literature, a stepwise procedure was conducted to design a V-AMC model. Validation interviews with educational professionals refined and validated the competence model.

Regarding the design of the V-AMC model, the construction process respected particular features of aggression conceptualisation and competence development. At the outset of the design process, the link between both was considered. The social-psychological definition of aggression directly refers to situation-specific skills concerning perception and interpretation [76]. The importance of perception features strongly in defining aggression as an observable behaviour. Next, interpretation is emphasised by stressing aggression as intentional behaviour to harm another [27,28]. Furthermore, design decisions were made to select and organise elements of the V-AMC model, keeping consistency in mind between the definition of aggression and the critical features of the competence development process. Building on the assumption of competences as dispositions, we proposed a distinction between steps and attitudes in the V-AMC model. Also, we stressed how the development of these dispositions depends on mobilising perception, interpretation, and decision-making skills (see Figure 1). Furthermore, scripts function as the basis for interpreting and responding to specific incidents [86]. This is aligned with the social-cognitive approach stressing that cognitive evaluation (i.e., perception) of events, interpretation of these events, and competency in responding in multiple ways (i.e., decision-making) drive self-regulatory mechanisms that steer social behaviour [30]. Looking again at the V-AMC model, teacher attention is directed towards classroom interaction elements by explicitly including detection as a separate step. This approach seems congruent with findings in the literature that novice teachers struggle to notice significant events in their classrooms [122]. Detection of warning signals provides insight into how the VAB potentially supports the incident's progression [123]. However, it should be stressed that detection remains essential in every aspect of the competence model given adjusting related strategies.

Second, aggression is multidimensional [124], with cause and effect often indistinguishable and influenced by several factors situated in and outside the classroom. Because of this multidimensionality, it is challenging for teachers to respond instantly. However, an immediate reaction might prevent further escalation of aggressive behaviour [33,56]. The V-AMC model incorporated two elements to reconcile contextual influences and instant response: the inclusion of relaxation and immediate-effect de-escalation techniques and a strong emphasis on the importance of follow-up. During this follow-up, additional emphasis can be placed on future prevention of VAB, for instance, by focusing on students' prosocial behaviour development. However, as stated before, the primary focus of this V-AMC model is reaction rather than prevention. Hence, preventive strategies were addressed in the model solely in the functionality of the reactive strategies. This can be seen, for example, in the formulation of general rules of conduct (step 4). These rules can be seen as preventive measures since they provide a guiding framework for 'appropriate' classroom behaviour. However, within the V-AMC model, they serve a functional role in the teacher's response strategy. On the one hand, they provide a framework by which the teacher can indicate and label the observed behaviour as a violation of the rules and, therefore, not in accordance with the general classroom agreements. On the other hand, they can assist the teacher in formulating consequences for the behaviour, both on an individual and group level. Furthermore, as the concept of aggression is subject to situational and contextual factors, applying the V-AMC model is likewise highly situational. This is reflected in the recommended application of the competence model. Instead of following steps in a rigid

order, the model is intended as a 'menu of options' from which teachers can select what is relevant to the situation and choose to deploy steps interchangeably.

Third, dealing with VAB is partly a subjective undertaking. Interpretation of behaviour is individual-dependent: what one considers aggressive behaviour may be characterised as mischief by another [37]. How teachers react to VAB depends on their perception and interpretation of that behaviour [57], which is also fundamental to competence development (i.e., professional vision; [84]). Focusing on the continuous development of situation-specific skills, i.e., perception, interpretation, and decision-making, cognitive and affective-motivational dispositions are further organised and elaborated [76]. Therefore, developing teachers' V-AMC is not straightforward. Again, the flexible structure of the V-AMC model is advantageous: teachers consciously select strategies based on their interpretation of VAB and adhere to attitudes fitting their personality. In line with this, ignoring students' VAB was deliberately not included as a strategy in the V-AMC model. Ignoring can be helpful when students display VAB to obtain attention [21], often deployed in the hope that the behaviour will disappear [125]. However, this strategy seems dependent on making accurate predictions, considering that ignoring VAB might result in social maladjustment [3]. Both this identification process [122], or noticing and reasoning about classroom behaviour, and the ability to make predictions [68] are less developed in novice teachers due to their limited classroom experiences. Thus, ignoring VAB contradicts the purpose of our competence model, i.e., guiding novice teachers' responses to VAB by providing an external script to compensate for their lack of experience [85].

The present study was one of the first attempts to specifically interview teachers about and investigate their responses to incidents of VAB in the classroom [34]. Combining literature with a validation activity resulted in a competence model addressing novice teachers' lack of V-AMC. This model is particularly relevant to the design of TEPs or professional development initiatives as it can be used to elevate teacher competence regarding verbal aggression management. In line with this, the current study also offers a significant contribution to the growing body of research aiming at bridging the theory–practice gap by providing concrete strategies and tools for addressing instances of VAB.

Nevertheless, this study, and therefore the generalisability of the final model, is subject to certain limitations. The first issue with the current study pertains to the participants of the validation activity. This validation was only aimed at educational experts' perspectives. These experts volunteered to participate in the study, which might raise concerns regarding the representativeness of the educational area. As previously stated, aggression is a subjective concept; hence, those who may have experienced verbal aggression but did not identify it as such were not included in the study. Furthermore, the majority of the participants were female. Despite the lack of consensus on the impact of gender on manifestations of verbal aggression (for example, some studies indicate that female teachers report more instances of verbal aggression than their male counterparts, e.g., [8], whereas others report no apparent associations, e.g., [106]), the effect of gender on management procedures is not well documented. This raises the possibility that the management of such incidents might be influenced by gender, which, therefore, also affects the results of our study. The second source of uncertainty is associated with the context of the Flemish education system. This system exhibits a diverse educational landscape in terms of socio-economic and ethnic school segregation [126]. As researchers, we had no control over the representation of these schools in our sample due to the voluntary nature of the sampling procedure. Previously, however, we alluded to the notion that the school culture plays a pivotal role in addressing verbal aggressive behaviour. The absence of a rigorous approach to participant recruitment introduces an additional potential impact on the overall applicability of the model.

To address some of these limitations, suggestions for future research are made. First, the orientation on educational experts precluded us from incorporating students' opinions into our narrative. Further studies focusing on their remarks can establish a comprehensive perspective on effective reaction strategies. Second, as stated before, the generalisability of the model should be approached with some caution. Although international intervention studies and practices guided the development process, the model was only validated by professionals in or associated with the Flemish education system. To make conclusive statements regarding the transferability of the V-AMC model, it is advisable to assess the extent to which the model can be applied in other international educational contexts and identify any context-specific elements that may need to be considered. Linked to this, evaluating the V-AMC model in actual classrooms might assist in outlining the model's feasibility. These effectiveness studies can encourage the implementation of the V-AMC model in TEPs. Indeed, developing an external script focusing on the cognitive and affective-motivational dispositions of the V-AMC is merely the initial step in developing this competence. Implementing and practising the competence model in TEPs should be the next. Specifically, conducting additional research on methods to rehearse this competence model is necessary. Competence development should be observed in relation to real-life situations [75]. Therefore, studies on embedding authentic situations in TEPs related to V-AMC development are suggested. Simulation-based learning proved effective in acquiring complex competences, such as those related to CM [127]. Given the contextual nature of aggression, it is important that these simulations accurately incorporate the cultural and situational factors that are unique to the settings they want to mirror in order to be viewed as authentic [30,87]. Therefore, we recommend implementing simulations focusing on various situations encompassing VAB to assist this competence development process.

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Data Availability Statement: Data will be made available upon request.

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Appendix A

Table A1. Initial coding instrument.

Steps	Category	Subcategory	Example
Detection	Detecting warning signals	/	*"And then, in the classroom, when they start shuffling their chairs, looking at others, and trying to interact with them… if they hesitate to take their materials or start nudging other students or bumping into desks while getting their materials, we already notice, 'oh, this one is struggling, we can expect something here'."*
	Detecting key actors	/	*"It's not always clear who did what, they say that too: 'But ma'am, he was also throwing and you're not addressing him.' Then I say that I only saw it from that one student and therefore only address him."*

Table A1. *Cont.*

Steps	Category	Subcategory	Example
Relaxation	Addressing the student(s)	/	*"From the very beginning, I would address that girl right away by telling her that she should show some respect for someone who is reading, even if she thinks it's wrong. That's not an appropriate way to react to fellow students."*
	Removing the student(s)	Surprise-effect/humour	*"I didn't know what to do anymore, so I suddenly started singing a song. Everyone went quiet and looked at me like 'what on earth is she doing.' They forgot they were actually arguing because I was standing there singing so silly. So, that worked."*
		Physical removal	*"I then sent that student out into the hallway; there was no other way to continue the lesson."*
	Providing time & space to cool down	Time to cool down	*"We also have small sofas where they can sit. If they feel the need to sit in the sofa, I say, 'You can take some time to sit in the sofa now, and when you're ready, just give me a signal; it can be a small signal like raising your hand or telling me, 'Ma'am, I'm ready to start again.' That's all okay with me. Indeed, giving them time to cool down is very important."*
		Providing low-stimulation environment	*"We also have a few tables in the hallway where they can work completely alone if they don't need other students, other people, or other stimuli—they can say 'okay, I'll sit in the hallway and work there alone'."*
		Respecting student's personal space	*"Never give a pat on their shoulder; they just pat you back because they think you're attacking them!"*
Whole class focus	Paying attention to the group	/	*"Usually, my approach is- after placing that student in the hallway—to take a moment to reflect on my own behaviour towards the class, and then continue with what I intended to accomplish, period."*
Situation evaluation	Giving student(s) the opportunity to tell what is on their mind	/	*"Then I ask, 'Can you please explain what happened?' Often, they don't respond immediately, but if you keep pressing a bit, usually some part of the story comes out. And then you can build on that."*
	Giving student(s) the opportunity to formulate solutions	/	*"I would actually go to those students to work with them on 'how can you deal with this better?', 'what can you do when you're angry?', because being angry is also a part of life, but what else can you do: count to ten before throwing a chair or take a few deep breaths down to your toes or . . ."*
Rules of conduct	Establishing general rules of conduct	Disapproval of behaviour	*"Just acknowledging it, and often in a very objective manner because sometimes the student might not even realise why it's a problem, like 'You just said this to your classmate or teacher, and that's language we don't use. . . it's impolite language, and you'd better. . .'"*
		Co-creating rules and expectations	*"If he feels like he's getting angry again, we agreed that he'll place a red pen on his desk. Then I know I should leave him alone for a while."*
	Communicating the rules to the class group	/	*"For example, if you've just sent a student out of the class, you can bring it up with the group: 'Wow, that was intense, you can express your opinion but let's do it respectfully.' Addressing the whole class immediately, 'Wow, that got a bit heated—you know that's not how we do it, that's not polite, and it's not how we address people.' And then the class nods, and we move on like that."*
Completion	Follow-up on students	/	*"If necessary, I will also involve the CLB. As a teacher, I can't extinguish every fire; sometimes, it goes beyond my capabilities. And then there are those professionals available to support you in such situations."*
	Debriefing & reflection: self-care	/	*"Reflecting to pause and consider what things trigger you and how you might feel. . . but it's also about 'am I already triggered before I enter a lesson' and, before entering a class, checking in with yourself to see if you're tired, irritated, have a sore throat, etc., to already know for yourself whether you're likely to be sensitive to triggers or not."*

Table A1. *Cont.*

Attitudes	Category	Subcategory	Example
Student-teacher relationship	Promoting a positive learning environment	Safety	*"The graphic school has developed specific characters around our '4R' approach, where, at the beginning of the school year, we ask our students to ultimately consider these 4Rs. It's about creating an environment where everyone feels safe, where we respect each other, and where, ultimately, we listen to each other. . . well, it's all part of our school philosophy, really. Something like that."*
		Investing in a positive S-T relationship	*"I believe it's important to ask how their holiday was, what they did, especially after a holiday break. Just to know a bit about what those kids are up to and show an interest in them."*
		Mutual respect	*"They are allowed to say a lot in my lessons, but it always has to remain polite and respectful. I tell them that explicitly: it's certainly possible that I'm not teaching well but communicate that in a different way than starting to make accusations."*
		Trust	*"Some of them also come to talk about their difficult home situations after the lesson. Even though they know I can't really do anything about it, the fact that they can vent to someone without that person immediately informing their parents also helps them."*
		Understanding	*"I know that boy has a difficult home situation. I know that; he carries that with him, and as a teacher, you also have to take that into account. I told him that in the hallway, 'Look, I know you're going through a tough time, and I know life isn't fair, especially not for you. But that doesn't mean that you can behave the way you did."*
		Active listening	*"It's important that I, as a teacher, make them feel like I'm listening. I think in many cases, even among older teachers who have been teaching for a long time, this often doesn't happen. Students may think, 'I express what I don't like here, but they don't listen to me anyway.' I believe that's where things often go wrong."*
Oneself as a teacher	Being aware of language use	Verbal language	*"Like I've said before, never raise your voice. . ."*
		Non-verbal language	*"Your demeanor at that moment is actually very important. If you also become agitated, that's pure interaction, that's dynamics. You elevate each other, and then even higher tension, even higher stimuli, doesn't work well."*
	Maintaining composure	Remaining calm	*"I always try to stay calm in such situations, even if I'm boiling inside, but the students shouldn't see it, or they'll take advantage of it."*
		Controlling the own emotions	*"In that one situation, I wanted to start crying. I tried to keep it under control for as long as possible and especially avoid that confrontation in the classroom. It's already difficult to walk out crying as a teacher; you would really lose face. You can't let it get the best of you either."*
The students	Acting non-judgemental	Being mindful of personal biases	*"In the teachers' lounge, you sometimes hear, 'Oh no, I really struggled with that class last year.' But if you listen to that too much, you might start approaching that class differently from the start. You have to be careful about that!"*
		Setting aside past experiences	*"Just because he disrupted your class last week doesn't mean you have to constantly remind him or punish him at the slightest thing he does without your permission."*
		Detaching from personal feelings	*"Just because you don't click with a particular student doesn't mean you should treat them 'differently' as a result."*
		Reserving judgment without discussion	*"I sometimes hear from colleagues, 'yes, that's typical, he behaves like that, he comes from a less privileged background.' But often, that's too simplistic, and there's a different reason for thatbehaviour. And you can't know it unless you have a conversation."*

Table A1. *Cont.*

Attitudes	Category	Subcategory	Example
The situation	Distinguishing between person(s) and action(s)	Disapproving the action rather than the person	*"Adolescents are very sensitive to that, you know. 'But ma'am, do you think I'm dumb?' And then I have to say very clearly: no, I don't think you're dumb, but what you did just now was dumb. It's a fine line."*
		Holding no grudges	*". . . just a small understanding, empathetic remark or. . . so that the student still feels that the relationship is okay, that you no longer hold a grudge, and that they can just start fresh."*
Additional steps/attitudes *	**Category**	**Subcategory**	**Example**
Student-teacher relationship	Promoting a positive learning environment	Authenticity	*"This is a form of authenticity that you must demonstrate, and students and people can quickly sense to what extent you are being yourself. I know that at some point, almost all teachers do this. . . well, I know that many colleagues do it. You don't feel physically top-notch every day, and there are times when you tell the students, 'Well, today isn't really my day. I don't feel that great, so we're going to take it a bit easier.'"*

* In the appendix, only one example of additionally created (sub)categories is given as an example. Coders were instructed to indicate what they would add (in this case, it is the subcategory 'authenticity'), under which category and/or step/attitude it belongs, and which different statements are examples of this new (sub)category.

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Does the Effect of Stress on Smartphone Addiction Vary Depending on the Gender and Type of Addiction?

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Abstract: Stress is closely associated with smartphone addiction. Nevertheless, there is a dearth of studies investigating the potential variation in the effect of stress on smartphone addiction based on the specific addiction type and gender. We conducted a cross-sectional questionnaire survey among 596 high school students. The results revealed that the effect size of stress on smartphone addiction varied across different types of addiction. The strongest relationship was observed between stress and social media addiction, followed by the relationship between stress and information acquisition addiction. Furthermore, gender played a significant moderating role in stress and three types of smartphone addiction. Specifically, stress was strongly associated with information acquisition addiction overall, with no significant gender differences observed. In contrast, stress exhibited a strong correlation with social media addiction, which was significantly more prevalent among females. On the other hand, game addiction and short-form video addiction were both strongly associated with stress, but showed significantly higher prevalence among males. This study enhances current research by offering supplementary insights into the correlation between stress and smartphone addiction, as well as exploring the potential implications of intervening in smartphone addiction.

Keywords: stress; smartphone addiction; type of addiction; gender differences

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1. Introduction

Smartphone addiction refers to a condition characterized by an excessive desire for and usage of smartphones, resulting in psychological and social dysfunction [1–3]. Research has unequivocally demonstrated the detrimental effects of smartphone addiction on both physical and mental health. Specifically, research has shown that smartphone addiction disrupts sleep quality [4,5] and increases the risk of conditions such as headaches and finger pain [6], thus impacting physical health. Additionally, smartphone addiction has been associated with reduced subjective well-being [7,8] and an elevated risk of anxiety and depression [9,10], exacerbating mental health concerns. Furthermore, research suggests that the detrimental impact of smartphone addiction is prevalent across different age groups, including children, adolescents, young adults, and middle-aged and elderly individuals [3,6,10,11].

Stress was a prominent predictor in both the development and exacerbation of smartphone addiction. Research has demonstrated that stress not only directly predicts adolescent smartphone addiction but also indirectly predicts it by weakening self-control [12]. Moreover, stress is significantly associated with smartphone addiction in both teenagers and young adults [12–14]. Additionally, stress plays a vital mediating role between certain risk factors, such as alexithymia and trait procrastination, and smartphone addiction [15,16]. However, despite existing studies providing preliminary evidence on the impact of stress on smartphone addiction, there are still two issues that require further clarification.

One area that necessitates further elucidation is the limited amount of research that explores whether the impact of stress on four types of smartphone addiction varies. Researchers have identified that smartphone addiction can be classified into four distinct types based on different behavioral characteristics: social media addiction, game addiction, information acquisition addiction, and short-form video addiction [17]. These four addictive behaviors all exhibit typical symptoms of smartphone addiction, but they are directed toward different Internet applications. Social media addiction refers to an excessive craving for and immersion in online social activities, whereas game addiction is characterized by an excessive craving for and obsession with online gaming. Information acquisition addiction involves an excessive craving for and engagement in activities related to information retrieval and browsing, while short-form video addiction refers to an excessive craving for, fascination with, and usage of short video applications. The Mobile Phone Addiction Type Scale (MPATS), developed based on these four addiction types, has demonstrated good reliability and validity [17]. Although previous studies have established a significant positive correlation between stress and general smartphone addiction [15,16], as well as specific types of smartphone addiction such as social media addiction [18] and short-form video addiction [19], there is still a lack of comparative research simultaneously examining multiple types of smartphone addiction. Investigating the influence of stress on different categories of smartphone addiction can help advance the development of more specific and targeted interventions for individuals who are particularly vulnerable to stress and have smartphone addiction.

The other aspect worthy of further investigation is whether the influence of stress on smartphone addiction varies among different gender groups. Previous research has indicated that compared to males, females tend to experience higher levels of stress [20–22]. Furthermore, females are also more prone to smartphone addiction in the face of certain negative factors [23–25]. These findings suggest that the association between stress and smartphone addiction may be more pronounced in females than in males. However, if we consider different types of smartphone addiction, it may result in relatively complex outcomes. The relationship between stress and one type of smartphone addiction might be stronger in females, while it could be stronger in males for another type of smartphone addiction. These specific research findings not only expand upon the general conclusions of previous studies on smartphone addiction but also facilitate gender-specific research and interventions for individuals who experience stress, thereby helping address smartphone addiction more effectively.

In summary, this study aimed to conduct a comprehensive analysis of the effect of stress on smartphone addiction. It also examined whether the predictive effect of stress on smartphone addiction varies depending on the type of addiction and gender. We hypothesized that stress would have significant effects on four types of smartphone addiction, with potential variation in the effect sizes. Furthermore, we anticipated that gender may moderate the impact of stress.

2. Methods

2.1. Participants

This study received approval from the ethics committee at the institution of the first author. All participants provided informed consent prior to their involvement. A total of 635 adolescents in Central China participated in our questionnaire survey. They provided responses pertaining to their stress levels, smartphone addiction, demographic information (gender and age), and duration of smartphone usage. The survey was completed by 596 adolescents in the classroom during regular school lessons. Their ages ranged from 12 to 19 years (M = 14.80, SD = 1.85). Of the 596 adolescents, 306 (51.3%) were male and 290 (48.7%) were female. Additionally, 364 (61.1%) adolescents were junior high school students, while 232 (38.9%) were senior high school students.

2.2. Measurements

2.2.1. Stress

Stress was assessed using the Chinese version [26] of the Depression Anxiety Stress Scale (DASS-21) [27]. The DASS-21 is a condensed version of the DASS-42, and, therefore, the final score for each subscale was multiplied by two. Participants were instructed to rate the degree to which they experienced seven statements using a four-point scale (0 = does not apply to me, 3 = applies to me very much or most of the time). Cronbach's α was 0.95.

2.2.2. Smartphone Addiction

The study utilized the Mobile Phone Addiction Type Scale [17] to evaluate four categories of smartphone addiction. The scale consists of a total of 26 items, with six items dedicated to measuring social media addiction, six items for game addiction, seven items for information-seeking addiction, and seven items for short-form video addiction. Participants are required to rate each item on a five-point scale, where 1 indicates "almost never" and 5 indicates "almost always". The reliability of the subscales was assessed using Cronbach's α, with values of 0.93, 0.94, 0.91, and 0.95 for the social media addiction, game addiction, information acquisition addiction, and short-form video addiction subscales, respectively.

2.2.3. Other Variables

The participants selected their gender (male or female) and subsequently provided their age and average daily duration of smartphone usage.

2.3. Analytic Strategies

An initial analysis was conducted to test the correlation between stress and smartphone addiction, as well as any gender differences in these variables. Afterward, a moderation analysis was conducted using the PROCESS macro for SPSS [28] to investigate whether gender plays a moderating role. Covariates, such as age and smartphone use time, were included to control for potential confounding effects on the results.

3. Results

3.1. Preliminary Analysis

The associations between the variables are presented in Table 1. Stress exhibited positive correlations with social media addiction ($r = 0.48$, $p < 0.001$), game addiction ($r = 0.27$, $p < 0.001$), information acquisition addiction ($r = 0.43$, $p < 0.001$), and short-form video addiction ($r = 0.24$, $p < 0.001$).

Table 1. Intercorrelations between variables.

Variables	*M*	*SD*	1	2	3	4	5
1. Stress	1.27	0.98	—				
2. Social media addiction	2.52	1.25	0.48 ***	—			
3. Game addiction	2.28	1.08	0.27 ***	0.34 ***	—		
4. Information acquisition addiction	2.19	1.02	0.43 ***	0.49 ***	0.50 ***	—	
5. Short-form video addiction	2.12	1.07	0.24 ***	0.43 ***	0.50 ***	0.42 ***	—

Note. *** $p < 0.001$.

We conducted a Skewness and Kurtosis test to analyze the distribution of the data. The results indicated that all variables exhibited Skewness and Kurtosis values within the range of [−1.96, +1.96]. These findings suggest that the data can be characterized as approximately normally distributed. Therefore, the data is considered appropriate for conducting an independent samples *t*-test (see Table 2). Males demonstrated lower scores in stress ($t = -4.00$, $p < 0.001$) and social media addiction ($t = -5.96$, $p < 0.001$) compared to females. Conversely, males displayed higher scores in game addiction ($t = 3.85$, $p < 0.001$) and short-form video addiction ($t = 3.67$, $p < 0.001$) compared to females. How-

ever, no significant gender differences were observed in information acquisition addiction ($t = -1.52$, $p = 0.13$).

Table 2. Gender differences in smartphone addiction.

Variables	Group	*M*	*SD*	*t*	*p*
Stress	Males	1.11	0.81	−4.00	<0.001
	Females	1.43	1.11		
Social media addiction	Males	2.26	1.11	−5.96	<0.001
	Females	2.82	1.31		
Game addiction	Males	2.46	1.17	3.85	<0.001
	Females	2.11	0.94		
Information acquisition addiction	Males	2.13	1.05	−1.52	0.13
	Females	2.25	0.99		
Short-form video addiction	Males	2.27	1.16	3.67	<0.001
	Females	1.96	0.94		

3.2. Testing for Gender Differences

Table 3 shows how gender moderates the relationship between stress and social media addiction. Controlling for age and smartphone use time, both stress ($\beta = 0.42$, $p < 0.001$) and gender ($\beta = 0.34$, $p < 0.001$) exhibited a positive association with social media addiction. Furthermore, the interaction between stress and gender was also found to have a positive impact on social media addiction ($\beta = 0.22$, $p < 0.001$). The correlation between stress and social media addiction was stronger in females ($\beta = 0.53$, $p < 0.001$) compared to males ($\beta = 0.31$, $p < 0.001$), as depicted in Figure 1.

Table 3. Moderation of gender in the association between stress and social media addiction.

Regression Equation		Significance of Regression Coefficients				Bootstrap	
Outcome	**Independent Variables**	**β**	**SE**	***t***	***p***	**LLCI**	**ULCI**
Social media addiction	Constant	−0.02	0.04	−0.50	0.62	−0.09	0.05
	Age	0.03	0.04	0.80	0.42	−0.04	0.10
	smartphone use time	0.04	0.03	1.26	0.21	−0.02	0.11
	Gender	0.34 ***	0.07	4.69	<0.001	0.20	0.49
	Stress	0.42 ***	0.04	10.02	<0.001	0.33	0.50
	Stress × Gender	0.22 **	0.08	2.72	<0.01	0.06	0.39

Note. Bootstrap sample size = 5000. SE = standard error. LL = low limit, CI = confidence interval, UL = upper limit. ** $p < 0.01$, *** $p < 0.001$. The same applies to the tables below.

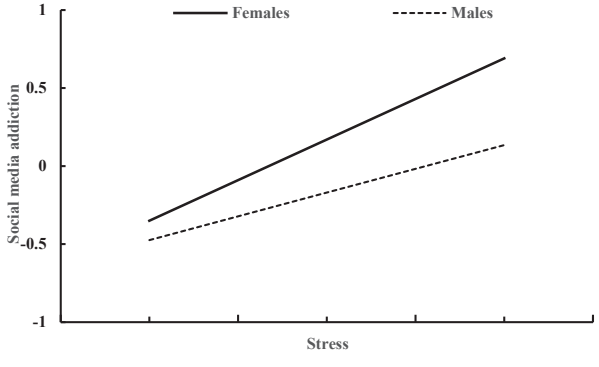

Figure 1. Stress and social media addiction in males and females.

Table 4 shows how gender moderates the relationship between stress and game addiction. Controlling for age and smartphone use time, both stress (β = 0.36, $p < 0.001$) and gender (β = −0.42, $p < 0.001$) exhibited a significant association with game addiction. Furthermore, the interaction between stress and gender was also found to have a significant impact on game addiction (β = −0.36, $p < 0.001$). The correlation between stress and game addiction was stronger in males (β = 0.53, $p < 0.001$) compared to females (β = 0.17, $p < 0.001$), as depicted in Figure 2.

Table 4. Moderation of gender in the association between stress and game addiction.

Regression Equation		Significance of Regression Coefficients				Bootstrap	
Outcome	**Independent Variables**	**β**	**SE**	***t***	***p***	**LLCI**	**ULCI**
Game addiction	Constant	0.03	0.04	0.74	0.46	−0.05	0.11
	Age	0.02	0.04	0.44	0.66	−0.06	0.10
	Smartphone use time	0.01	0.03	0.04	0.97	−0.06	0.06
	Gender	−0.42 ***	0.08	−5.32	<0.001	−0.58	−0.27
	Stress	0.36 ***	0.05	7.38	<0.001	0.26	0.45
	Stress × Gender	−0.36 ***	0.10	−3.77	<0.001	−0.55	−0.17

Note. Bootstrap sample size = 5000. SE = standard error. LL = low limit, CI = confidence interval, UL = upper limit. *** $p < 0.001$.

Figure 2. Stress and game addiction in males and females.

Table 5 shows how gender moderates the relationship between stress and information acquisition addiction. Controlling for age and smartphone use time, stress (β = 0.45, $p < 0.001$) displayed a positive association with information acquisition addiction. However, the effect of gender on information acquisition addiction was not significant (β = −0.02, $p = 0.82$). Additionally, the interaction between stress and gender did not have a significant impact on information acquisition addiction (β = −0.13, $p = 0.17$). These results indicate that gender did not significantly moderate the association between stress and information acquisition addiction, as illustrated in Figure 3.

Table 6 shows how gender moderates the relationship between stress and social media addiction. Controlling for age and smartphone use time, both stress (β = 0.32, $p < 0.001$) and gender (β = −0.40, $p < 0.001$) exhibited a significant association with short-form video addiction. Furthermore, the interaction between stress and gender was also found to have a significant impact on short-video addiction (β = −0.39, $p < 0.001$). The correlation between stress and short-form video addiction was stronger in males (β = 0.51, $p < 0.001$) compared to males (β = 0.12, $p < 0.001$), as depicted in Figure 4.

Table 5. Moderation of gender in the association between stress and information acquisition addiction.

Regression Equation		Significance of Regression Coefficients				Bootstrap	
Outcome	**Independent Variables**	**β**	**SE**	***t***	***p***	**LLCI**	**ULCI**
Information acquisition addiction	Constant	0.01	0.04	0.27	0.79	−0.07	0.09
	Age	0.04	0.04	0.94	0.35	−0.04	0.11
	Smartphone use time	−0.04	0.03	−1.28	0.20	−0.10	0.02
	Gender	−0.02	0.08	−0.23	0.82	−0.17	0.14
	Stress	0.45 ***	0.05	9.43	<0.001	0.36	0.55
	Stress × Gender	−0.13	0.09	−1.37	0.17	−0.32	0.06

Note. Bootstrap sample size = 5000. SE = standard error. LL = low limit, CI = confidence interval, UL = upper limit. *** $p < 0.001$.

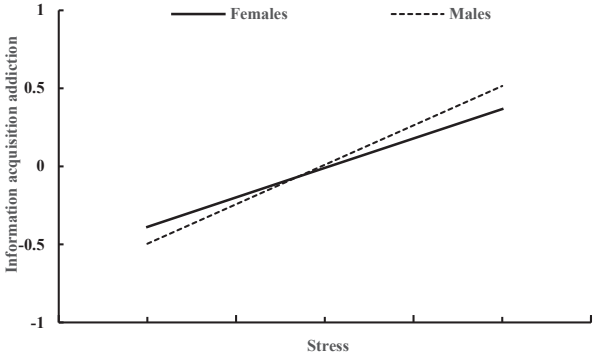

Figure 3. Stress and information acquisition addiction in males and females.

Table 6. Moderation of gender in the association between stress and short-form video addiction.

Regression Equation		Significance of Regression Coefficients				Bootstrap	
Outcome	**Independent Variables**	**β**	**SE**	***t***	***p***	**LLCI**	**ULCI**
Short-form video addiction	Constant	0.03	0.04	0.78	0.44	−0.05	0.11
	Age	0.02	0.04	0.44	0.66	−0.06	0.09
	Smartphone use time	−0.03	0.03	−0.93	0.36	−0.10	0.03
	Gender	−0.40 ***	0.08	−4.85	<0.001	−0.56	−0.24
	Stress	0.32 ***	0.05	6.38	<0.001	0.22	0.42
	Stress × Gender	−0.39 ***	0.10	−3.91	<0.001	−0.59	−0.20

Note. Bootstrap sample size = 5000. SE = standard error. LL = low limit, CI = confidence interval, UL = upper limit. *** $p < 0.001$.

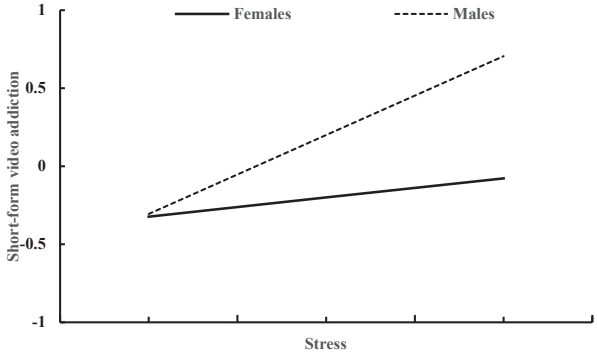

Figure 4. Stress and short-form video addiction in males and females.

4. Discussion

While numerous studies have been conducted on smartphone addiction, very few have comprehensively analyzed and compared various types of smartphone addictions. This particular study focused on examining the correlation between stress and smartphone addiction, aiming to build upon previous research. Specifically, the study investigated whether the association between stress and smartphone addiction differs based on the type of addiction. Additionally, the study explores whether gender moderated the effect of stress on smartphone addiction. The results showed that the intensity of the relationship between stress and smartphone addiction varies based on the type of addiction. Furthermore, gender played a role in moderating the effect of stress on three types of smartphone addiction. The results can carry significant implications for the development of tailored interventions that address the experience of stress among male and female students in different groups, with the ultimate objective of mitigating smartphone addiction and minimizing problematic behaviors.

This study revealed that stress had a significant impact on all four types of smartphone addiction, corroborating previous research on the association between stress and general smartphone addiction [12–16]. However, the effect size of stress on smartphone addiction varied across different types of addiction. More specifically, the strongest relationship was found between stress and social media addiction, followed by the relationship between stress and information acquisition addiction. In contrast, the effects of stress on game addiction and short-form video addiction were less pronounced. The findings demonstrate that when faced with stress, individuals are prone to excessively engage in mobile socializing or information browsing. Some may seek solace in social activities as a means of stress relief [29], while others may turn to information retrieval to better manage stressful situations [30]. Social activities offer individuals emotional support, and smartphones conveniently cater to various social needs. Consequently, individuals may excessively depend on their smartphones for social activities to attain emotional support when confronted with stressful situations [31,32]. However, the abundance of interpersonal relationships on social media platforms can lead to individuals becoming overly engrossed in mobile socializing and eventually developing an addiction. Similarly, information-seeking behaviors can provide individuals with informational support, and mobile phones serve as a convenient tool for satisfying their need to retrieve and obtain information. Consequently, many individuals may become overly dependent on searching and browsing relevant information as a means to address stress-inducing events [33,34]. However, the vast array of information available through various mobile applications can cause individuals to become lost in an overwhelming sea of knowledge and develop an addiction to information acquisition. Additionally, short videos [17,35] and mobile games [36,37] have emerged as coping mechanisms for some individuals in response to stress. However, the findings of the present study indicate that in the case of high-stress populations, it is imperative to prioritize the examination of social media addiction and information addiction.

In addition, this study revealed significant gender differences in three types of mobile phone addiction, with the exception of information acquisition addiction. Specifically, there was no clear disparity between males and females in terms of information acquisition addiction. However, females demonstrated notably higher levels of social media addiction compared to males, whereas males exhibited significantly higher levels of gaming and short-form video addiction compared to females. These findings provide an explanation for the inconsistent research findings regarding gender differences in smartphone addiction and contribute to a better understanding of the complex gender differences that exist in smartphone addiction when considering multiple types of addictions. The analysis of gender differences in smartphone addiction should be based on specific addictive behaviors. Different types of addictive behaviors may show distinctly different gender differences.

Based on the gender differences in specific types of smartphone addiction, this study also revealed a gender-based moderation effect on the relationship between stress and three types of smartphone addiction. Specifically, the association between stress and social

media addiction was stronger in females compared to males. On the contrary, there was a stronger correlation between stress and both game addiction and short-form video addiction in males compared to females. These findings suggest that the interplay between addiction types and gender plays a crucial role in shaping the association between stress and smartphone addiction. Previous research has consistently identified significant gender differences in social media addiction, with females displaying higher levels of addiction compared to males [38,39]. Females are more susceptible to excessive phone use for social interaction when confronted with negative life events [23,39]. This propensity may stem from their heightened need for relatedness and a strong inclination to seek social support and emotional release through interpersonal communication [40,41]. However, it is essential to acknowledge that online social interactions only offer temporary relief for negative emotions, and repeated exposure to diverse stressors may drive females to excessively rely on social media activities, ultimately leading to social media addiction. Conversely, males tend to employ emotional inhibition [20] and avoidance coping in response to stress [42]. They are less inclined than females to seek support from social relationships [41,42] and may instead cope with stress through mobile gaming or engaging with short videos. As a result, males are more susceptible to developing mobile gaming addiction and short video addiction compared to females. It is worth noting that there is no significant difference between genders in the relationship between stress and information acquisition addiction. Both males and females are susceptible to developing information addiction in the presence of stress. This finding suggests that individuals of both genders may excessively rely on their phones to search and browse information, using them as a means to analyze and solve problems when faced with stress. However, according to the strength model of self-control and relevant empirical studies [43–45], stress depletes an individual's limited psychological resources, resulting in a decline in self-control, which hampers the processes of autonomous decision making and behavior. In such circumstances, individuals may become increasingly reliant on Internet information, eventually developing information addiction.

This study provides two valuable insights for the prevention of and intervention in smartphone addiction. Firstly, it is crucial to pay special attention to social media addiction and information acquisition addiction, particularly among individuals who are sensitive to stress, such as children and adolescents with immature self-control abilities. In times of stress, these two forms of addiction tend to be particularly strong in adolescents. Therefore, it is important for schools and parents to guide adolescents with high academic stress, discouraging excessive use of online socializing and information seeking as a means to alleviate stress. Secondly, it is important to tailor addiction interventions based on gender-specific patterns. While stress-induced information addiction does not exhibit significant gender differences, girls tend to display more severe addiction to social media when faced with stress, while boys demonstrate more severe addiction to Internet games and short-form videos. Therefore, schools and parents can guide girls to seek support from parents and teachers through real-life interactions as a coping strategy for stress, and encourage boys to alleviate stress through physical exercise, participation in school clubs, or engagement in class activities.

There are two primary limitations in this study. Firstly, it utilized a cross-sectional survey design, which does not allow for the establishment of a strict causal relationship between stress and smartphone addiction. Future research should consider utilizing experimental designs to manipulate stress levels and examine potential variations in smartphone addiction levels. Secondly, given that our study was conducted among Chinese adolescents, it is important to approach the generalization of our findings to other adolescent populations in different countries with caution. Future research endeavors could investigate and compare adolescents from various countries and cultural backgrounds.

5. Conclusions

Previous studies have confirmed the association between stress and smartphone addiction. However, there is a lack of research specifically examining the influence of

addiction type and gender on this relationship. Therefore, this study aimed to analyze and compare the relationship between stress and different types of smartphone addiction while also investigating whether gender acts as a moderating factor. The results indicated that stress significantly predicted all four types of smartphone addiction. However, the magnitude of this relationship varied across the different types of addiction. Furthermore, gender was found to significantly moderate the effect of stress on three types of smartphone addiction. This study underscores the importance of examining the relationship between stress and smartphone addiction by considering different types of addiction and gender groups. Moreover, it provides useful insights for targeted prevention and intervention strategies aimed at addressing smartphone addiction among adolescents.

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Understanding the Role of Parent-Child Relationships in Conscientiousness and Neuroticism Development among Chinese Middle School Students: A Cross-Lagged Model

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Abstract: The parent-child relationship is a crucial factor in promoting adolescent mental health. However, the current evidence on the relationship between parent-child relationships and adolescent conscientiousness and neuroticism, as well as the directionality of these relationships, remains limited. In particular, there is a lack of analysis focusing on Chinese middle school students. Based on a sample of 8437 students from the China Education Panel Survey (CEPS) database, this study empirically examined the bidirectional relationships between parent-child relationships, conscientiousness and neuroticism among Chinese middle school students, with specific emphasis on the significant role of parent-child relationships in the development of conscientiousness and neuroticism. Descriptive statistical results indicated that during the seventh and eighth grades of Chinese middle school students, the closeness of their parent-child relationships with both parents decreased, while the level of conscientiousness showed a slight decrease, and neuroticism showed an increasing trend. Correlational results demonstrated a significant positive correlation between parent-child relationships and conscientiousness and a significant negative correlation between parent-child relationships and neuroticism. Further analysis using cross-lagged models revealed that parent-child relationships significantly positively predicted subsequent conscientiousness development, and conscientiousness significantly positively predicted subsequent parent-child relationships. Parent-child relationships significantly negatively predicted subsequent neuroticism development, and neuroticism levels also significantly negatively predicted subsequent parent-child relationships. Based on these findings, we believe that there is a need to strengthen parent-child relationships and to recognize the important role that both mothers and fathers play in the healthy development of their children. Both parents should actively contribute to their children's upbringing and take responsibility for their family education.

Keywords: parent-child relationships; conscientiousness; neuroticism; students

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1. Introduction

Currently, the rising prevalence of mental health problems among adolescents worldwide is a growing concern and indicates a trend toward younger age cohorts [1–4]. According to statistics released by the World Health Organization, approximately one in every seven adolescents between the ages of 10 and 19 suffers from mental health problems [5]. A recent meta-analysis study of 96,000 adolescents from 11 countries found that almost 90% of the 21 studies covering 23 indicators of anxiety, depression and general mental health exhibited an upward trend. This suggests a significant escalation in the severity of negative emotions and mental health problems among adolescents [6]. Specifically, a national social survey conducted in Iceland found that between 2016 and 2020, the proportion of 13-year-old Icelandic adolescents with depression symptoms increased from 16.52% to 18.72%, while mental well-being decreased from 25.21% to 23.13% [1]. Some studies have also highlighted the exacerbation of adolescent mental health problems due to prolonged

home confinement and deteriorating family dynamics during the COVID-19 pandemic [7]. For instance, the prevalence of depression and anxiety symptoms in Chinese adolescents increased significantly from 36.6% to 57.0% and from 19% to 36.7%, respectively, leading to a significant increase in the risk of emotional dysregulation [8].

Conscientiousness and neuroticism, the integral parts of the widely recognized Big Five personality model, play contrasting roles in adolescent mental health [9–11]. Conscientiousness typically refers to an individual's tendencies toward diligence, self-discipline, caution and self-control, while neuroticism manifests as emotional traits, such as anxiety, depression, hostility, inhibition and vulnerability [12–15]. Specifically, conscientiousness serves as a protective factor in mitigating the impact of negative emotions on adolescents. Adolescents with high levels of conscientiousness are more likely to exhibit positive psychological traits, such as emotional stability, self-management skills and effective coping strategies [11,16–18]. Conversely, neuroticism has long-term detrimental effects on individual development, including reduced quality of life, poorer health, increased frequency of experiencing unpleasant events and a potentially shortened life span. Individuals with higher levels of neuroticism are more likely to experience negative emotions, show symptoms of depression and anxiety, and suffer from mental health problems [19–23]. Therefore, there is an urgent need to identify the key factors for preventing the exacerbation of neuroticism in adolescents and fostering conscientiousness development to effectively reduce the occurrence of negative emotions, promote adolescent mental health and facilitate holistic development.

It is worth noting that adolescence is a critical period for individual development and personality formation [3,4,11,24], where the parent-child relationship is considered a key factor, which may influence adolescent development and mental health [25–28]. The parent-child relationship encompasses the emotional, communicative and interactive aspects between children and their parents. The ecological systems theory posits that parents are not only the earliest socializing agents for individuals but also play a crucial role in the microsystem of the family [29]. In China in particular, early attachment formation is influenced by long-standing family-oriented values. The impact of the parent-child relationships formed by the emphasis on shared parenting in everyday life cannot be overlooked in individual development. According to the stress-buffering model, social support or positive relationships with others can mitigate the potentially detrimental impacts of stressful events [30]. In the context of the family environment, the support and warmth derived from close parent-child relationships may help alleviate the stress, which adolescents encounter in school or peer relationships. However, further empirical research is necessary to validate these assumptions. Previous research has focused on the influence of parent-child relationships on adolescent aggression, maladaptive behaviors, social–emotional difficulties and general levels of mental health [31–34], but specific investigations of their effects on the development of conscientiousness and neuroticism are lacking. In reality, early adolescence marks a critical juncture characterized by physiological changes, academic adjustment and peer pressure, leading to crises and an urgent need for attention in parent-child relationships [9]. On the one hand, as individuals in adolescence increasingly yearn for independence and seek autonomy, attachment to parents diminishes with age, resulting in more arguments and fewer opportunities for parent-child communication [16,17,33,35]. On the other hand, in countries such as China, with limited educational resources and intense competition, parents have high expectations for their children's education and often demand outstanding academic performance, which puts enormous pressure on children [36,37] and hinders the establishment of harmonious parent-child relationships. Similarly, in the case of Bangladeshi middle school students, a mixed-methods study reveals that parents willingly bear significant financial burdens to enroll their children in extracurricular tutoring in order to enhance academic competitiveness. This places considerable demand on the students, who have to cope with a heavy academic workload even in their leisure time, sacrificing adequate rest and leading to profound psychological stress [38]. A study of Canadian adolescents further found that

parent–child relationships tend to become rigid, especially when parents impose unrealistic educational expectations, increasing students' vulnerability to self-injury behaviors [39]. The evidence from German fifth graders suggests that positive parent–child relationships and parental understanding of real needs are essential prerequisites for promoting children's psychological well-being [40]. Therefore, it is important to understand the current status of parent-child relationships among middle school students and their role in the development of conscientiousness and neuroticism.

Furthermore, previous literature has often focused broadly on parent–child relationships without distinguishing between maternal and paternal roles. The present study addresses the growing need for a more specific understanding of the effect of mother–child and father–child relationships on adolescent development. In China, mothers are typically seen as the primary caregivers and nurturers, while fathers often take on more peripheral roles [41]. There is an increasing interest in elucidating the precise contributions of both parents to adolescent development. Our study refines the investigation of the role of parent–child relationships in conscientiousness and neuroticism development by distinguishing between mother–child and father–child relationships separately. This is also in line with the policy direction of the Chinese government, which emphasizes the collective involvement of parents in fostering the development of minors.

2. Literature Review

2.1. Parent-Child Relationship and Neuroticism

Previous literature has extensively discussed the influence of parent-child relationships on adolescent neuroticism, but there is little evidence on the influence of neuroticism on parent-child relationships. In an autobiographical review of the risk factors for depression, Hammen (2018) suggests that experiences of rejection, exclusion and conflict in interpersonal relationships, particularly parent-child relationships, can shape negative cognitive patterns and self-evaluations, leading to higher levels of depression risk [42]. Warm parent-child relationships can act as a protective factor against the negative effects of stress [43]. Meanwhile, some empirical studies have focused on the relationship between parent-child relationships and adolescent mental health, particularly negative emotional traits, but most of them have found only correlational relationships. For instance, Li et al. (2020) used cross-sectional data to show a positive correlation between improved parent-child relationships and better mental health among Chinese middle school students [33]. A study involving 234 British adolescents aged approximately 18 found a significant negative correlation between parent-child relationships and adolescent neuroticism [44]. Another study of public high school students in New York revealed that a lack of intimacy with parents was associated with a higher degree of depressive mood [45]. The evidence from a study of 847 Israeli adolescents showed that adolescents with more intimate parental relationships experienced less distress, higher levels of happiness and more social support [28]. In addition, previous literature has analyzed the unidirectional predictive relationship between parent-child relationships and neuroticism. For example, a longitudinal study of nearly 700 adolescents from New Jersey and Colorado found that high levels of parent-child bonding (i.e., closer parent-child relationships) could protect adolescents from the negative effects of peer stressors and reduce depressive symptoms [9]. A survey of 290 European–American adolescents found that warm parental behaviors significantly predicted an increase in adolescent optimism and a decrease in neuroticism levels [25]. A one-year longitudinal study involving a sample of 418 participants found that the quality of parent-child relationships in eighth grade significantly predicted depressive mood in ninth grade [46]. However, these studies have limitations, such as insufficient representativeness of the sample and lack of generalizability of the conclusions [44]. As mentioned earlier, given the importance of measuring the quality of parent-child relationships, it is necessary to examine the bidirectional relationship between the closeness level of parent-child relationships and adolescent neuroticism. Unfortunately, previous research has rarely investigated the dynamic relationship between these two variables over

time, and in particular, empirical evidence on the influence of neuroticism on parent-child relationships is lacking [16]. This is the gap, which the current study aims to address and analyze.

2.2. Parent-Child Relationships and Conscientiousness

There is currently limited direct research on the bidirectional relationship between parent-child relationships and conscientiousness development, although most of the literature suggests a potential positive correlation between these two variables. For example, a survey of nearly 1000 Chinese primary school students confirmed the role of family environmental factors in shaping conscientiousness, revealing a significant positive correlation between parent-child relationships and children's levels of conscientiousness [47]. Another study of some 750 people in the community also found a significant positive correlation between parent-child relationships and conscientiousness, with respondents reporting lower scores in conscientiousness among those who reported lower levels of parental care and higher levels of parental intrusiveness [48]. As an essential component of the family ecological environment, the parent-child relationship has a positive impact on individual adjustment. Compared with unhealthy and negative parent-child relationships, close and positive parent-child relationships can facilitate the development of individual adaptive abilities [9]. Additionally, some studies have examined the association between parental nurturing behaviors, family environmental characteristics and adolescent conscientiousness, reflecting to some extent how positive parent-child relationships contribute to the development of adolescent conscientiousness. A survey conducted among 674 participants aged 18 to 28 from three universities in Slovenia revealed a negative correlation between conscientiousness and perceived parental intrusiveness and fear of disappointment from mothers, suggesting that individuals with lower levels of conscientiousness may have poorer relationships with their parents [16]. Studies conducted in Serbia and Germany found a positive correlation between adult conscientiousness and a supportive family environment in childhood [18]. A survey of 402 adolescents aged 14 to 21 found significant positive correlations between conscientiousness (including resilience) and both mother support and father support [49]. Although a study of 287 Dutch families also found an association between the quality of the parent-child relationship and conscientiousness, the association was relatively weak [50]. Furthermore, a meta-analysis conducted by Prinzie et al. (2009) found that higher levels of conscientiousness and lower levels of neuroticism in parents were associated with greater warmth and behavioral control, while lower levels of neuroticism were associated with greater autonomy support. However, it is important to note that this study focused on parents as subjects, whereas in reality, as the recipients of education, children's personality traits and their development also deserve attention [27]. In summary, there is currently a lack of literature based on longitudinal data, which reveals the bidirectional relationship between parent-child relationships and conscientiousness, and empirical analysis is needed to provide new evidence. The existing research mainly focuses on Western countries and includes a wide age range, making it difficult to directly apply the conclusions to the adolescent population in the Chinese context. This highlights the need for further exploration and investigation in this study.

2.3. Research Hypotheses

Our current understanding of the relationship between parent-child relationships and adolescent neuroticism and conscientiousness is still quite limited. In particular, there is a lack of empirical evidence regarding the bidirectional relationships among these three variables in the context of Chinese education. It is imperative to gain a deeper understanding of the relationships between parent-child relationships, conscientiousness and neuroticism among Chinese middle school students, especially in the approximate seventh grade. Adolescents in this age group are in a critical period of psychological well-being, academic adjustment and personality development [3,11,51]. Previous literature

has shown that the transition from childhood to adolescence is accompanied by changes in personality traits [52]. Investigations involving German and Spanish students have indicated a slight decrease in conscientiousness levels between the ages of 12 and 15 [53], while neuroticism, which is characterized by anxiety, emotional instability and vulnerability, is increasing worldwide [54]. At the same time, early adolescence is often a high-risk period for a decline in the intimacy of parent–child relationships and the emergence of crises [16,17,33,35]. An analysis based on changes in parent–child relationships among over 1000 American adolescents found a downward trend in the level of closeness in parent–child relationships from early childhood to age 15 [55]. Since the parent-child bond is the closest and undoubtedly the longest lasting interpersonal relationship for adolescents, we speculate that the parent–child relationship may play a significant role in the development of adolescent conscientiousness and neuroticism based on the above literature review and theory. The establishment of close parent–child relationships within the family context may serve as a protective buffer against negative emotions experienced by adolescents in educational and other environments. Consequently, improving parent–child relationships and implementing effective family education strategies hold the potential to guide children along a positive trajectory of personal growth. Additionally, if decreasing conscientiousness and increasing neuroticism serve as indicators of potential problems within the parent–child relationship, this offers precise guidance for timely intervention and improvement through family education.

In conclusion, the present study aims to systematically explore the bidirectional relationships between parent–child relationships, neuroticism and conscientiousness, with a particular focus on elucidating the role of parent–child relationships in the development of these traits during adolescence. To address these key questions, we use a cross-lagged model to clarify the bidirectional predictive relationships between parent-child relationships and the development of conscientiousness and neuroticism among Chinese middle school students. The findings provide both theoretical and practical implications for future research efforts. Based on the literature and research objectives, we propose the following research hypotheses:

Hypothesis 1. *During the seventh and eighth grades, there is a slight decrease in the level of closeness in parent-child relationships, a decrease in conscientiousness and an increase in neuroticism among Chinese middle school students.*

Hypothesis 2. *There is a significant positive correlation between parent-child relationships and conscientiousness and a significant negative correlation between parent-child relationships and neuroticism among Chinese middle school students.*

Hypothesis 3. *There is a bidirectional relationship between parent-child relationships and both conscientiousness and neuroticism development among Chinese middle school students.*

Hypothesis 3a. *The closeness of parent-child relationships in grade seven can significantly positively predict the level of conscientiousness in grade eight among middle school students, and the level of conscientiousness in grade seven can significantly positively predict the closeness of parent-child relationships in grade eight.*

Hypothesis 3b. *The closeness of parent-child relationships in grade seven can significantly negatively predict the level of neuroticism in grade eight among middle school students, and the level of neuroticism in grade seven can significantly negatively predict the closeness of parent-child relationships in grade eight.*

3. Methods

3.1. Participants

The dataset used in this study is the China Education Panel Survey (CEPS) database. CEPS is a nationally representative longitudinal survey project, which has gained widespread recognition. It was designed by the National Survey Research Center (NSRC) of the Renmin University of China. The project is currently ongoing and has released data for two waves, namely the 2013–2014 and 2014–2015 periods. Taking the 2013–2014 academic year as the baseline, CEPS selected two concurrent cohorts of students, namely grade seven and grade nine in middle school, as the starting point of the survey. The sampling procedure used a multistage probability proportional to size and whole-class sampling method, with average educational attainment and the proportion of floating population as stratification variables. A follow-up survey was then conducted in 2014–2015. It is important to note that the follow-up survey followed only those students who were in grade seven at baseline. The CEPS database provides the necessary data support to investigate the quality of parent-child relationships and the psychological well-being of Chinese middle school students in this study. We selected students who participated in both waves of the survey (i.e., grade seven at baseline and grade eight at the follow-up survey), and we also excluded samples with missing variables. The final sample consisted of 8437 students.

3.2. Measures

3.2.1. Parent-Child Relationship

The CEPS student questionnaire contains separate questions on the parent-child relationship with the mother and the father. Specifically, we used the following questions from the questionnaire: "How is the general relationship between you and your parents (Relationship between you and your mother)?" and "How is the general relationship between you and your parents (Relationship between you and your father)?". Each question had three response options: "1 = Not close", "2 = Not too close nor too far" and "3 = Very close". Higher scores indicate a closer relationship between the child and the parent, indicating a better parent-child relationship.

3.2.2. Neuroticism

To measure the levels of neuroticism, we used the following questions from the CEPS student questionnaire: "Did you feel blue in the past seven days?"; "Did you feel unhappy in the past seven days?"; "Did you feel depressed in the past seven days?"; "Did you feel that life was meaningless in the past seven days?"; "Did you feel sad in the past seven days?"; and "I feel bored in this school". The response options for the first five questions were on a 5-point scale ranging from "1 = never" to "5 = always". The last question had a 4-point scale with the following response options: "1 = Strongly disagree", "2 = Somewhat disagree", "3 = Somewhat agree" and "4 = Strongly agree". The average score across these six questions was calculated, with higher values indicating a higher level of neuroticism. The reliability coefficients α for neuroticism in the first and second years were 0.827 and 0.876, respectively, indicating a high level of measurement reliability.

3.2.3. Conscientiousness

To measure conscientiousness, we used the following questions from the CEPS student questionnaire: "I would try my best to go to school even if I was not feeling very well or had other reasons to stay at home"; "I would try my best to finish even the homework I dislike"; and "I would try my best to finish my homework, even if it would take me quite a long time". Each question had a 4-point scale ranging from "1 = Strongly disagree" to "4 = Strongly agree". The average score across these questions was calculated, with higher scores indicating higher levels of conscientiousness. The reliability coefficients α for conscientiousness in the first and second years were 0.690 and 0.810, respectively, indicating good measurement reliability.

3.3. Data Analysis

This study used Stata 17.0 and Mplus 7.4 software for data analysis. The dataset used was sourced from the CEPS database, which provided the secondary data for our analysis. We first conducted a descriptive analysis of parent-child relationships, neuroticism and conscientiousness among Chinese middle school students in grades seven and eight to gain a basic understanding of these variables. Building upon this foundation, we conducted a correlation analysis to examine the associations between parent-child relationships, neuroticism and conscientiousness. Finally, in line with the research objectives and hypotheses, we used a cross-lagged model to analyze the bidirectional predictive relationships among parent-child relationships, neuroticism and conscientiousness, with the aim of elucidating the role of parent-child relationships in the development of conscientiousness and neuroticism among Chinese middle school students. This study obtained ethical approval from the local Institutional Review Board (IRB).

3.4. Cross-Lagged Model

The cross-lagged model is a longitudinal research model, which examines the existence and direction of the relationship between variables. In the context of this model, if X and Y represent two variables, and T1 and T2 represent two points in time (T1 is earlier than T2), the cross-lagged model essentially compares the relationship between X at time T1 and Y at time T2 and the relationship between Y at time T1 and X at time T2, thus helping clarify how X and Y interact with each other. The present study focuses on the variables of parent-child relationships, neuroticism and conscientiousness; therefore, we use the cross-lagged model to investigate the predictive effects of parent-child relationships on neuroticism and conscientiousness and to clarify the bidirectional relationship between these variables among Chinese middle school students.

4. Results

4.1. Descriptive Statistics of Parent-Child Relationships, Neuroticism and Conscientiousness

Table 1 presents descriptive statistics, including the mean scores, standard deviations and other indicators, for parent-child relationships, neuroticism and conscientiousness among Chinese middle school students. The mean scores for parent-child relationships with mothers in grades seven and eight were 2.747 and 2.707, respectively, while the mean scores for parent-child relationships with fathers in grades seven and eight were 2.629 and 2.506, respectively. It can be observed that the level of closeness in parent-child relationships is moderate, with slightly higher levels of closeness reported between middle school students and their mothers compared to their fathers. In addition, there is a slight decrease in the level of closeness in parent-child relationships as the school level increases. Meanwhile, the conscientiousness of middle school students shows a decline between grades seven and eight, with the average score dropping from 3.424 to 3.155. It is worth noting that there is a slight upward trend in neuroticism levels among middle school students, as the average score increases from 1.920 in grade seven to 2.095 in grade eight. Additionally, according to independent sample t-tests, there were significant differences in parent–child relationship (mother) ($t = 5.303$, $p = 0.000$), parent–child relationship (father) ($t = 14.050$, $p = 0.000$), conscientiousness ($t = 25.373$, $p = 0.000$) and neuroticism ($t = -14.809$, $p = 0.000$) between the first and second wave. This trend may reflect the changes in family interactions and psychological development, which middle school students experience at this stage, highlighting the need for timely attention from parents and teachers. Hypothesis 1 was confirmed.

Table 1. Descriptive statistics of parent-child relationships, neuroticism and conscientiousness.

Year	Variables	N	Mean	Standard Deviation	Min	Max	Skewness	Kurtosis
Year1	1. Parent-child relationship (mother)	8437	2.747	0.483	1	3	−1.710	5.046
	2. Parent-child relationship (father)	8437	2.629	0.553	1	3	−1.159	3.348
	3. Conscientiousness	8437	3.424	0.616	1	4	−1.507	5.835
	4. Neuroticism	8437	1.920	0.710	1	4.833	1.064	4.557
Year2	5. Parent-child relationship (mother)	8437	2.707	0.498	1	3	−1.397	3.937
	6. Parent-child relationship (father)	8437	2.506	0.579	1	3	−0.683	2.482
	7. Conscientiousness	8437	3.155	0.757	1	4	−0.92	3.560
	8. Neuroticism	8437	2.095	0.820	1	4.833	0.873	3.694

4.2. Correlation Analysis of Parent-Child Relationships, Neuroticism and Conscientiousness

Table 2 shows the correlation coefficients between parent–child relationships, neuroticism and conscientiousness among Chinese middle school students. According to Cohen's guidelines, correlation coefficients of 0.1, 0.3 and 0.5 are considered small, medium and large effect sizes, respectively [56]. The data demonstrate significant negative correlations ($p < 0.01$) between parent–child relationship (mother) and neuroticism, as well as significant positive correlations ($p < 0.01$) between parent–child relationship (mother) and conscientiousness each year. Similar patterns are observed for the parent–child relationship (father). There is also a significant negative correlation ($p < 0.01$) between conscientiousness and neuroticism. In the first year, the effect sizes between parent–child relationship (mother) and conscientiousness (r = 0.105), neuroticism (r = −0.241), as well as between parent–child relationship (father) and conscientiousness (r = 0.109), neuroticism (r = −0.249), are relatively small. The effect size between conscientiousness and neuroticism is also relatively small (r = −0.169). In the second year, similar trends of small effect sizes are observed. Additionally, both parent-child relationships with mothers and fathers in the first year are significantly positively correlated with conscientiousness in the second year and significantly negatively correlated with neuroticism in the second year ($p < 0.01$). The correlations of parent–child relationship (mother) in the first year with conscientiousness and neuroticism in the second year are 0.100 and −0.157, respectively. The correlations of parent–child relationship (father) in the first year with conscientiousness and neuroticism in the second year are 0.104 and −0.163, respectively, falling within the range of small effect sizes. In summary, it is evident that the negative correlation between parent-child relationships and neuroticism, as well as the positive correlation between parent-child relationships and conscientiousness, remain stable among Chinese middle school students in grades seven and eight. Moreover, there are significant correlations ($p < 0.01$) between these three variables across the years. Hypothesis 2 was also confirmed.

Table 2. Correlation analysis of parent-child relationships, neuroticism and conscientiousness.

Year	Variables	1	2	3	4	5	6	7	8
Year1	1. Parent-child relationship (mother)	1							
	2. Parent-child relationship (father)	0.480 ***	1						
	3. Conscientiousness	0.105 ***	0.109 ***	1					
	4. Neuroticism	−0.241 ***	−0.249 ***	−0.169 ***	1				
Year2	5. Parent-child relationship (mother)	0.471 ***	0.234 ***	0.087 ***	−0.164 ***	1			
	6. Parent-child relationship (father)	0.240 ***	0.493 ***	0.086 ***	−0.184 ***	0.442 ***	1		
	7. Conscientiousness	0.100 ***	0.104 ***	0.241 ***	−0.129 ***	0.143 ***	0.134 ***	1	
	8. Neuroticism	−0.157 ***	−0.163 ***	−0.067 ***	0.441 ***	−0.216 ***	−0.221 ***	−0.156 ***	1

Note: *** $p < 0.01$.

4.3. Cross-Lagged Panel Model of Parent-Child Relationships, Neuroticism and Conscientiousness

Based on the characteristics of the variables, we constructed the cross-lagged models shown in Figures 1 and 2. Figure 1 shows the bidirectional relationships between the parent-child relationship (mother), neuroticism and conscientiousness. The model demonstrates good indices of fit: RMSEA = 0.048, 90 Percent C.I. = [0.046, 0.049]; CFI = 0.955, TLI = 0.946; SRMR = 0.040. In Figure 1, we can see that the standardized autoregressive path coefficient for the parent-child relationship (mother) is 0.454 ($p < 0.01$); for conscientiousness, the standardized autoregressive path coefficient is 0.299 ($p < 0.01$); and for neuroticism, the standardized autoregressive path coefficient is 0.470 ($p < 0.01$). Figure 2 shows that the standardized autoregressive path coefficient for the parent-child relationship (father) is 0.473 ($p < 0.01$); for conscientiousness, the standardized autoregressive path coefficient is 0.298 ($p < 0.01$); and for neuroticism, the standardized autoregressive path coefficient is 0.468 ($p < 0.01$). Controlling for autoregression, during the transition from seventh to eighth grade, Chinese middle school students' parent-child relationship (mother) significantly and positively predicts conscientiousness development one year later and significantly and negatively predicts neuroticism development one year later. In the meantime, Chinese middle school students' conscientiousness significantly and positively predicts the parent-child relationship (mother) one year later, whereas neuroticism significantly and negatively predicts the parent-child relationship (mother) one year later. Similarly, the results of the bidirectional relationships between parent-child relationship (father), neuroticism and conscientiousness demonstrated in Figure 2 are consistent with the conclusions from Figure 1. Thus, we confirm the proposed research Hypothesis 3.

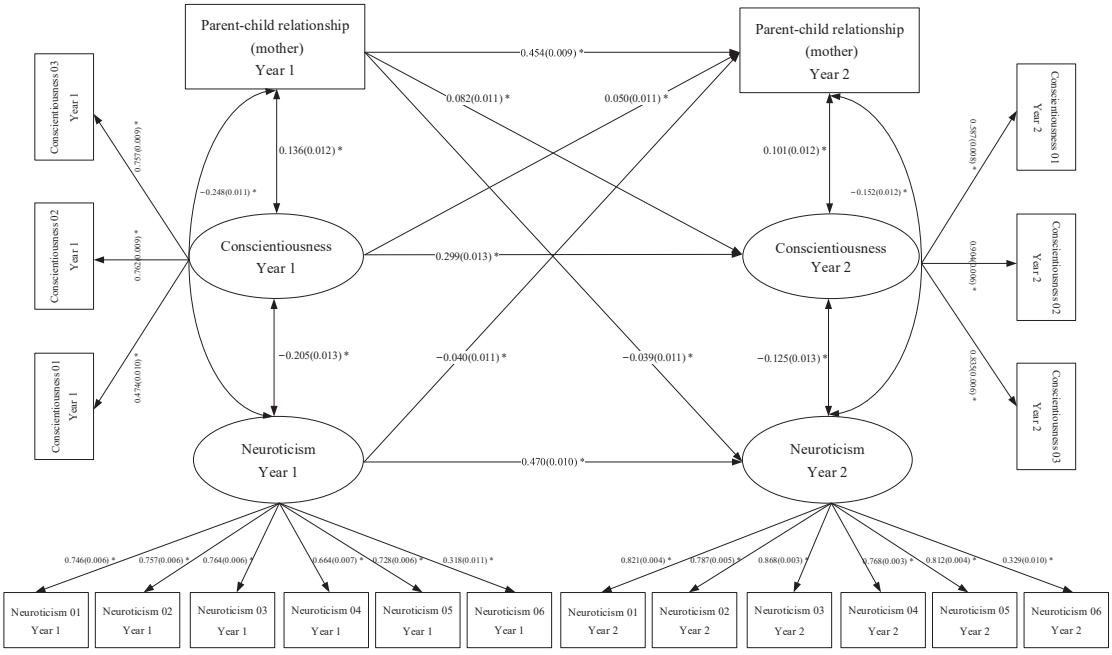

Figure 1. Bidirectional relationships between the parent-child relationship (mother), neuroticism and conscientiousness. Note: (1) The variables Conscientiousness 01, Conscientiousness 02 and Conscientiousness 03 in the figure represent the questionnaire items used to measure conscientiousness; the variables Neuroticism 01 to Neuroticism 06 in the figure represent the questionnaire items used to measure neuroticism. (2) The numbers in brackets in the figure represent Standard Error (S.E.). (3) We use "*" to indicate a statistically significant relationship ($p < 0.05$) between variables. Figure 2 is the same as Figure 1.

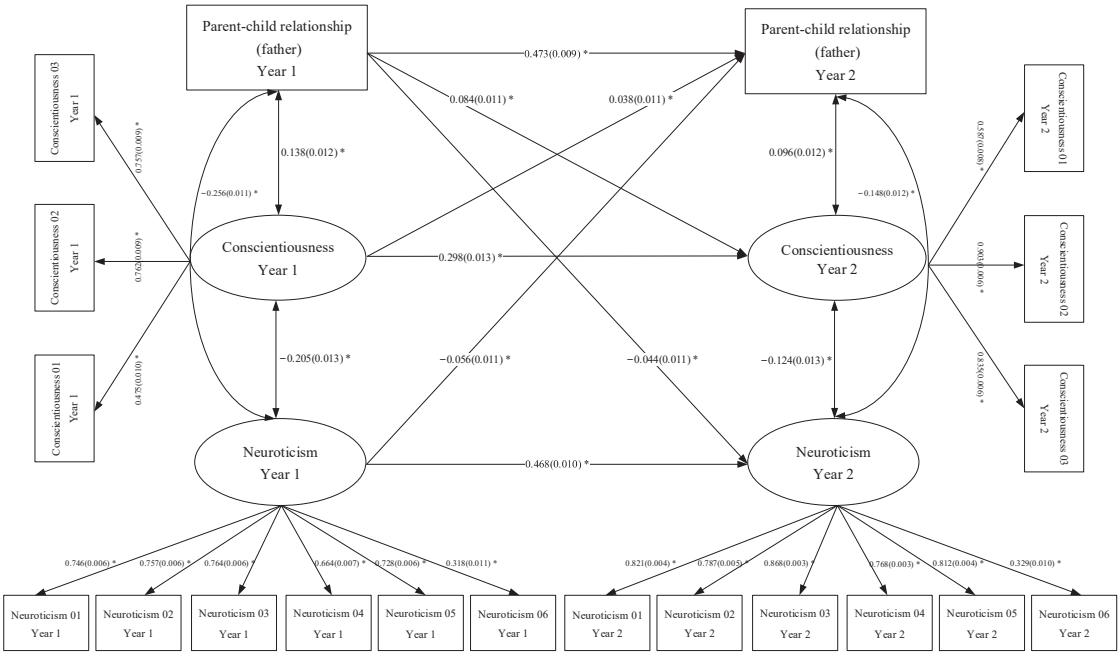

Figure 2. Bidirectional relationships between the parent-child relationship (father), neuroticism and conscientiousness. Note: We use "*" to indicate a statistically significant relationship ($p < 0.05$) between variables.

5. Discussion

The descriptive statistical results demonstrate that the level of closeness of the parent-child relationships decreases slightly from grade seven to grade eight, while conscientiousness also shows a decrease, and neuroticism shows an increasing trend. In particular, although the overall level of closeness in the parent-child relationships remains moderate, the slight decline warrants attention. The finding is consistent with previously observed trends in personality traits and changes in parent–child relationships among adolescents from Germany, Spain, the United States and other countries [53–55]. This may be due to the transition from childhood to adolescence, which middle school students experience, where they begin to exhibit rebellious attitudes, develop a sense of independent self-identity, become more sensitive to external evaluations and relationships, and have less frequent communication with their parents, resulting in a decrease in the closeness of the parent-child relationships [17,33,35]. In the meantime, the decline in conscientiousness may be due to the significant academic pressure imposed by the Chinese education system, as middle school students face the challenges of academic advancement and various exams [36,37]. They are also influenced by peers and societal expectations regarding a sense of responsibility, which may lead to a decrease in their diligence and commitment to tasks and obligations [11,16–18], resulting in a decline in proactive responsibility taking. Neuroticism, as a major component of personality, reflects an individual's emotional stability and ability to regulate emotions. It is a predictor of various psychological and physical disorders and an indicator of an individual's quality of life and life expectancy [19–23]. The increase in neuroticism reflects a negative trend in the psychological and emotional development of individuals [16]. This can be attributed to the physical and physiological changes, which middle school students undergo, along with the challenges of accelerated learning pace, social pressures and identity formation, making them more prone to emotional instability, feeling stressed, anxious and lacking in self-confidence. These phenomena need to be

addressed and taken into account by parents and school teachers. In addition, we found a significant positive correlation between parent-child relationships and adolescent conscientiousness, which is consistent with previous related literature [9,47,48]. The significant negative correlation between parent-child relationships and neuroticism is consistent with previous research findings from countries such as the United Kingdom, Israel and the United States [28,44,45], indicating that adolescent mental health problems have indeed become a global concern.

Based on cross-lagged models, this study further validates the bidirectional predictive relationships between parent-child relationships, neuroticism and conscientiousness, highlighting the important role of parent-child relationships in adolescent development. Specifically, first, Chinese adolescents' parent-child relationships significantly positively predicted subsequent conscientiousness development, and conscientiousness levels also significantly positively predicted subsequent parent-child relationships. These findings suggest that an intimate and harmonious parent-child relationship provides adolescents with a supportive and nurturing family environment, which helps cultivate their conscientious traits. This supportive environment promotes adolescents' diligence and commitment to tasks and obligations, helping them develop self-discipline and a sense of responsibility. At the same time, adolescents' high levels of conscientiousness are an indicator of better parent-child relationships, meaning that their behavior and actions may be more in line with parental expectations, thus promoting the maintenance of a healthy parent-child relationship. Previous studies have predominantly examined the correlational relationship between parent-child relationships and conscientiousness, focusing primarily on Western countries [9,16,18,48–50]. This study builds on the literature by further investigating this bidirectional relationship in the context of Chinese adolescents, providing new evidence on the bidirectional relationship between parent-child relationships and conscientiousness development.

Second, Chinese adolescents' parent-child relationships significantly negatively predicted subsequent neuroticism development, and neuroticism levels also significantly negatively predicted subsequent parent-child relationships. This finding is consistent with the conclusions of previous research by Hazel et al. (1982), Yu et al. (2019) and Brouillard et al. (2018) and supports the unidirectional negative impact of parent-child relationships on adolescent neuroticism [9,25,46]. Our study also adds to the understanding of neuroticism as a predictor of parent-child relationships. Positive parent-child relationships provide emotional support and a sense of security, enabling adolescents to cope better with the stresses and challenges of life. This emotional support helps reduce anxiety and tension in adolescents, thereby reducing their levels of neuroticism. On the other hand, lower levels of neuroticism indicate a closer relationship between adolescents and their parents, as reduced emotional fluctuations and emotional stability contribute to establishing more stable and harmonious family communication. It is worth noting that previous studies have often combined the effects of fathers and mothers when analyzing parent-child relationships in a general way. Our study comprehensively highlights the significant impact of parent-child relationships on adolescent neuroticism and conscientiousness development by examining mother–child and father–child relationships separately.

In conclusion, our study not only supports existing theoretical perspectives but also provides insights for valuable educational practice. The ecological systems theory emphasizes the importance of the environment in the process of individual development and views individual development as the result of interactions between the individual and the surrounding environment. Among these environments, the family is the innermost microsystem within the ecological environment, closely related to the individual and exerting the greatest influence [29]. As a pivotal component of the family ecological environment, the parent-child relationship plays an undeniably positive role in adolescent development and psychological well-being. According to the stress-buffering model, positive factors in one environment buffer the impact of risk factors in another environment on adolescent developmental outcomes [30]. The results of this study suggest that positive relationships

and support from parents help prevent potential negative emotional effects and contribute to individuals becoming more responsible and healthier.

6. Implications for Educational Practice

The findings provide valuable insights for educational practice. Through empirical analysis of longitudinal data, we clarified the contributions of both mother–child and father–child relationships in promoting adolescent development in the Chinese educational context. This highlights the critical role of both mothers and fathers in ensuring the healthy development of children and emphasizes the need for each parent to be actively involved in fulfilling the family's educational responsibilities. In China, fathers often occupy a marginalized or even absent position in family education, while mothers typically take on more responsibility for accompanying and caring for their children within the household [41]. Nevertheless, a burgeoning body of literature has begun to shed light on the positive effects of father–child relationships on adolescent emotions, behaviors and cognition [57–59]. Our study adds to this body of evidence by highlighting the indispensable role of both fathers and mothers in promoting conscientiousness and mitigating neuroticism among Chinese middle school students. This is in line with the family education law promulgated by the Chinese government last year, which emphasizes the paramount importance of joint parental involvement and participation in promoting the comprehensive development of minors. To begin with, both parents should recognize this importance and work together to improve parent–child bonding. They should give priority to encouraging parent–child interaction and providing emotional support to create a nurturing and supportive family atmosphere [60]. It is important to avoid stereotyping fathers and instead encourage their active involvement in intimate interactions and communication with their children. For instance, participation in democratic family meetings and volunteering in the community can be beneficial. In addition, parents should improve cooperation with schoolteachers, increase the frequency of communication and stay attuned to their child's academic performance and emotional fluctuations. At the same time, appropriate support and motivation are essential to help children develop self-discipline, responsibility and effective time management skills. Finally, a child's decreasing conscientiousness and increasing neuroticism may indicate problems in the parent–child relationship. This finding suggests that parents can introspect and make timely adjustments to address these concerns. Certainly, further research should include comparative studies across different cultural and educational backgrounds, exploring the mechanisms through which father–child and mother–child relationships affect adolescents' personality and psychological well-being. An in-depth exploration of these aspects would be valuable if the relevant data could be obtained.

Based on a large-scale longitudinal survey, this study used a cross-lagged model to empirically clarify the bidirectional relationships between parent-child relationships, neuroticism and conscientiousness among Chinese middle school students. The findings further enhance our understanding of the role, which parent-child relationships play in shaping the development of neuroticism and conscientiousness among middle school students. Moreover, the study provides meaningful evidence within the context of the Chinese educational background.

7. Limitations

First, it should be noted that the information on parent-child relationships, neuroticism and conscientiousness used in this study was obtained from student questionnaires. While students' perceptions of parent-child relationships may provide a more accurate reflection of the actual closeness between parents and children, self-report measures are inherently subject to certain biases. Additionally, due to the utilization of secondary data and the exceptionally large sample size, certain fit indices are not applicable. Future research could consider employing multiple methods and incorporating multiple sources of information (such as in-depth interviews with both students and their parents, as well as direct obser-

vation) to assess parent-child relationships, thereby obtaining a more comprehensive and accurate understanding.

Second, due to the limited availability of data in the database, this study was based on two waves of survey data, and a two-wave cross-lagged model was constructed to explore the bidirectional relationships among Chinese adolescents' parent-child relationships, neuroticism and conscientiousness. If future releases of the CEPS project include additional waves of longitudinal data, further analysis could be conducted to explore the dynamic patterns of these variables over a longer time span.

Third, this study primarily focused on examining the predictive effects of parent-child relationships on neuroticism and conscientiousness development. We also acknowledge that in real-life situations, the positive effects of parent-child relationships extend beyond the variables addressed in this study. Researchers can explore the influence of parent-child relationships on other aspects of middle school students' performance. Future research can broaden the scope to include the school and community environments, analyzing the effects of relationships with teachers, neighbors or peers on the development of middle school students. Finally, it is necessary to clarify the matter of correlations in the context of a large sample size. Some of the relatively small correlations observed in this study may be due to the large sample size.

8. Conclusions

It is noteworthy that during the seventh and eighth grades among Chinese middle school students, the closeness of the parent-child relationship with both parents decreased, accompanied by a decrease in conscientiousness levels and an increase in neuroticism levels. This highlights the need for parents and teachers to closely monitor and address the emotional and personality development of adolescents to prevent further deterioration in their mental health.

Second, among Chinese middle school students, there is a bidirectional predictive relationship between parent-child relationships, conscientiousness and neuroticism development. Specifically, the levels of closeness in parent–child relationships show bidirectional positive predictive relationships with conscientiousness and bidirectional negative predictive relationships with neuroticism. These findings highlight the important role of close parent–child relationships in fostering later conscientiousness and mitigating neuroticism. Furthermore, decreasing conscientiousness and increasing neuroticism may serve as potential indicators for identifying problems within the parent–child relationship.

Third, both mothers and fathers play a crucial role in the healthy development of children, and each party should contribute to the family's educational responsibilities. It is essential for both parents to support and cooperate with each other and to make joint efforts to create a warm and harmonious family environment and to foster high-quality parent-child relationships. Such efforts are conducive to the development of children's conscientiousness and their healthy growth.

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

Data Availability Statement: Data will be made available upon request.

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

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Many-Dimensional Model of Adolescent School Enjoyment: A Test Using Machine Learning from Behavioral and Social-Emotional Problems

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Abstract: There is an emerging, many-dimensional model of human functioning that has yet to be rigorously tested in adolescent psychopathology. The model is based, in part, on research suggesting stronger predictive power at the level of single items compared to the commonly used smaller number of higher-level constructs represented by scores or factors. Here, the model is tested in research relevant for the understanding how psychopathology relates to adolescent school enjoyment. We compared, explained, and clustered machine learning model results from a set of 99 self-reported items from different instruments that measured the behavioral and social-emotional problems of adolescents to predict school enjoyment. There is support for a many-dimensional model. Individual items had unique variances beyond noise that incrementally added out-of-sample predictive power above construct-level prediction, particularly for nonlinear machine learning classifiers. Explainable machine learning uncovered important predictors of low school enjoyment, and these were specific nuances of withdrawn/depressive behaviors, elevated fears and anxieties, lowered sensation-seeking, and some conduct problems—what we term risk nuances (cf. risk factors). Clustering further identified shared risk nuances among different groups of individuals with low school enjoyment. Our results suggest that item nuances are important in revealing many ways in which adolescents' behavioral and social-emotional problems relate to school enjoyment at the individual and group levels. A many-dimensional model can complement current descriptive, predictive, and intervention efforts in adolescent psychopathology.

Keywords: adolescents; behavioral problems; machine learning; psychopathology; school enjoyment; social-emotional problems

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1. Introduction

1.1. Power of the Item

What problems do adolescents manifest, and how does the constellation of problems relate to an important aspect of adolescent life, that of schooling [1,2]? To address this question, the current dominant approach is based on two major assumptions, among many. First, from a measurement perspective, it assumes that measured indicators such as individual questionnaire items are noisy, adversely affecting their reliability [3]. Second, from a theoretical perspective, what many are interested in are not the measurements themselves but what they are caused by, which are psychological constructs in the widely-used reflective model [4]. Constructs are "postulated attributes of people", such as interpersonal hostility or anxiety [5]. Consequently, various theories based on these assumptions have been developed to provide reliable and compact construct-level postulations relevant for adolescent psychopathology, such as, among many, the developmental cascade model of psychopathology [6] and the spillover theory of parent-child-peer relationships [7]. An

alternative perspective is emerging, mostly in personality science, of a many-dimensional model [8–10]. It is argued that individual questionnaire items representing many different dimensions of feelings, thoughts, and behaviors are themselves worthy of study over and above their assumed role as mere indicators of higher-level constructs. These many narrow descriptions, termed nuances in personality science [11], provide a much richer, many-dimensional view of human functioning compared to the smaller number of higher-level constructs typically studied. In terms of empirical evidence, studies have directly compared predictions by individual items (e.g., "I see myself as someone who is moody") to higher-level personality constructs such as facets (e.g., anxiety) and domains (e.g., neuroticism), finding extensive evidence for the predictive advantage of items over facets and domains for a wide variety of outcomes [8,12–14]. To the extent that mental health research is a prediction science, the power of individual items to make good predictions on unseen data is a noteworthy effort. In terms of theoretical motivations, advances in using items as a unit of study are driven in part by measurement theory. Items are noisy measurement tools [3], and traditionally, this noise is overcome by aggregating many items, for example, via scales or summed scores. However, larger sample sizes that are increasingly common can also compensate for noise, allowing reliable associations at the item level to be uncovered [13]. Further, as argued by Seeboth and Mõttus [8], any theory-building effort needs to first start with precise and accurate descriptions of associations before any theoretical explanations can be offered. Seeboth and Mõttus [8] argued with the example of how the big five personality domains seemed to predict a vast universe of outcomes [15], though very weakly with little specificity, such that similar combinations of personality domains can predict very different life outcomes. The ubiquitous but weak relationships, or weak ubiquity, motivate the search for a stronger predictive theory that is more specific. Lastly, the emerging many-dimensional model is further inspired by the rapid growth of genome-wide association studies (GWAS) in the past decade. These studies have correlated pieces of genetic information (e.g., millions of single nucleotide polymorphisms) with psychiatric disorders [16] and educational outcomes [17], among others. Much in the same way that pieces of genetic sequences constitute the genome, nuances at the item level are argued to constitute the building blocks of the persome [18]. While the genome represents a person's unique genetic make-up, the persome, using nuances, represents a person's unique psychological make-up.

1.2. Toward a Many-Dimensional Adolescent Psychopathology

There is a need to test a many-dimensional model in adolescent psychopathology for a number of reasons. First, much, if not all, of the relevant work has been in personality science with a focus on adults, and much less is known about adolescents. Many of the items used in personality science are arguably related to habits of thoughts and behaviors that may have more stable, trait-like properties, especially in adults. However, many widely used instruments relevant to adolescence research may assess more state-like, context-dependent responses. These would include symptom presentations that vary over time [19] or social relationships that change dynamically over development [20]. There is a need to test whether items relevant to adolescent psychopathology can confer predictive power. Adolescence is a stage of change and instability, making it a relevant age group to rigorously test the many-dimensional model. Second, similar to personality research, the phenomenon of the weak ubiquity of constructs is also present in adolescent psychopathology. For example, the widely used psychopathological construct of internalizing behaviors, conceptualized as inner distress, is linked to numerous school functioning measures such as attendance and grades, but only weakly so, typically with an r of less than 0.3 as demonstrated in a previous meta-analysis [21]. Can specific items related to internalizing behaviors more powerfully and specifically predict aspects of adolescent school functioning? One important aspect of adolescent school functioning is how much adolescents enjoy schooling, an indicator of their overall positive feelings about school, classes, and their activities [22]. Children and adolescents who enjoy schooling, are meaningfully engaged in school, or

are less bored tend to have better academic, behavioral, and emotional outcomes [23,24]. It is argued that positive feelings about school can foster higher aspirations and greater motivation to learn, which in turn lead to higher achievement [24]. School enjoyment also has broader positive correlates of positive teacher-student [25] and peer relationships [26], while also potentially protecting against further psychopathology and delinquency [22]. Despite its importance, whether or not adolescents enjoy school has not been studied in detail, particularly how specific and narrow behavioral and social-emotional problems may hinder optimal school enjoyment in different adolescents.

1.3. Present Study

The primary aim of the study was to test the relevance of a many-dimensional model of human functioning in adolescent psychopathology. We compared items to constructs in the concurrent prediction of school enjoyment. Nonlinear machine learning classifier models were trained and tested on a large sample of items measuring adolescent behavioral and social-emotional problems to predict how much they enjoy school. Results were then compared to higher-level constructs and to traditional linear models. Further machine learning explainability analysis and clustering were implemented to obtain more insights into how specific problems related to low school enjoyment in different groups of adolescents.

2. Materials and Methods

2.1. Participants

A nationally representative, non-clinical, school-based sample was collected. Participants were 3232 Singaporean adolescents aged 12–18 years (M = 14.0 years, SD = 1.0 year), with 49% female, drawn from four publicly funded schools in Singapore. Participation was voluntary, obtained via written informed consent from each participant and their parents. English, the main language of instruction in Singapore, was used for all questionnaires that were administered in a classroom setting, with responses kept confidential. Other than informed consent, there were no other eligibility criteria for inclusion/exclusion. Supplementary Table S1 provides details of the sample. A subset of the data was previously used for person-centered analysis [27] and machine learning to predict social functioning [28]. In the present research, we focused on a new detailed investigation of how nuances at the item level differed from scores at the construct level in the concurrent prediction of school enjoyment. All procedures involving human participants and secondary data analyses were approved by the Institutional Review Board of Nanyang Technological University.

2.2. Measures

The present study measured nine constructs of behavioral and social-emotional functioning: six related to behavioral and emotional problems in addition to sensation-seeking, peer pressure, and parent-child relationships. A list of all predictors at item level is given in Supplementary Table S2, including the reporting of descriptive statistics for all items.

Behavioral and socio-emotional problems. Behavioral and emotional problems were measured by Youth Self-Report (YSR) [29] using a 3-point Likert scale ("Not true", "Somewhat or sometimes true", "Very true or often true"). Items covered factor-separable syndromes assumed to represent latent psychopathologies [30]. Anxious/depressed was measured by 12 items (e.g., "I am nervous or tense"). Cronbach's alpha was 0.84. Withdrawn/depressed was measured by eight items (e.g., "I don't have much energy"). Cronbach's alpha was 0.75. Attention problems were measured by nine items (e.g., "I don't finish what I start"). Cronbach's alpha was 0.79. Somatic complaints were measured by 11 items (e.g., "I feel dizzy or light-headed"). Cronbach's alpha was 0.78. Rule-breaking behaviors were measured by 13 items (e.g., "I steal at home"). Cronbach's alpha was 0.66. Aggression was measured by 17 items (e.g., "I am louder than other kids"). Cronbach's alpha was 0.86.

Sensation-seeking. The Brief Sensation Seeking Scale for Chinese (BSSSC) [31] was used with eight items (e.g., "I am interested in almost everything that is new"). Responses were

recorded on a 5-point scale (1, "Completely disagree" to 5, "Completely agree"). Cronbach's alpha was 0.72.

Peer pressure. Nine items from the Peer Pressure Inventory (PPI) [32] were administered to measure the extent of self-perceived peer pressure in school (e.g., "How often do you feel the need to be friends with the popular students?"). Responses were recorded on a 5-point scale (1, "Never" to 5, "All the time"). Cronbach's alpha was 0.81.

Parent-child relationship. The Parent Environment Questionnaire (PEQ) [33] was used, specifically the 12-item "Parent-Child Conflict" scale from the adolescent's perspective (e.g., "My parent often hurts my feelings"). Responses were recorded on a 4-point scale (1, "Definitely true" to 4, "Definitely false"). Cronbach's alpha was 0.90.

School enjoyment. Participants were asked "How much do you enjoy school and school activities?". Responses were recorded on a 3-point scale (1, "Above average"; 2, "Average"; 3, "Below average").

2.3. Machine Learning

Because there is currently no community guideline for machine learning reporting, a recent publication initiated a methodology checklist for transparent reporting of machine learning analysis (29) that has since been used by others [34]. The reporting combines items from two recent systematic reviews on the use of machine learning in biomedical and mental health research [35,36]. The checklist of reporting items is provided in Supplementary Table S1.

2.3.1. Variables

Ninety-nine items were used as item-level predictors. These items came from 9 constructs: anxious/depressed, withdrawn/depressed, attention problems, somatic complaints, rule-breaking, aggression, sensation-seeking, peer pressure, and parent-child relationship. Supplementary Table S2 lists all the predictor items and constructs labels. The outcome to be predicted was school enjoyment, collected concurrently with the predictors. A small amount of missing data for each set (development and test) was imputed independently using the K-nearest neighbor algorithm. For main item-level analysis, all predictors were ordinal data and were all similarly entered without any variable selection. For construct-level analysis, linearly summed scores were computed from items belonging to each construct [37]. For events per predictor variable number (EPV), focusing on the combined event count for two minority categories of school enjoyment ("above average" and "below average"), the EPV for the development set was 11.5 events per predictor variable for the main item-level analysis and 126.3 for the construct-level analysis. This ratio indicates a sufficiently large sample size in order to reliably predict the minority categories.

2.3.2. Data and Machine Learning Workflow

An imbalanced 80–20 split, as is common in machine learning research, was performed on the full data (N = 3232 cases or participants), producing a development set and a test set. This was performed once via random selection. The test set consisted of N = 164 (25.4%), 419 (64.9%), and 63 (9.8%) cases in the outcome categories of "above average", "average" and "below average", respectively. This test set was reserved for final testing of the optimized models and was not employed in any of the steps in model development. Previous analysis suggested that oversampling minority cases can help increase prediction [28]. Thus, we applied the synthetic minority oversampling technique, SMOTE [38], to the development set to increase the proportion of the minority categories by about 200%. For the 99-item or 9-construct analysis, all items or constructs were used. For the 1-item, 2-item, or 4-item analysis, 1, 2, or 4 items were randomly sampled from each of the item pools belonging to each construct. For example, for 1-item analysis, 1 item was randomly chosen from each of the nine constructs, producing 9 items in total for use in subsequent machine learning, and this was repeated 50 times to assess variability from item sampling. After these steps, the model development set underwent Bayesian hyperparameter optimization

and model training (see subsequent text). The best model for each classifier at the end of model development was then used to predict the outcome categories in the test set using the same set of predictor items. We performed three additional analyses to address questions about item-level prediction, which we termed (1) residual variance analysis on the full training set, (2) residual variance analysis on a subsample, and (3) randomly-permuted variance analysis on the full training set. First, we asked the extent to which the machine learning results depended on unique variances at the item level. For this question, we regressed each item onto the summed score of the construct that the item belonged to. The residuals from this regression were then used for further machine learning. This procedure allowed us to assess whether analyzing only items' unique variances affected the results. Second, we repeated this residual variance analysis, but first randomly subsampled just 20% of the training set, followed by further machine learning. This analysis allowed us to examine the extent to which sample size played a role in driving the items' predictive power. Third, for a given pool of items belonging to each construct, we randomly assigned the item values using values from another item belonging to the same construct for each respondent. For example, 12 items belonged to the anxious/depressed construct, and the item values were randomly permuted such that one item took on a value from one of the 12 items, then the next item took on a value from one of the remaining 11 items, and so on (this was performed without replacement, thus no values were duplicated). This was then performed for the next respondent, and so on and so forth. This procedure maintained the summed score representing the construct for each respondent but randomized the item values. It allowed us to test whether the machine learning analysis capitalized on item variances that were simply noise, in which case such random permutations would not adversely affect the machine learning results. Alternatively, if the item variances had genuine signals beyond their relationship with the construct (since summed scores were maintained), the randomly permuted values would reduce machine learning performance.

Four classifiers were used to predict the outcome variable of school enjoyment. Nonlinear classifiers were artificial neural networks and K-nearest neighbor. These were nonlinear classifiers that learned complex patterns in the data in an automated manner, such as nonlinear combinations of predictor variables or higher-order terms. These would result in nonlinear decision boundaries to classify the outcome categories. Artificial neural networks use computational units akin to neurons, which transform inputs (predictor values) into outputs (inputs to other layers of neurons or final outcome categories) via weighted summation and nonlinear activation functions [39]. K-nearest neighbor applies the concept of neighbors such that cases with known outcome categories that are most similar in their predictor values to a query case (case to be predicted) are used to predict the outcome category of the query case [40]. These two machine learning classifiers were found to be among the best-performing ones in similar previous analyses [28] and were thus used here. Two other classifiers were linear ones from multinomial logistic regression and linear discriminant analysis. These classifiers are very common in school and clinical psychology research and are under the class of generalized linear models, as their functions for classifying cases into outcome categories are forced to be linear in variable space. Though both are linear classifiers, they differ in other properties (e.g., normality assumption, susceptibility to outliers, etc.), allowing us to assess potential differences in results.

Each of the four classifiers first independently underwent hyperparameter optimization, similar to a previous publication [28]. Briefly, hyperparameters are static parameters that govern model structure and the downstream learning process. An example would be the lambda parameter for regularization in logistic regression, which is typically fixed. Previous research suggested that hyperparameter tuning can be important for optimizing predictive performance [41]. Given the large space of possible hyperparameter combinations, Bayesian optimization (50 evaluations) was instead used to estimate the best set of hyperparameters using 5-fold cross-validation. The best set of hyperparameters was then subsequently used during the training of the classifier model parameters. The trained models were then applied to the test set. There are a variety of performance measures

that can be used in machine learning. We chose Matthew's correlation coefficient (MCC) as it uses all four cells in a confusion matrix (true positives, true negatives, false positive, and false negatives). It is also a type of correlation; thus, MCC and its squared, MCC2, which is a measure of outcome variance explained by the model, can be directly compared to commonly used R and R^2 measures in the social sciences. However, we note that the pattern of results remained essentially the same when considering other metrics such as the F1 score. MCC ranges from −1 (a perfectly opposite prediction to actual outcome) to 0 (a random prediction) to 1 (a perfect prediction of actual outcome). MCC^2 ranges from 0 (zero outcome variance explained by model) to 1 (100% of outcome variance explained by model).

2.3.3. Model Explainability

To interpret the machine learning models, model explainers were used on the test set, in particular local interpretable model agnostic explanations (LIME) [42]. Briefly, LIME assumes that for a single query case, one can apply a simple approximation of the prediction function for a local region, even though globally for all cases, the prediction function might be highly complex in the machine learning model. This approximation is achieved by producing synthetic (artificial) data, weighing each synthetic datapoint by its proximity to the query case, and then fitting a simple model to identify important predictors specific to the query case. As a simple model, we used a decision tree that still allowed some limited form of nonlinear complexity. The top 20 predictors for each correctly classified case in the test set were identified using Gini impurity-based predictor importance (how well the predictor node in the tree classified cases into the different classes). To interpret the directionality of the relationship between the top predictors and outcomes, an overall measure of effect size (Cohen's d, mean difference divided by standard deviation) was used, comparing those with low ("below average") to high ("above average") school enjoyment for each of the top predictors.

Model explainability operates at the individual case level, but because there are too many cases, it can become difficult to visualize each and every case's list of predictors. Thus, using the ordered list of the top 20 predictors across all cases, we then performed t-SNE dimensionality reduction (to 3 dimensions) [43]. t-SNE, like factor analysis and principal components analysis, reduces high-dimensional data to a smaller number of dimensions based on similarities (e.g., correlation or distance). Unlike other commonly used linear dimensionality reduction techniques, t-SNE is nonlinear, allowing us to capture more complex structural features while preserving local similarities. Clustering was subsequently performed on the t-SNE-reduced dimensions using k-means clustering. The optimal number of clusters (ranging from 1 to 15) was estimated via the commonly used variance-ratio criterion (maximum ratio of between- and within-cluster variance) [44]. These putative clusters represented cases with an overlapping list of top predictors. One top predictor that was most common among all the cases in each cluster was then identified to qualitatively interpret the cluster.

All data processing, machine learning, and model explainability were performed in Matlab 2021b programming environment using the Statistics and Machine Learning Toolbox and custom scripts. The machine models are available as Matlab objects upon request.

3. Results

3.1. Items Versus Constructs

Four types of classifier models to predict school enjoyment were built using the model development set consisting of either individual items or linearly summed scores for all nine constructs. The models' performance was then evaluated on the unseen test set based on MCC. Figure 1 shows the results. As the number of sampled items per construct increased, the classifiers generally increased in performance on the test set. However, nonlinear machine learning classifiers of artificial neural networks and K-nearest neighbor exceeded the performance of linear classifiers for all sampled items, suggesting complexities in our

data that nonlinear classifiers were able to discover for prediction purposes. Importantly, both linear and nonlinear classifiers started to outperform construct-level classifiers when more than four items were sampled per construct. This result indicated that a small number of items did not lend itself to good prediction but that as more items were added, the classifiers could leverage the additional information to improve prediction. The best prediction performance was demonstrated by artificial neural networks and K-nearest neighbor using all 99 items in the model. These 99-item models had MCC = 0.74 and 0.75, respectively, exceeding the performance of the same types of classifiers using constructs (MCC = 0.63 and 0.62, respectively). MCC is a form of correlation comparable to R, and MCC2 is comparable to R^2. Thus, our nonlinear classifiers can explain about 55% (0.74^2) of the variance of the outcome variable.

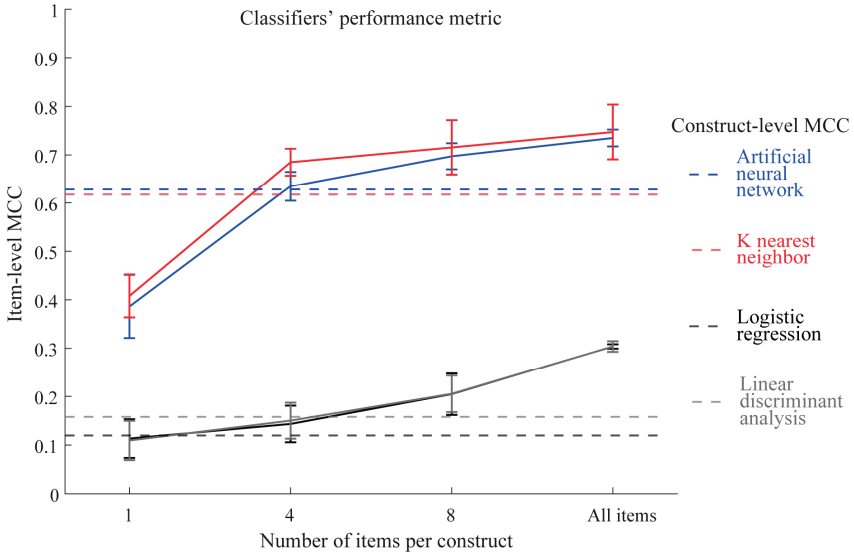

Figure 1. Classifiers' prediction performance as measured by MCC on the test set. Each solid line (mean ± S.D.) is MCC based on the number of items per construct in the *x*-axis. Broken horizontal lines are the MCC at construct-level (9 summed scores representing 9 constructs). MCC and MCC^2 are comparable to R and R^2, respectively.

We further investigated the nature of item-level signals, focusing on our artificial neural network classifier. Items belonging to the same construct were correlated to one another and to the summed scores representing constructs, so the prediction performance at the item level could conceivably be driven by common variance with only marginal unique contribution by each item. The finding that items outperformed constructs that relied on common variance suggests that this was not likely to be the case. Nonetheless, to formally test this possibility, we regressed each item onto the summed construct score that the item belonged to and used the residuals as data for model development and test sets. As expected, this procedure did not change the performance at the item level for artificial neural networks (Figure 2). The MCC for the 99-item residual variance model was still higher than the construct-level MCC. This finding supports the idea that individual items had unique variances (beyond the construct) that were driving our main machine learning results. To test whether sample size played a role, we randomly subsampled 20% of the training set with the residual variance data before model development and model testing. Performance dropped substantially but not fully, suggesting the contribution of large sample sizes for machine learning. Another test of the predictive power of items is to randomly permute the values of items belonging to each construct. This procedure

would maintain the summed scores for each construct but destroy any signals at the item level. If the models were simply capturing noise in the items and overfitting them to the data, we would expect similarly good predictions. However, this was not the case: randomly-permuted variance essentially eliminated any prediction performance on the test set (Figure 2). Overall, this pattern of results suggests that individual items had genuine signals beyond noise that incrementally added predictive power above construct-level prediction. This predictive power was maximized by using the largest number of items in a large sample size for nonlinear machine learning models.

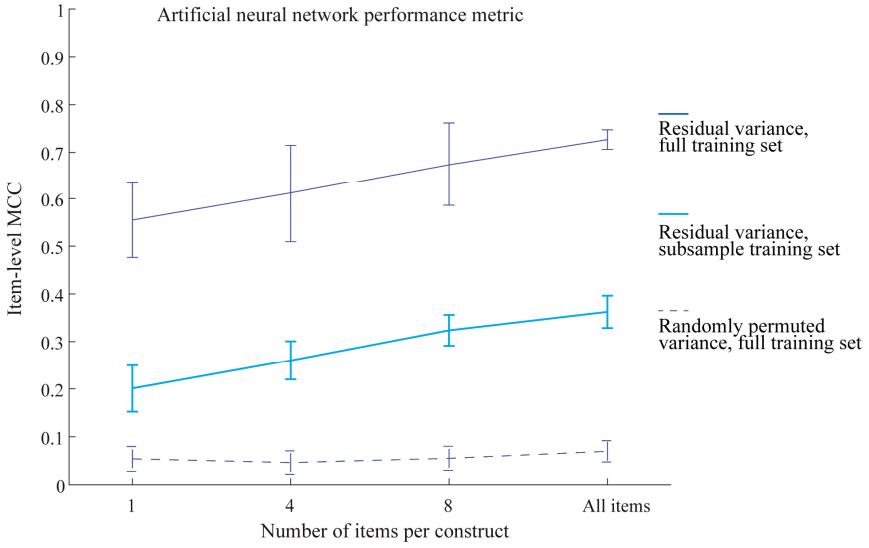

Figure 2. Performance of an artificial neural network on the test set using residual variance on the full training set, residual variance on a subsample of the training set, or randomly permuted variance on the full training set.

3.2. Model Explainability

We next focused on our 99-item artificial neural network model, attempting to explain its prediction function specifically for low school enjoyment (rated as "below average" by respondents). In other words, we tried to identify items contributing to individual risk for low school enjoyment. LIME analysis was employed [42]. LIME is based on the insight that simple model explanations can be applied at the local level for each case, even though the black-box machine learning model may involve complex, nonlinear decision boundaries at a global level for all cases. LIME, therefore, allows us to identify important predictors specific to each case. We used simple tree explainers of our artificial neural network model. The ranking of the top 20 predictors of low school enjoyment is shown in Figure 3. Each circle indicates a case and its LIME value. A higher value shows a stronger influence on a particular case's prediction, while the number of circles indicates how many cases the predictor has an influence on. Thus, both the LIME value and the number of circles can be interpreted together as representing the overall importance of a predictor. The top five predictors were: YSR5, There is very little that I enjoy; BSSSC1, I'm interested in almost everything that is new; YSR102, I don't have much energy; YSR103, I am unhappy, sad, or depressed; and YSR90, I swear or use dirty language. These top five predictors were generally related to emotional nuances of being withdrawn/depressed, personality characteristics of low sensation-seeking, and conduct problems/rule-breaking behaviors. Having some conduct problems is not inconsistent with withdrawn and depressed behaviors because, in children, irritability is a notable feature of depression [45]. Additionally, it is

not uncommon to see interrelationships between internalizing and externalizing symptoms and school-related concerns or issues [46]. We observed that many other items subsumed under the same constructs were not identified as being important predictors. For example, YSR75—I am shy or timid—though part of the withdrawn/depressed symptom construct was not identified as a top 20 predictor. Other top 20 predictors related to school fears and anxieties and school functioning, such as YSR30, I am afraid of going to school and YSR61, My school work is poor, suggesting some face validity in the list of predictors of school enjoyment.

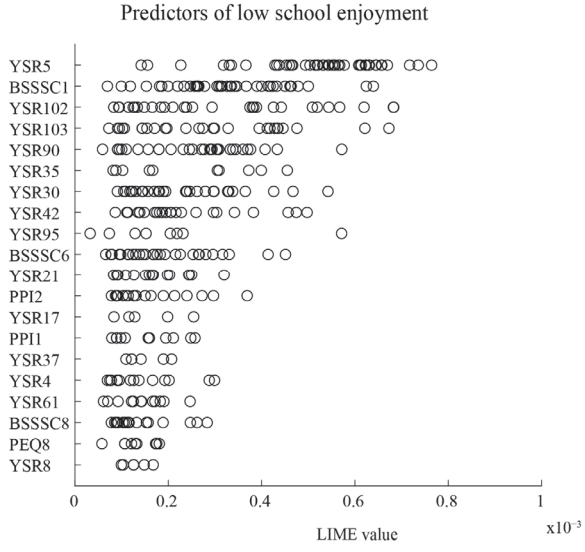

Figure 3. Top 20 predictors of low school enjoyment. Each circle represents a predictor importance value as measured by the Gini impurity of the local decision tree for a single case (respondent) prediction in the test set. Predictors are ranked by average predictor importance. YSR5, There is very little that I enjoy; BSSSC1, I'm interested in almost everything that is new; YSR102, I don't have much energy; YSR103, I am unhappy, sad, or depressed; YSR90, I swear or use dirty language; YSR35, I feel worthless; YSR30, I am afraid of going to school; YSR42, I would rather be alone than with others; YSR95, I have a hot temper; BSSSC6, Going on adventures always makes me happy; YSR21, I destroy things belonging to others; PPI2, How often do you feel the need to be part of a group in school?; YSR17, I daydream a lot; PPI1, How often do you feel the need to take the same co-curricular activities (CCAs) that your friends take? YSR37, I get in many fights; YSR4, I don't finish things that I start; YSR61, My school work is poor; BSSSC8, To pursue new experiences and excitement, I can go against rules and regulations; PEQ8, My parent and I often get into arguments; YSR8, I have trouble concentrating or paying attention.

To further interpret the directionality of the predictor-school enjoyment relationship, we examined simple effect sizes (Cohen's d) for each predictor, comparing low to high school enjoyment outcome categories. For all YSR-related items, as expected, adolescents with more problems had low school enjoyment (Cohen's d = 0.41 to 0.92 for all YSR predictors in the top 20; a positive value shows a higher mean for those with low school enjoyment compared to high school enjoyment). For BSSSC-related items, the pattern was more complex. Low sensation-seeking via items BSSSC1 and BSSSC6 tapping into experience seeking was linked to low school enjoyment (Cohen's d = -0.67 and -0.45 respectively), but the opposite seemed to be the case for BSSSC8 (Cohen's d = 0.52), as was the finding for the YSR items. BSSSC8 has a positive association with low school enjoyment, likely because it taps into the disinhibition dimension of sensation seeking, which aligns with acting out

and conduct problems. Overall, across all individuals, important predictors of low school enjoyment were specific nuances of withdrawn/depressive behaviors, elevated fears and anxieties, low sensation-seeking, and some manifestations of conduct problems. Figure 3 provides an aggregate view of the top predictors, combining all individual cases with low school enjoyment. To better understand the distribution of predictors for each individual, we additionally performed dimensionality reduction of the list of top 20 predictors for each individual, followed by clustering. Figure 4 visualizes the clustered distribution of cases in lower-dimensional space. Cases with the same color belonged to the same cluster with an overlapping distribution of top predictors. Four clusters were optimally inferred for individuals with the outcome of low school enjoyment. For each cluster, we identified the most common top three predictors from the overlapping distribution of top predictors. We conceptualized these common top predictors as shared risk nuances, as reported in Table 1. Interestingly, each cluster had a different common top predictor. Two clusters had different common top predictors, but both related to sensation-seeking: BSSSC1, I'm interested in almost everything that is new, and BSSSC6, Going on adventures always makes me happy. Both BSSSC1 and BSSSC6 items tap into the experience and adventure seeking dimensions of the sensation-seeking construct, whereby low levels of sensation seeking are associated with low school enjoyment. Two other clusters had different common top predictors of PPI2, How often do you feel the need to be part of a group in school? and YSR30, I am afraid of going to school. With respect to PPI2, these adolescents did not feel the need to be part of a group in school. Given the profile of an adolescent who manifests withdrawn and depressive symptoms and is somewhat fearful of novel and adventure-related experiences, such an individual would typically not be found seeking out cliques and groups in school. In other words, we uncovered evidence of different important predictors for distinct groups of individuals related to specific nuances of low sensation-seeking, school anxiety, and a low need for peer conformity pressure with respect to a sense of belonging derived from peer groups.

Table 1. Shared risk nuances for each of the four clusters identified in Figure 4.

Cluster 1
BSSSC1, I'm interested in almost everything that is new (negatively related) PEQ11, My parent sometimes hits me in anger (negatively related) BSSSC6, Going on adventures always makes me happy (negatively related)
Cluster 2
PPI2, How often do you feel the need to be part of a group in school? (negatively related) YSR90, I swear or use dirty language BSSSC1, I'm interested in almost everything that is new (negatively related)
Cluster 3
YSR30, I am afraid of going to school YSR42, I would rather be alone than with others YSR61, My school work is poor
Cluster 4
BSSSC6, Going on adventures always makes me happy (negatively related) YSR42, I would rather be alone than with others BSSSC8, To pursue new experiences and excitement, I can go against rules and regulations

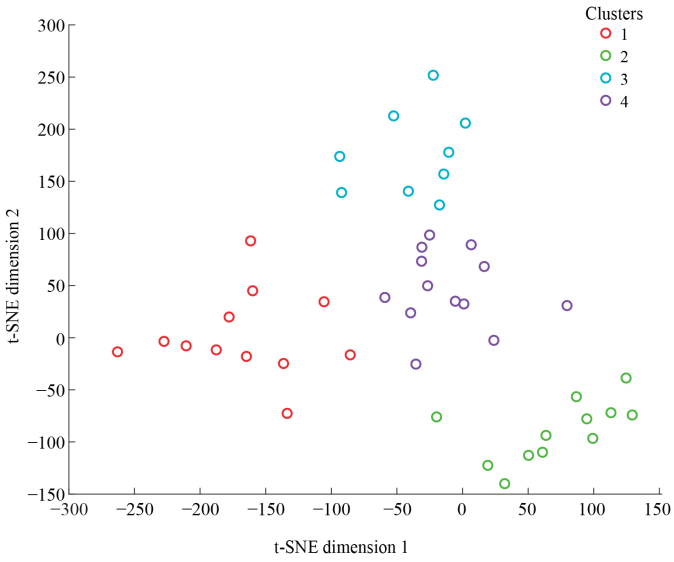

Figure 4. Dimensionality reduction of the top 20 predictors of low school enjoyment. Refer to Table 1 for the list of shared risk nuances (the most common top predictors) for each cluster.

4. Discussion

How can we better understand adolescent psychopathology so as to best describe and predict an important aspect of adolescence, that of school enjoyment? Traditional analysis has relied on linear models that aggregate items to represent higher-level constructs and then build compact descriptions and models averaged across all individuals. However, our results strongly suggest that there is unique information at the level of single items that can be used to build highly predictive models of school enjoyment in support of the many-dimensional model [8–10]. Further machine learning explainability analysis and clustering can reveal important predictive items at the individual or group level.

Our study can be compared to previous studies on psychopathology and school functioning. In the most recent study on psychopathology and school enjoyment, Cadman and Hughes [22] examined a multivariate model to predict school enjoyment from the latent construct of externalizing problems. However, the predictive relationship was very small (standardized beta coefficient of −0.08). They also found that depressive symptoms, part of the internalizing problems construct, predicted school enjoyment, but similarly, very weakly. This weak ubiquity contrasts with our study's possibility of building a stronger predictive model with more specificity. However, our approach does make the model less compact since many more non-aggregated items are involved. Our procedure, however, guards against overfitting because performance was tested on an unseen test set kept separate from model development. Further, psychopathology can be dimensionalized at different hierarchical levels [47]. In contrast to our results, Allen et al.'s [21] meta-analysis found that broadband scores involving high-level internalizing and externalizing constructs had better predictive power on various school-related behaviors compared to narrowband scores involving aggregations at the lower level. We found the opposite: narrower measurements at the item level had better predictive power compared to higher-level aggregates (Figure 1). The reasons for these different results from past literature may have to do with the samples, specific outcomes being predicted, and methodological differences, as none of the previous studies used nonlinear machine learning models.

Further contrasts can be made to a recent study that predicted poor school social functioning using the same dataset and methodology [28]. Just two of the top 10 predictor items of school social functioning overlapped with our current study focusing on poor

school enjoyment (YSR5, There is very little that I enjoy and YSR42, I would rather be alone than with others). The rest of the top 10 predictors of school social functioning were related to psychosomatic complaints and social problems, unlike our current study. This result of strong specificity at the item level contrasts with the weak ubiquity of broad constructs in past literature and suggests that school functioning may involve different mechanisms depending on whether it relates to social functioning, general feelings about school, or any other outcomes.

Our study complements existing theory-building approaches in adolescent psychopathology. One of the biggest insights from GWAS is that behavioral phenotypes are associated with large numbers of genetic markers, each with small effect sizes (also known as the fourth law of behavior genetics), but all of which additively contribute to making powerful combined predictions with medium-to-large effect sizes [48]. Such a situation of non-compactness, in which many small associations and explanations co-exist, may similarly be important for non-genetic studies of adolescent behavior. Furthermore, items with unique variances are highly underused because scale development generally discards items that do not strongly load (correlate) onto the same factor (construct) as other items. Our results thus likely underestimate the overall power of nuances at the level of single items (12). The research suggests the importance of developing alternative measurements and theories that are less overly broad with more specific descriptions and predictions in adolescent psychopathology. This may involve using a much wider universe of items, even though they may typically be excluded by traditional measures (e.g., internal reliability via Cronbach's alpha). Our understanding of adolescent psychopathology is enriched by embracing both scale-level theoretical constructs as well as item-level nuances; there is much potential and power in using both in a complementary and comprehensive manner, depending on the goals and needs of the research.

Finding support for a many-dimensional view may expand our conceptualization of how we design and implement school interventions. Many current intervention efforts revolve around using broad theoretical constructs such as school belonging [49] or even broader ones still under the umbrella of positive education [50]. However, an alternative many-dimensional view suggests that interventions can be conceptualized at the most elementary level, identifying specific thoughts, feelings, and behaviors that have the strongest risk for the outcome, what we call risk nuances (cf. risk factors). Focusing on risk nuances carries immense utility, especially for specific behaviors, feelings, and thoughts that would be the target of intervention and prevention efforts. This is easily achieved using machine learning with explainable simple models followed by clustering to identify shared risk nuances for interventions in groups of individuals. To put it concretely, instead of relying solely on interventions aimed at the broad factor of depression for all adolescents that report lower school enjoyment, one can consider interventions with risk nuances. For example, targeting "I am afraid of going to school" for one group of adolescents and "I'm interested in almost everything that is new" (negatively related) for another group, as these are the shared risk nuances for two different clusters of adolescents with low school enjoyment (Figure 4). The former group may require interventions addressing negative beliefs about school, while the latter involves a scaffolded approach toward coping with novel school activities. However, targeting one risk nuance may not be sufficient, as our results suggest that each risk nuance plays a small, incremental role and that more risk nuances need to be addressed.

Furthermore, a multidimensional view may also affect how we evaluate school interventions. For example, when synthesizing evidence for interventions such as via meta-analysis, one may consider dispensing with higher-level constructs that average out effects since the specific thoughts, feelings, and behaviors themselves should be the focus of evidence evaluation instead of common constructs they are hypothesized to tap upon. In other words, a many-dimensional view may require a bottom-up way to organize the plethora of interventions and their evidence base by focusing on the elementary levels of human psychology, e.g., [51]. One idea is the use of network graphical representations for

a potentially large number of effect sizes, something frequently used in the biomedical field for network meta-analysis [52]. Further research is necessary on how to better synthesize and summarize these disaggregated effect sizes, given the overwhelming number of different interventions when analyzed at the lowest levels.

In addition to conceptual and practical contributions, our study also expands the literature methodology-wise. Our approach may be reminiscent of person-centered analysis, in which individual items are used to form profiles of groups of individuals (28) in contrast to variable-centered analyses. However, the current study has important differences from previous traditional person-centered analysis. First, we used nonlinear machine learning classifiers followed by nonlinear dimensionality reduction in contrast to the typically linear models used in person-centered analysis. This approach allowed us to uncover potentially more complex and informative relationships among predictors and outcomes that may have been missed by previous profiling studies. Second, non-parametric approach of LIME was used to simulate data to identify important predictors specific to an individual, something missing from traditional person-centered analysis. Further, Mõttus and colleagues [8,12] have performed extensive analyses to demonstrate the power of the item, including the use of item residuals, which we broadly replicated. However, our analysis in Figure 3 went further to uncover more details as to how items may be driving good predictions. For example, when we randomly permuted item values while keeping construct scores, item-level prediction fell substantially, suggesting that a large portion of construct-level prediction was instead driven by individual item patterns. There was also reduced performance when using a smaller number of items and smaller sample sizes. Taken together, power from items is derived from having many of them combine in unique ways in large sample sizes.

The present study has numerous limitations. First, we are unable to draw causal conclusions given the observational nature of the data. Thus, we can only speculate about whether these identified risk nuances can indeed influence subsequent school enjoyment in a causal manner. There may also be residual confounding given that we did not analyze other covariates that may potentially affect the results, such as family background. Future research can consider additional background variables. Furthermore, our measures were all self-reported from a single timepoint. One possibility is the use of multi-informant reports to predict longitudinal outcomes more robustly. Finally, our sample was a school-based, non-clinical one. It is unclear if our results can be generalized to predict clinical cases. Further research is necessary to test whether a many-dimensional model is useful for clinical use in adolescent psychopathology.

5. Conclusions

We tested an emerging model of human functioning in research relevant to adolescent psychopathology. Using machine learning, we uncovered extensive evidence of items from behavioral and social-emotional problems that represented risk nuances for low school enjoyment. Our results strongly supported the many-dimensional model, with implications for how to complement current descriptive, predictive, and intervention efforts in adolescent psychopathology and, more broadly, in adolescence research.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/educsci13111103/s1, Table S1: Reporting items checklist for assessing machine learning methodology based on Senior et al. (2021) and Christodoulou et al. (2019); Table S2: List of PEQ, BSSS-C, PPI and YSR items used as predictors; Table S3: Descriptive statistics of individual predictor and outcome items.

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Informed Consent Statement: Written informed consent was obtained from each participant and their parents.

Data Availability Statement: Related data and analysis codes are available in the National Institute of Education Data Repository, https://doi.org/10.25340/R4/C0WCB7 (accessed on 27 September 2023).

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

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