European Journal of
Investigation in Health, Psychology and Education

Cares in the Age of Communication

Health Education and Healthy Lifestyles

Edited by
Iván Herrera-Peco and Julio C. de la Torre-Montero

Printed Edition of the Special Issue Published in
European Journal of Investigation in Health, Psychology and Education

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This is a reprint of articles from the Special Issue published online in the open access journal *European Journal of Investigation in Health Psychology and Education* (ISSN 2254-9625) (available at: https://www.mdpi.com/journal/ejihpe/special_issues/health_education).

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

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

ISBN 978-3-0365-0652-4 (Hbk)
ISBN 978-3-0365-0653-1 (PDF)

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About the Editors

Iván Herrera-Peco (BSc, PhD). Associate Professor, Nursing Department of Health Sciences Faculty, Alfonso X el Sabio, Spain). One of Dr Herrera-Peco's main research areas, associated with his role as professor of Public Health, is the analysis of social media as a public health strategy. More specifically, how it could be used to spread verified health information, but also the use of social media to spread health misinformation (focused in anti-vaccine groups).

Julio C. de la Torre-Montero (Rn, PhD). Bachelor in Nursing from the University of Salamanca, as well as a Master's degree in nursing care research and a Ph.D. in Ultrasound in Vascular Access, both from Complutense University of Madrid (UCM). His doctorate program was implemented into an innovative scale that allows performing clinical and objective measurement of the peripheral vascular system (VIA Scale, Venous International Assessment). In this line of his research, Julio published a PCT, Device for Intraosseous Needle Removal, with an innovative biosecurity system (WO2020012051). Accredited by the Spanish independent educational agency ANECA, as Adjunct Professor (as an associate). Since 2014, he teach Oncologic Nursing Care and Palliative Care along with the Ethic and Research Methodology at Comillas Pontifical University. He has over twenty-year clinical experience and has worked, among others, as a researcher, study coordinator, and study nurse, as well as data entry, in clinical trials at Hospital Clínico San Carlos in Madrid. In Europe, he has worked in primary care, implementing health education programs (Skeletal Care Academy) for patients, in order to improve their quality of life and to promote a healthy lifestyle. Overseas, he has designed and implemented Health Programs in Africa. He is also a member of several scientific societies, among others, the European Society for Medical Oncology European Oncology Nursing Society and the Spanish Society of Oncology Nursing. In addition, he works as an editor of several scientific journals in his field of expertise.

Preface to "Cares in the Age of Communication: Health Education and Healthy Lifestyles"

Traditionally, health professionals have been a source of reference for knowledge related to health and illness. If someone had a problem, the only solution was to put it in the hands of those who knew about it and listen to them. From the self-care point of view, this system leaves very little space for people to take care of their needs themselves, however, the evolution of society, mainly in the Western world, has brought overwhelming ease of access to information and education. In a major part of the world, everyone today is sufficiently educated and has easy enough access to information through the media or the internet, especially through social networks, to be able to take charge of managing a certain part of their problems or needs themselves, and even when these exceed their capacities, to be able to question the alternatives or solutions that health professionals can offer them.

The good side of this transformation is that the person has been empowered. The person who in the past was a patient, with all those connotations of passivity and obedience to the expert, is now a person with sufficient resources and skills to be an active part, if you like, of any health process that affects him or her, which makes him or her more responsible, autonomous and independent of his or her care, even if he or she does not want to be.

But there is also a downside, or at least a risk, which many authors such as Michael Sandel or Ciril Rozman are already beginning to point out: who guarantees that the information we have access to is true and reliable, who can guarantee that the tool we now have is well used from the point of view of that person's health, or of public health?

The inherent freedom of social networks gives rise to processes such as fake news, disinformation, pseudotherapies, etc., which are all in the same window and with the same characteristics as scientific evidence or expert consensus. How many times have we read on Twitter, for example, "I don't believe in the virus"? This type of statement, which confronts what health professionals believe to be essential, places those professionals before a challenge with few precedents.

What can health professionals do in the face of this? Can they ignore the existence of these processes and continue with their work as before? What part of responsibility do professionals have, whether by action or omission, leaving this in the hands of anyone who needs information to take care of themselves?

Health professionals must work when people cannot, do not know how to, or do not want to, care for themselves, using different methods, but they must act. From this reflection, we can see the need for health professionals, and health institutions too, to be on social networks, and to be there to create quality, reliable and truthful content that is available to people who use these networks as another resource for their self-care. The big question here is how to do this: Does any content count? In any format? For all audiences? Does it have to be personalised? How do you personalise it on a mass social network?

We live in a hyper-connected society, which makes communication another scenario for working on health, but it is also true that social networks represent an inequality gap that can pose a risk to the caring of people who do not have access to them. Older people, developing countries, people in social exclusion, etc., may see their access to this care based on social networks reduced and is this also a challenge for health professionals. Care, health education, or health promotion through social networks must not become an add-on to the inequality that already exists.

Research in this field is needed. We already have some background and publications, but it is still necessary. Methodological difficulties, especially the control of bias or the large number of variables involved, may make it difficult to achieve results that support the hypotheses, but this is one more reason to continue researching. It is necessary to know the true potential of these tools to improve people's self-care and health and that this empowerment is truly a resource to improve the health of the population and not the opposite.

Daniel Cuesta-Lozano
Editor

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Editorial

Preface of Special Issue "Cares in the Age of Communication: Health Education and Healthy Lifestyles": Social Media and Health Communication in a Pandemic?

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Received: 7 April 2020; Accepted: 10 April 2020; Published: 10 April 2020

1. Introduction

In the midst and the mist of the Covid-19 outbreak, we are living in the age of global communication in a hyperconnected society in which the transmissions channels between people have been changed very clearly due to both the internet itself in general and social networks in particular [1]. These represent very powerful tools when searching for health information or collecting such information [2], but they also exemplify a clear way for patients to share information [3,4] and healthcare professionals to meet the needs and concerns of patients and caregivers [1,4,5].

Directly associated with the use of social networks and the internet, it is important to highlight a series of data that can show that this situation is of great importance. In 2016 there were more than 7000 million mobile users, and this number has also increased globally year after year, while the use of the internet also increased globally from 6.5% to 43% between 2000 and 2015 [6].

Focusing on the case of Spain, it is observed that during 2019, 91.4% of Spanish households have access to the internet, while 90.7% of the population between 16 and 74 years have used the internet weekly [7]. Of all these internet users, 96.9% say they have used a mobile phone to access the internet and check its contents [7]. Likewise, and to emphasize the importance of social networks, it was indicated that 64.6% of internet users use the internet to consult social networks, and in addition, 72.1% of women and 60.3% of men use the internet to search for health-related information [7]. These data, limited only to Spain, show the large amount of information that is generated as well as the existing contact networks involving the internet.

However, with regard to social media, it is important to understand that it has been associated with personal interactions, a situation that has been supported by the great technological development that occurred at the beginning of the 21st century, since it has de facto changed our way of communicating, exchanging information, impressions, etc. [8]. Today various forms of virtual social media, such as Facebook, Twitter, Instagram, etc., provide some of the most powerful forms of communication between people around the world [1].

In the light of the above, it has to be concluded that we can now see an increasing flow of data and information related to health, while the population is increasingly co-responsible, together with health professionals, for their own health and quality of life [9] by generating relevant information and data through interactions involving the internet and social networks, which can potentially be used by researchers [9]. However, it is necessary not to forget that social media could be the fastest way to transfer knowledge of current practices to healthcare professionals and other people that need to hear about it during natural disasters, pandemics, etc. [10].

Twitter is a social network service that was created in 2006 [11,12], and in 2016 it had more than 328 million active users per month [13], while more than 500 million tweets have been released each day by more than 300 million active users [13,14]. This social network is available in more than 33 different languages, and even supports non-Latin characters.

These characteristics facilitating both a rapid exchange of information and an ease of generating both unidirectional and bidirectional contact networks [14], make Twitter a social media of special interest when it comes to disseminating information related to health or scientific information, but also an element to keep in mind when designing and proposing research projects related to, for example, monitoring the flow of information, evaluating the effectiveness of awareness or information dissemination campaigns, etc. [14,15].

2. Social Media as Important Tool in Public Health Surveillance

An important role of social media is helping researchers to develop epidemiological studies when health emergencies appear, such as the spread of infectious diseases. Twitter can not only be useful when looking for information about the state of this emergency, but it could also be useful for studying opinions, emotions or the strategies that people are adopting to protect themselves. This information is very useful for governments, public health agencies or researchers in epidemiology and public health [15–17].

But Twitter is also useful for helping with actions focused on health promotion at a remote level, as the monitoring of physical activity during confinement yields very interesting figures, such as a great decrease in physical activity, which can be recorded through wearable devices [18].

Epidemiological Information

Twitter is taking advantage of the full potential of its internet and web-based services though the monitoring of various infectious diseases and epidemiological studies such as the H1N1 Flu virus [16], Zika disease [19,20], Dengue virus [21], Ebola [15,22] or even COVID-19 [10,23].

Because Twitter is a free service that enables millions of users to send short messages, it provides useful information that allows, for example, for tracking rapidly evolving public opinion regarding H1N1 or swine flu. Results have shown that disease estimates using these conversations on Twitter accurately correspond to disease levels reported by authorities [16].

On the other hand, Miller et al.'s study [19] focused on specific social concerns related to the prevention, transmission, symptoms and treatment of the Zika virus, for which they collected 1,234,605 tweets discussing specific aspects of Zika or that contained associated misinformation. With this information, five topics were created for each category (prevention, transmission, treatment and vaccine in development), which future studies will be able to use to automatically detect erroneous information using Twitter and thus allow well-directed and timely interventions [19].

Another example of social media use could be the experience of Sousa et al. [21]. They developed a mobile application (*VazaDengue*) to prevent and combat mosquito-borne diseases, in which citizens report mosquito breeding sites and cases of dengue fever. The tweets are then classified, and the relevant ones are tagged as reports, and the reports are then made available to the community and health agencies. This study shows that health workers tend to agree with the relevance of classified tweets. Furthermore, tweeting is likely to be effective for monitoring diseases in large cities.

3. Limitations of Social Media

In regard to the gathering of scientific information, the main risk from social media could be the dissemination of misinformation [10], which could occur not only when accessing non-peer reviewed materials but also when using peer-reviewed resources. People without adequate scientific formation can misinterpret this information and create fake news [24]. These kinds of fake news spread through a large number of users and modify perceptions and understandings of events and even facts [25] because they are based on scientific communication. Of course, one limitation of social media is

the existence of rumors or stories without any fundamental basis in facts. Sometimes healthcare professionals, scientific researchers, politicians, etc., can make declarations that could seem correct but this "expert" still stepped outside their area of expertise or even use scientific document or research paper that has not been peer-reviewed [23].

In addition, but linked with previous limitations, we could not find enough data to track down a source of information that is available to distinguish between valid or invalid information [10,22].

4. Conclusions

Twitter can be used as a measuring form of public interest or concern about health-related events, which can serve to generate data on emerging time trends for greater effectiveness of actions, interventions and policy responses to avoid misinformation about these diseases and allow communities to play an important role in the fight against and prevention of diseases.

Finally, we must insist that the pillars of the health system and of any epidemiological projection reside in an adequate information and data processing system. We live in a complex and interrelated system where many factors can be decisive in influencing the health status of the population.

Author Contributions: J.C.d.l.T.-M. and I.H.-P. have contributed substantially to the work reported. All authors have read and agreed to the published version of the manuscript.

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

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European Journal of
Investigation in Health, Psychology and Education

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Article

Assessing the Quality of Physical Environments of Early Childhood Schools within the Cape Coast Metropolis in Ghana Using a Sequential Explanatory Mixed-Methods Design

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Received: 7 November 2020; Accepted: 16 December 2020; Published: 18 December 2020

Abstract: (1) Background: The last few decades have seen researchers giving considerable attention to the physical context of early childhood care and development (ECCD) centers because many of the underlying processes that link physical context are quite similar to psychosocial environmental factors regarding child development. However, research on the physical environments, and the employees' understanding of the importance of physical environments, is often underestimated. The purpose of this study was to assess the quality of the physical environments of ECCD centers in the Cape Coast Metropolis, Ghana, and ascertain whether being a private or public center (center auspices) would be associated with the quality of its physical environment. A further inquiry into the educators' understanding of the importance of physical environment on children's developmental outcomes was made. (2) Methods: Using a sequential explanatory mixed-methods research design, all 160 ECCD centers in the Cape Coast Metropolis were assessed using a modified version of the Children's Physical Environment Rating Scale (CPERS) and a semi-structured interview guide. (3) Results: Descriptive statistics indicated that more than half of the ECCD centers, 56%, rated "fair" on the quality of their physical environment. Although the locations and sites of these centers were of good quality, other physical environmental characteristics (i.e., "Planning of the Centre", "Building as a Whole" and "Outdoor Space") of ECCD centers were also rated to be fair. A Chi-square test showed that center auspices (i.e., being private or public) were not significantly associated with the quality of the physical environments of the centers [$\chi^2_{(2)} = 2.490$, $p > 0.05$], suggesting no significant difference between private and public ECCD centers in terms of the quality of their physical environment. A follow-up qualitative inquiry identified two themes as reasons why play yards in early years' schools were not good: a "lack of funding" and "governmental support". (4) Conclusions: Our findings suggest that the physical environments of ECCD centers are, to some extent, compromised. Stakeholders (e.g., Ghana Education Service, non-governmental/religious organizations, and private entrepreneurs) should help improve the quality of physical environments and also provide financial assistance for the provision of basic equipment (e.g., learning materials) for private and public ECCD centers in the Cape Coast Metropolis. Educators require in-service training to boost their in-depth understanding of the importance of physical environments on children's developmental outcomes. Future studies could target children's perceptions of their preschools' physical environments as useful empirical information to help guide appropriate policy interventions.

Keywords: center auspices; ECCD centers; modified CPERS; Cape Coast; Ghana; physical environment; quality

1. Introduction

Child development literature reveals that the early years of a child's education are essentially influential, and, across many societies of the world, attempts have been made towards investments by governments and other stakeholders to facilitate the development, learning opportunities, and healthy living for young children [1]. One significant index that plays a critical role in the attainment of these standards is the environment of the early childhood care and development (ECCD) centers, popularly referred to as preschools [2–5]. Berti et al. [6] indicate that a child's early experiences with an excellent environment help form the architecture of the brain and set the foundation for the child's lifelong success. Thus, positive outcomes are likely to occur if the child's early experiences are positive. Conversely, undesirable outcomes are likely to happen if these experiences are negative. Some educational theorists and practitioners (e.g., Werner, Piaget, Montessori) have continually acknowledged the significance of physical space in an early learning environment and that a child's physical environment is one of the key determinants towards his or her holistic development [7]. For example, the interactional-constructivist theory of child development and the environment places more emphasis on the physical environment by focusing on how the connections between the architectural and geographical environment and the social system separately and jointly influence how the child behaves [7]. According to Moore [8], educational environments well-endowed with refreshing stimuli offer diverse opportunities for exploration and testing. Maxwell [9] reiterated that the architectural design of the physical environment should boost a child's sense of competence (i.e., an ability to discover the physical world with independence), generating opportunities for learning and play. Additionally, physical motor activities are essential to the health and general wellbeing of young children by promoting healthy cognitive development, weight gain, good cardiovascular condition [10], motor skill development, and psychosocial health [11] as well as lower adiposity, and increased bone density [12]. Since play and movement are important for brain development, preschool children should be exposed to activities that promote the development of fine motor and gross motor skills [13].

Scholarly reports over the years have established the susceptibility of children to negative health impacts of their degraded or unsafe environments [14]. Other studies have shown a correlation between ECCD center design and positive growth of children in preschool, suggesting that when the physical environment is comfortable, it influences children's play behavior, which leads to better learning [15,16]. Similarly, the role the physical environment plays on other factors determines the quality of teaching and learning, that is, the educator's effectiveness as well as the child's performance and overall growth [3,9,17–20]. In contrast, exposure to poor quality physical conditions is also associated with psychosocial conditions [21]. For example, preschools with high-quality physical environments have children exhibiting fewer anxious and distress behaviors [22]. Similarly, good quality physical environments in ECCD centers have been found to be helpful for little children from disadvantaged backgrounds (i.e., poor homes) as they are provided with opportunities and experiences not given in their houses [23].

Other extant research literature indicates that three explicit physical environmental design parameters are considered most essential in early childhood learning: spaces that boost exploration, independence, and development (i.e., a child's sense of self and willingness to play); spatial quality (e.g., color, light, noise, and materials); and the amalgamation of outdoor and indoor environments [2,7,9]. According to Curtis and Carter [24], a very thoughtful and appropriate architectural design of physical space can foster a child's quest for exploration, learning by means of play, peer interaction, and self-confidence improvement and social skills. A suitably designed space could improve a child's sense of competence and offer a serene place that provides maximum security and comfort. These development benchmarks would help provide an identity and a sense of self-worth through exploration and play for these young children [9,25]. Other research evidence suggests that children benefit from their overall well-being as well as physical health when their preschools provide substantial opportunities for outdoor play and have contact with nature [26,27]. Bagot [28] further stated that children who attend more "natural" daycare centers display better motor skills abilities,

increase their attentional capacity, and have fewer sick days. Additionally, spending some time in the sun during outdoor play improves children's health and minimizes the risk of sick building syndrome, which is usually linked with inadequate access to natural daylight and fresh air in indoor settings [29].

The connection between physical environment and early childhood developmental outcomes in the current study could be considered from a theoretical perspective, using the constructivist approach. This premise is based on the idea that an understanding and knowledge of the environment in which people live is co-constructed through vicarious experiences of the immediate environment and reflections on those experiences [30,31]. According to this perspective, perception of space is considered very important. For instance, the physical features of spaces impact the perception and representation of reality; they define the context in which people can act and live [31]. From this theoretical standpoint, specifically accounting for the physical features of early childhood environments and better understanding educators' perspective on children's developmental outcomes may provide useful emerging themes through meanings and behaviors of individuals who inhabit these contexts [32,33].

To date, many countries in sub-Saharan Africa depend primarily on public–private early childhood care and education through collaborations with non-governmental organizations (NGOs) for community-based initiatives. Early childhood care and education services in Ghana, as in other sub-Saharan states, are provided by the state and private institutions such as NGOs, religious organizations, communities, and commercially-oriented private entrepreneurs with varied motives for their participation in early childhood education [34,35]. Although some of these ECCD centers have relatively good environments (i.e., adequate and appropriate play and other physical facilities, clean and hygienic sanitary facilities), quite a number lack the appropriate environment to promote effective teaching and learning.

Ghana has made great progress in early childhood education, with evidence showing significant increases in enrolment in ECCD centers in the country, which have exceeded the goal for preschool enrolment [1]. Despite the Ghana Education Act, 2008 [36] legislation providing legal directives and policies supportive of the restructuring and transformation of the physical environment, as well as the educational facilities of preschools, earliest years' schools have seen no structural transformation. These centers still operate in unchanged and undesirable physical environments in the midst of their huge enrolment sizes. A scenario that eludes one of the stated objectives of the Ghana Education Act, 2008 is "to redefine and augment education and support services that are responsive to the needs of all children, within the context of universal design and child-friendly schools, and overall, to increase participation and educational access for children, including those with special needs". To accomplish this educational policy goal, the physical architectural designs and environments of existing schools ought to be reformed or adapted, while also guaranteeing that all new school physical designs and constructions enhance opportunities for all children.

Given that a large body of research exists on how different physical design features influence child development and behavior, it is surprising that scholarly information on early childhood educators' understanding of the physical designs of their early childhood learning centers within the Ghanaian context is undocumented. Additionally, research on the extent to which specific physical environment characteristics of ECCD centers are identified and assessed to promote learning in the country is limited. To date, only a few studies have investigated issues related to the physical environments of ECCD Centers in Ghana. For example, Bidwell, Watine, and Perry [37] explored ECCD programs in peri-urban settings in Africa and found that fundamental structures, such as toilet facilities and playing fields, enclosed spaces around the school, and electricity mostly existed in preschools in Soweto (South Africa) and Ashaiman (Accra, Ghana). Bidwell and partners noted that these infrastructures were lacking, in substantial proportion, in preschools in Mukuru, Nairobi, Kenya. Similarly, evaluating preschool programs of selected schools for the deaf in chosen Ghanaian cities (i.e., Cape Coast, Sekondi, Kibi, Koforidua, and Mampong-Akuapem), Larbi [38] found that most preschools for the hearing impaired had environments and indoor, as well as outdoor, learning spaces that were conducive to learning and development. However, the playgrounds were not spacious enough for the preschoolers, and most

classrooms were not spacious enough to accommodate the children and their indoor equipment. Summarily, these few studies did not provide an in-depth assessment of the qualitative impressions of school educators (i.e., employees' understanding) on how physical environment indices might promote learning in these educational institutions. To the best of our knowledge, no research has accounted for employees' understanding of how ECCD centers' architectural designs might promote learning. Further, given governmental support for public schools compared with private ones across all levels of education in Ghana, examining whether center auspice would be connected to the quality of the physical environments of ECCD centers could provide useful information for policy realignment. This comparative assessment has been ignored by previous studies. Besides, even though the impact of physical environment on children's holistic development appears to be critical at all educational stages [5], educators' (e.g., employees, heads, coordinators) understanding about their working spaces regarding the children's physical environments are vital. Therefore, this current study assessed the quality of physical environments of early childhood schools within the Cape Coast Metropolis, Ghana by employing a sequential explanatory mixed-method approach. Additionally, whether ECCD center auspices (i.e., being private or public) would be associated with the quality of the physical environment often associated with overall child development was examined. A further inquiry was made on educators' in-depth understanding of the importance of how ECCD physical environment features would be associated with overall children's developmental outcomes.

It was hypothesized that physical characteristics of ECCD centers incorporated as part of the physical environment of the ECCD centers would rate higher in quality, according to the standard ratings of the adapted Children's Physical Environment Rating Scale (CPERS) inventory. Based on more governmental support (e.g., infrastructure, financial) for public schools than for their private counterparts in Ghana, it was anticipated that public ECCD centers would rate higher than private ECCD centers on the CPERS physical environment indicators. Given that educators' views are central to children's developmental outcomes, additional hypotheses were drawn from the quantitative results that recorded the least mean scores on the selected CPERS indicators. It was further hypothesized that ECCD coordinators would demonstrate an adequate understanding of the value of physical environment and relate the values to young children's developmental outcomes. ECCD centers in this study included all the institutional service centers that take care of children from birth until school age (i.e., facilities that take care of children from 0 to 6 years old). These facilities were primarily day-care and childcare centers, nursery schools, preschools, and kindergartens in the Cape Coast Metropolis. The physical environment in the current study referred to the overall design of a center, covering features such as size, density, privacy, well-defined activity settings, modified open-plan space, a variety of technical design attributes, as well as outdoor play spaces, which are linked to the emotional, social, and cognitive development of children [6].

2. Materials and Methods

2.1. Study Design

The study was conducted using a sequential explanatory mixed-methods approach, where the quantitative part precedes the qualitative component, a design usually noted for exploring new phenomena [39–41]. According to Hancock [42], this research design is very essential towards the attainment of both in-depth experiences and general realities that frequently reconstruct social stratification along numerous loci of marginalization. Given that there is sparse empirical evidence on the quality of physical environments of the early years schools in the Cape Coast Metropolis, Ghana, using the sequential exploratory mixed-methods approach serves as the most preferred design for this inquiry. Ethical approval for this study was obtained from the Institutional Research and Ethics Committee, University of Cape Coast, Ghana (UCCIRB/CES/2016/01). Permission to conduct the study was initially obtained from the Central Regional Education Directorate of the Ghana Education Service, Cape Coast Metropolis.

2.2. Study Area

The study was conducted in the Cape Coast Metropolis, the capital of the Cape Coast Metropolitan District and Central Region of Ghana. Cape Coast is situated in the south of Ghana, on the Gulf of Guinea, and has a population of 169,894 people [43]. This city is about 146 km away from the national capital, Accra. The European merchants introduced castle schools within its catchment areas along the coast. The formation of these schools gave birth to the introduction of formal education in the country, including Cape Coast. Currently, there are 160 early childhood centers in the Cape Coast Metropolis, with 101 being private and 59 public. Primarily, Kindergarten Education has a two-year preschool program offered mostly by communities and private organizations, with technical support from the government (i.e., Ghana Education Service). The preschool program is offered to help children learn to communicate, play, and interact with others appropriately [44]. Educators at the preschool centers provide various learning materials and activities to motivate children to learn their local and English languages through music, art, physical activities, and social behaviors.

2.3. Quantitative Phase

ECCD Center Inclusion

The current study used a census approach for sampling all registered ECCD centers in the Cape Coast Metropolis that were in existence. The Ghana Education Management Information System (GEMIS, [45]) records had initially indicated 163 ECCD centers in the Metropolis. However, only 160 ECCD centers were in existence during the field data collection. The other three centers had either relocated or closed down. The characteristics of the ECCD centers chosen for the study are presented in Table 1.

Table 1. Frequency Distribution of Early Childhood Care and Development (ECCD) centers in Cape Coast Metropolis by Auspices.

Early Childhood Care and Development (ECCD) Center Characteristics	Frequency	Percentage
Public	59	37
Private	101	63
Total	160	100

2.4. Instrumentation

A modified version of the Children's Physical Environment Rating Scale" (CPERS, [7]) was used for this study. The original CPERS questionnaire has 124 items organized into 4 parts of 14 subscales, with each subscale having different items. Part A focuses on the overall planning of the center (e.g., building size of the center: length, breadth); Part B looks at the environmental quality of the building, overall organization, image, and circulation (e.g., children can see some indoor activity areas from outside before entering the center); Part C assesses each module (classroom) and spaces where children spend the majority of their time (e.g., children activity areas are partially enclosed to provide protection from visual and noise distractions); and Part D evaluates the outdoor activity area around the building, and surrounding conditions (e.g., the total area useable outdoor play yards: length, breadth).

Based on the rationale of this study, that is, to assess the quality of physical environments in relation to developmental outcomes of children, the CPERS was modified by excluding the subscales assessing the "Quiet Activity Area" and "Messy Activity Area". Under the subscale for the "Physical Activity Area", the items measuring the "Music Area" and "Dramatic/Fantasy Play Area" were removed. Additionally, the items measuring the Arts and Crafts Studio, Water Play Area, and Science and Nature Area were also removed. These specific areas and provisions are usually not provided as part of a preschool's physical environmental design in the Ghanaian context, and therefore might

be redundant information or not relevant to the instrument. Therefore, the modified CPERS used in the current study constituted 84 items, categorized into 4 parts of 12 subscales. To ascertain the validity (i.e., construct and content) of the modified CPERS, a group of three experts (i.e., professors) considered the overall instrument and its themes. These experts considered the validity of the "items" under each subscale with particular reference to the general Ghanaian school set-up. The researchers assessed the building of ECCD centers by deciding on how well each center satisfied each item on the subscales anchored on a five-point linear-numeric scale, starting from "Not Met" (score of 0) to "Fully Met" (score of 4). After completion, each subscale score was calculated using a mean of the items on a particular subscale. The total score for an ECCD center was then calculated based on a grand mean of all the subscale scores. Previous studies have reported internal reliability (Cronbach alpha) values ranging from 0.53 to 0.96 on all the CPERS subscales [7,46,47]. Calculated Cronbach coefficient alpha values in the current study ranged from 0.63 to 0.97 on all the chosen modified CPERS subscales (see Table 2). These coefficient figures are acceptable and consistent with previous research [7,46–48].

Table 2. Means (M) and Standard Deviations (SD) of Modified CPERS Scores with Subscale Reliability Values.

Sub-Parts of the Physical Environment	M	SD	Cronbach Alpha
Planning			
(1) Centre Size and Modules Building as a Whole	1.59	0.53	0.84
(2) Image and Scale	2.53	0.93	0.88
(3) Circulation	2.49	0.77	0.93
(4) Common Core of Shared Facilities	2.02	1.14	0.96
(5) Indoor Environmental Quality	2.28	1.12	0.96
(6) Safety and Security	2.60	0.76	0.89
Indoor Activity Spaces			
(7) Modified Open-Plan Space	2.53	0.96	0.94
(8) Home Bases	2.06	1.14	0.97
(9) Physical Activity Areas	2.08	0.91	0.96
Outdoor Spaces			
(10) Play Yards: Functional Needs	1.90	0.65	0.63
(11) Play Yards: Developmental Needs	1.84	0.84	0.91
(12) Location and Site	2.95	0.58	0.81
CPERS			
CPERS Total Mean Score	2.24	0.86	
Modified CPERS	84 items	-	0.63–0.97
Original CPERS	124 items	-	0.53–0.96

Note: N = 160

2.5. Procedure

The researchers obtained permission letters from the Cape Coast Metropolitan Education Directorate and the Social Welfare Department. The letters of intent were sent to all the centers. Standard ethical practice and interview procedures were followed after approval by the institutional review board (IRB), University of Cape Coast, Ghana. Informed consent was obtained from each ECCD center through the institutional head to participate in the study, which involved two research protocols: qualitative interviews with center heads and quantitative analysis (i.e., measurement) of each center's physical environment. The researchers booked an appointment with the centers and discussed the rationale of the study, that is, to assess the physical environment (i.e., architecture and the built environment of the center) and that the study was not looking at curriculum, staffing, or the children. Two research assistants were used in the physical measurements of the classrooms (length

and breadth), the play yard, and the center building, after they were trained on how to read and use a measuring tape. The actual assessment of the physical environment of all the centers was done by one of the researchers (i.e., principal author), and a hired architectural expert, together with the two trained assistants, through live visits to classrooms at the ECCD centers. Specific guidance from the expert rater, whose readings and codes were presumed to be acceptable, was followed throughout the data collection period [49]. To avoid disrupting the ECCD centers' academic work, the data collection exercise was staggered, with a duration of three months.

2.6. Data Analysis

Descriptive statistics (means, frequencies, percentages) between the physical parameters under study variables were computed. To get the overall quality of the physical environment, the total score of the modified CPERS was calculated by finding the mean score for all 12 subscales, and the final scores were grouped as follows: 0.00–1.00 = "Poor", 1.01–2.00 = "Fair", 2.01–3.00 = "Good" and 3.01–4.00 = "Excellent". Pearson's Chi-square test of independence was also performed to determine the extent to which center auspice (i.e., private or public) was significantly associated with the quality of the physical environments of the ECCD centers. During the Chi-square test, it was found that the "Poor" environment category had one cell indicating zero cases. Therefore, the category of "Poor" could not be added for the analysis, leaving three categories under the quality of the physical environment variable.

3. Results

3.1. The Quality of the Physical Environment of ECCD Centers in the Cape Coast Metropolis

The results indicate that more than half of the ECCD centers, 56% (N = 89) rated "Fair" on the quality of their physical environments, while only 14% (N = 23) of the ECCD centers have an "Excellent" rating on the quality of their physical environments (see Table 3). Other results show that the majority of the ECCD centers, 56% (N = 89) scored fairly on three parts of the physical environment: "Planning of the Centre", "Building as a Whole", and "Outdoor Space" (see Table 4).

Table 3. Quality of the Physical Environment in ECCD Centers in the Cape Coast Metropolis.

Quality	Mean Score	Frequency	Percentage
Poor	0.00–1.00	7	4.4
Fair	1.01–2.00	89	55.6
Good	2.01–3.00	41	25.6
Excellent	3.01–4.00	23	14.4
Total		160	100

Table 4. Physical Environment Quality Distribution among ECCD Centers in Cape Coast Metropolis.

Physical Environment	Poor (%)	Fair (%)	Good (%)	Excellent (%)
Planning	68 (42.5)	89 (55.6)	3 (1.9)	0 (0)
Building as a Whole	0 (0)	89 (55.6)	45 (28.1)	26 (16.3)
Indoor Space	25 (15.6)	71 (44.4)	39 (24.4)	25 (15.6)
Outdoor Space	15 (9.4)	89 (55.6)	51 (31.9)	5 (3.1)

To further explore the overall performance of the centers on the rating of the physical environment, Table 4 indicates that the centers scored high on 'Location and Site' (Mean (M) = 2.95, Standard Deviation (SD) = 0.58). However, consistent with the results shown in Table 3 is the evidence from Table 4 showing the majority of the mean scores ranging from 1.01–2.00 ("Fair" rating). Specifically, "Planning of the Centre" (Centre Size and Modules (M = 1.59, SD = 0.53), "Building as a Whole" (Common Core of Shared Facilities" (M = 2.02, SD = 1.14), and "Outdoor Space" (Play Yard: Functional

Needs (M = 1.90, SD = 0.65) and Play Yard: Developmental Needs (M = 1.84, SD = 0.84)) were realized. The overall modified CPERS Total Score indicated a "Good" rating (M = 2.23, SD = 0.86).

3.2. Chi-Square Results on Centre Auspices' Association on the Quality of Physical Environments of ECCD Centers

Table 5 shows the results of the test for association between center auspices (private or public) and the quality of their physical environments (Fair, Good, and Excellent). Centre auspices were not significantly associated with the quality of physical environment of the centers ($\chi^2_{(2)} = 2.490$, $p > 0.05$), suggesting no significant difference between private and public ECCD centers in terms of the quality of their physical environments.

Table 5. Results of Chi-square Test and Descriptive Statistics for CenterAuspices' Association with the Quality of Physical Environment of ECCD Centers in the Cape Coast Metropolis.

	Quality of Physical Environment			
Auspices	**Fair (%)**	**Good (%)**	**Excellent (%)**	**Total**
Public	39 (66.1%)	13 (22.0%)	7 (11.9%)	59 (100.0%)
Private	50 (53.2%)	28 (29.8%)	16 (17%)	94 (100.0%)
Total	89 (58.2%)	41 (26.8%)	23 (15%)	153 (100.0%)

Note: N = 153. *$\chi^2 = 2.49$, df = 2. Numbers in parenthesis indicate row percentages. $p = 0.288$.

3.3. Qualitative Phase

3.3.1. Participants' Inclusion Criteria

Eight ECCD center heads and coordinators were purposively sampled for the follow-up interviews. The inclusion criteria were solely based on the educators' ability to proficiently speak English and the local Fante language of the metropolis, who have been at the facility for at least five consecutive years, and were willing to be interviewed.

3.3.2. Need for Follow-Up Explanations

From the results of the overall performance of the centers on the rating of the physical environments, as shown in Table 4, it was found that the centers had the lowest scores in "Planning" (Centre Size and Modules (M = 1.59, SD= 0.53)) and "Outdoor Space" (Play Yard: Functional Needs (M = 1.90, SD = 0.65) and Play Yard: Developmental Needs (M = 1.84, SD = 0.84)). The purpose of the follow-up section of this study was to ascertain the detailed reasons why ECCD centers did not perform well in the physical environment aspects that looked at "Play Yard", meeting both the functional and developmental needs of the children at the centers. These specific two indicators were selected because the educators/coordinators have no direct role in the establishment of the ECCD centers and the modules used are solely determined by supervising governmental institutions. Another reason is the "Centre size and Modules" result is not too surprising because, over the years, Ghana has seen a rise in preschool enrolment and has even exceeded the nation's target of both gross and net enrolment ratios, as of the 2013/14 academic year [1]. Hence, there was no follow-up interview on this subject matter, and the following two questions were posed to guide the semi-structured interview phase:

I Do ECCD center heads/coordinators recognize the importance and support the provision of outdoor spaces for children to play?

II Why do play yards in ECCD centers not meet both the functional and developmental needs of the children?

Table 6 presents the demographic characteristics of the eight selected participants interviewed in the study.

Table 6. Demographic Characteristics of Participants Interviewed. (HR: Head as respondent)

Participants ID	Gender	Age	Years of Experience	Qualification	Pre-School Type
HR 1, 2, 4, 5	Female	Above 35	3, 26, 8, 12	M. Phil, First Degree	Public
HR 3	Female	Under 35	3	First Degree	Private
HR 6, 7	Female	Above 35	5, 7	First Degree	Private
HR 8	Female	Under 35	12	First Degree	Public

3.4. Measures

3.4.1. Qualitative Interviews

The semi-structured face-to-face interviews were done to cover the following areas: the extent to which the physical environment had an influence on the ECCD center, the relative importance of the physical environment on a child's development, center characteristics or features constituting quality physical environment, as well as the design expectations of ECCD centers. Other preliminary questions focused on the demographic characteristics of the heads/coordinators, such as their age, gender, experience, qualifications, as well as the type of ECCD center they work in.

3.4.2. Analysis

Transcripts were coded and analyzed using both manual and computer-assisted qualitative data analysis software (CAQDAS), referred to as NVivo 11 Plus. For quality checks purposes, expert and independent coders were used for the template analysis coding portion of the collected data for later subsequent discussion. Preliminary inter-coder reliability of the coding was determined using the Holsti's coefficient [50] because the chance that two coders might use the same quote of a participant by chance as a reason why ECCD centers did not have enough equipment was deemed negligible. The Holsti formula is the following:

$$C.R. = 2M/N_1 + N_2 \quad (1)$$

where M is the number of coding decisions on which the two judges were in agreement, whereas N_1 and N_2 referred to the number of coding decisions made by Judges 1 and 2, respectively (p. 140). In the current study, two coders coded all eight cases (quotes), agreed on seven cases, and disagreed on one case. The cause of the disagreement was that one of the coders coded a participant's quote as a funding reason, while the other coder coded it as a government support reason. Therefore, the inter-coder reliability was C.R. = 2(7)/8 + 8, which was equal to 0.875, a figure considered very reliable [51].

The main analysis involved a thematic approach identifying key categories, themes, and patterns. Following the recommendation of Saldana [52], four key iterative steps were followed: mechanics (transcription), data immersion (i.e., reading and re-reading transcripts), which involved using phrases or sentences to describe or capture the meaning of an aspect of the data, generating initial codes in vivo (i.e., initial pattern recognition using participants own words), and theming (i.e., categorizing key themes and sub-themes through the identification of meaningful categories) based on the code frequencies [53]. Emerging themes were revised and refined into main themes and sub-themes, with the results specifically capturing various excerpts from the raw data that had the exact words of study participants, so that readers can assess the different thematic constructions from the findings.

3.5. Results and Explanation of Themes

3.5.1. Participants' Views on the Importance of Outdoor Spaces

All the ECCD heads and coordinators responded positively that having a space for children to play was very important. Explaining why they responded positively to the question, three themes were identified and are presented in Table 7 (a, b) shows some of the extracted responses under each of the themes identified.

Table 7. a: Themes Identified from the Interview on the Importance of Spaces. **b**: Extracted Responses Concerning the Themes: "Learning Outdoors", "Upkeep", and "All work and No Play". (HR: Head as respondent).

a		
Theme	**Meaning**	**Number of Codes Assigned**
Learning Outdoors	Respondents gave an indication that children also learn when they are playing outdoors.	8
Upkeep	Playing outdoors contributes to the general wellbeing and upkeep of children.	7
All Work and No Play	Children need to play because they cannot be learning in the class all the time.	6
b		
Participants	**Narratives**	
"Learning outdoors"		
HR 4	We know that, with preschool, children learn through playing, so while they are playing they are also learning; it is very necessary.	
HR 8	It is very important for the kindergarten KG, we are doing the "SABER" program and we have indoor activities, which are table-top activities, and we have outside activities too, so they go and have some activities outside. We have to provide some things outside for them to use... aside from their playing outside, they also learn outside.	
"Upkeep"		
HR 7	It is very important. In most instances, they have to come out and enjoy a bit of sunshine, so providing outdoor space for them to maneuver and play helps them stretch their legs.	
HR 5	We have a lot of toys and equipment on our playground, some are like tunnels. People don't know the use of these tunnels, but they are actually good for children who are unable to crawl. Something like a slide also helps children to be physically active.	
"All work and no play"		
HR 6	Yes... as the saying goes "all work and no play, makes Jack a dull boy", so if you don't provide outdoor space for children to play, it means you are making them work, work, work, and if they work throughout, their minds become tired.	
HR 4	When you teach them a little, there should be a little outdoor game so that their minds will rest for a while. You can't teach them from morning to afternoon.	

3.5.2. Why Play Yards do not Meet the Functional and Developmental Needs of Children

Two themes were established on participants' responses to the question "Why do play yards not meet the developmental needs of children?" Table 8 (a) shows the themes identified, whereas Table 8 (b) presents extracted responses concerning the themes identified.

Table 8. a: Themes Identified from the Interviews on Why Playgrounds do not Meet the Developmental Needs of Children. **b**: Extracted Responses Concerning the Theme on "Funds" and "Government". (HR: Head as respondent).

a		
Theme	**Meaning**	**Number of Codes Assigned**
Funds	Challenge with getting enough equipment for children to play with; has to do with funds (money).	8
Government	The expectation is that the government should provide playing equipment for children.	4
b		
Participants	**Narratives**	
	"Funds"	
HR 6	It is the availability of funds because when we want to get equipment for the children to play with, there seems to be no money, the capitation grants do not capture it, in fact, it is a problem.	
HR 5	If you look around, the majority of the playing equipment is destroyed but what can I do? Replacing them is quite a challenge because they are expensive.	
HR 3	With this school, we don't have sponsors. We sponsor ourselves so we buy our teaching materials from the school fees that parents pay, some don't pay at all and some pay it in bits. Some parents will pay half, while others won't pay the rest so getting enough money to provide these things (playing equipment) is very difficult.	
	"Government"	
HR 4	For the equipment, the government should supply all these materials. Once it is a government school, I think they should be able to provide all these things.	
HR 8	The office (Government Education Office) does not provide these educational materials. If we want them (equipment), we will have to use our own money to build up something for the children to use.	

4. Discussion

One key indicator of the quality of early childhood education programs is the physical environment within which education and care are provided [5]. The purpose of this current study was to assess the quality of the physical environment of early childhood care and development (ECCD) centers in the Cape Coast Metropolis, Ghana, and ascertain whether being a private or public ECCD center (center auspice) would be associated with the quality of its physical environment. Additionally, a further inquiry on educators' in-depth understanding of the importance of how ECCD physical environment features would be associated with overall children's developmental outcomes.

4.1. Quality of the Physical Environment of ECCD Centers

The hypothesis related to the quality of physical environments, as measured by the modified CPERS indicators, was partly supported. Our findings suggest that the overall physical environment of ECCD centers in the Cape Coast Metropolis is of a fair quality, a result that echoes similar research findings [5,37,54,55]. The majority of ECCD centers scored fairly on all four main parts of the physical environment (i.e., "Planning of the Centre", "Building as a Whole", Indoor Spaces", and "Outdoor Spaces"). Consistent with the overall quality ratings of the physical environment, the results for the 12 physical environment indicators revealed that the ECCD centers rated fairly on half of the indicators. Previous studies have established that the quality of the physical environment in ECCD centers in relation to the building, open spaces, and the quality of outdoor play spaces are associated with children's cognitive, social, and emotional development [21]. Barbour [56] noted that the design

of play spaces is connected with children's development by either enabling or hindering specific sets of behaviors. According to some researchers [3,5], the effectiveness of the preschool program is often hampered, non-fetching, and uncomfortable because of inadequately designed and disorganized physical environments. For instance, preschools with high-quality open and outdoor spaces have children exhibiting fewer anxious and distress behaviors [22], which subsequently influence their play behaviors towards learning [16]. Therefore, a well-organized physical environment (e.g., building, indoor, and outdoor spaces) is likely to contribute decisively to children's adjustment in school and foster positive interactions between children and their teachers, thus promoting children's moods and behaviors, as well as the quality of the educators' work [9,17]. Other research on the quality of physical environment has shown a stronger positive relationship with children's academic and literacy skills [57].

One area of concern that needs considerable attention is "Centre size and Modules" because current results imply that most centers in the Cape Coast Metropolis could have more children at the centers than their current capacities. This finding calls for the expansion of existing physical structures of the ECCD centers.

4.2. Variations on ECCD Centre Auspices (i.e., Being Public or Private) on the Physical Environment

The quality of physical environments across center auspices (i.e., being private or public) was compared on the premise that many countries in sub-Saharan Africa, including Ghana, depend primarily on public–private early childhood care and education through collaborations with non-governmental and religious organizations, as well as private entrepreneurs. The formulated hypothesis was not supported because current findings revealed no significant difference between private and public ECCD centers in terms of the quality of their physical environments. The results from the profile of the 12 physical environment indicators suggest that the most obvious strength of ECCD centers within the Cape Coast Metropolis appears to be "Location and Site". This finding indicates that the dimensions of the outdoor spaces in the physical environments, together with the locations and sites of ECCD centers in the Cape Coast Metropolis, are good. The plausible reason is that the Cape Coast Metropolis is not a heavy industrial area. Rather, it enjoys a moderate business climate, which includes petty trading, crafts and other manufacturing, institutional workers, professionals (public servants—largely teachers), agriculture (farming and fishing), and fish processing [58]. Therefore, the location and sites of most of the ECCD centers in the Metropolis do not primarily expose children to notable harmful pollutants, especially from neighboring industrial facilities or contamination from past industrial use of land. This current finding is good and worth noting. Various stakeholders should make all efforts to maintain the outdoor environmental quality, especially in areas where these ECCD centers are situated. Evans [21] reiterated that the neighborhood set-up for ECCD centers is critical because some physical environmental conditions may pose potential developmental challenges for children. For example, some negative consequences (e.g., attention problems and movement-related challenges) have been linked to neighborhoods characterized by economically deprived conditions after controlling for individuals' socio-economic statuses [59].

4.3. ECCD Centre Heads/Coordinators' Understanding on the Importance of Outdoor Spaces and Play Yards for Children's Functional and Developmental Needs at ECCD Centers

The formulated hypothesis that ECCD coordinators would demonstrate an adequate understanding of the value of outdoor space and relate the values to young children's functional and developmental outcomes was partially supported. Follow-up interviews with the various heads/coordinators of the ECCD centers in the Cape Coast Metropolis partly acknowledged the importance of outdoor spaces towards children's learning experiences.

Substantiating previous research [7,25,60], the importance of specific features of the physical environment, such as outdoor spaces, was seen by heads/coordinators as a factor in children's enjoyment and learning at ECCD centers. Analytically, whereas these interviewed heads/coordinators valued

adequately designed open or outdoor spaces, they gave abstract responses to the concept of physical spaces and could not clearly express which specific elements (e.g., scale, form, organization) influence children's development and learning [2]. Importantly, it is crucial that ECCD center heads and coordinators demonstrate a thorough understanding of how well a center space, designed with tangible educational materials and not merely the availability of ideal space, could provide better communication and social interactions towards enhanced learning for children. Heads and coordinators' ability to vividly describe the ideal physical environment could provide architectural designers with a significant understanding of design prioritization for the ECCD centers [2]. For instance, ECCD personnel's understanding of 'modified open-planned space' with small and large play areas open enough for children to see out, related to important educational messages (i.e., contents), could change specific interactions between teachers, children, and the physical environment. These parameters may offer a sense of confidentiality in children's play, safeguard them from noise and distraction, as well as facilitate their attention and learning retention [3,5,6]. The design implication for this proposition is that a greater value would be placed on general indoor and outdoor orientation when first establishing an ECCD center, regardless of whether it is being established as a private or public educational set-up.

Additionally, the interviewed educators indicated that time spent in outdoor areas is key to promoting effective learning and development among preschool children [61]. The heads also indicated that playing outdoors helps with the upkeep of the children. This finding corroborates other research that spending some time in the sun during outdoor play can help improve children's health [35]. Additionally, ECCD center heads/coordinators also indicated that children need to play so that they do not become dull. When children are involved with play in an indoor or outdoor environment, their motor skills and abilities are significantly improved. Researchers [62] on physical education and movement science highlight the significant association between the fundamental period of preschool children and their development of motor skills. The Council on Physical Education for Children [63] emphasize that preschoolers, whose physical environment promotes physical activities, enhance their positive attitudes toward health and fitness. Other research has shown that the lack of physical activity in childhood is associated with sedentary behavior in adolescence and later adult life [64], often related to various health risk conditions (e.g., obesity, cardiovascular diseases) in adulthood [65]. Therefore, indoor and outdoor spaces that foster preschoolers' consistent involvement in physical activities during their early years may be the first step towards developing their psychomotor skills that positively contribute to a healthy lifestyle in later life [62].

Other areas of weakness shown by the profile of the 12 physical environment indicators were the "Play Yards: Functional Needs and "Developmental Needs". A follow-up interview with the center coordinators revealed that the centers were characterized by inadequacies of basic equipment (e.g., playing and educational materials) appropriate for children and playgrounds, due to a lack of adequate financial support. The educators showed appreciable understanding of why play yards were not meeting both the functional and developmental needs of children in the Cape Coast Metropolis, a finding consistent with other research [66]. Although basic equipment has a significant influence on children's development [18], there seems to inadequate attention by supervising authorities on the provision of these learning materials for ECCD centers in the city. According to Woodhead [67], most preschool yards across many parts of the world are just flat, hard, and open surfaces that reflect a traditional belief that children's learning only takes place in the classroom—a scenario that mirrors play yards of the ECCD centers in the Cape Coast Metropolis.

4.4. Limitations

The current findings should be interpreted in light of some limitations. This study was restricted only to the Cape Coast Metropolis in the Central Region of Ghana, one of the numerous Metropolises in the country. Therefore, the current findings limit generalizability to other geographical areas of the region and/or other parts of the country. A larger and more diverse sample group is required to fully appreciate the current and future role of the physical environment in the Ghanaian context and

undertake explicit observations and assessments of other areas of physical environment not captured in the current study. Additionally, children's data (e.g., growth pattern, cognitive, physical, and intellectual development) and other discriminant variables (e.g., socioeconomic background of the neighborhood, years of center creation) were not measured in the current study, hence, causality cannot be ascribed to current findings. Future studies could consider which specific physical environmental features of ECCD centers could predict children's intellectual and cognitive development. Further, given that CPERS could be used by different people (e.g., researchers, school staff, educators, and architects) who might differ in their knowledge and experience about early childhood programs, the use of test-retest and/ or inter-rater reliability, and possibly testing the psychometric properties of modified versions of CPERS would be appropriate. However, the number of ECCD centers (N = 160) in the current study and time constraints made using these reliability approaches practically impossible. Though the modified CPERS was validated by experts, the reported scores from the modified instrument should be noted with caution.

Despite our relatively small and homogeneous sample of eight educators (heads/coordinators), the use of a sequential exploratory design justified a full examination of the study variables. Gathering interview or focus group data to show emerging patterns or trends related to the physical environments of ECCD centers in early childhood education as a follow-up to a survey could enhance the correctness and precision of the quantitative findings [68]. This research design, according to Cabrera, could provide openings to assess the validity of personal perceptions on how the physical environment could help promote early childhood development through personal experiences that are considered very essential.

4.5. Practical Implications

The first early childhood in-school experiences predict later school accomplishment. Hence, the environment for children ought to offer a productive early school transition period, considered a "sensitive period" for later school success [69]. This transition period should promote a developmental pathway for the child through his or her social and physical environment that boosts new opportunities for personal growth [70]. The trajectory for development at this critical stage may also show an inverse association with the direction of the child's educational career. Consequently, the reasons that may impact this trajectory permit great consideration [71].

Immediately, when children enroll in ECCD schools, their protection and wellbeing, and access to buildings and teaching as well as recreational areas should be assured [72,73]. When the comfort of every child is guaranteed, effective learning will improve. Hence, the educational value of the physical environment should not be underestimated in terms of its organization and the experiences it provides. The interactions children have with the physical environment build a great bond with their teachers, promote their health, and boost overall mood and behaviors that ultimately build their development (e.g., psycho-motor), learning outcomes (e.g., literacy), and overall wellbeing (e.g., health [9,17]).

5. Conclusions

Summarily, the quality of ECCD centers in the Cape Coast Metropolis is not the best. The current study revealed that even though the locations and sites of early childhood schools in the Cape Coast Metropolis were of good quality, the overall assessment indicated that the physical environments (e.g., "planning of the centre", "building as a whole", indoor spaces", and "outdoor spaces") of these ECCD centers were of average standard. There was no significant difference between center auspices and the physical environment of ECCD centers in the Cape Coast Metropolis. Play yards of these schools do not meet the functional and developmental needs of the children. The relative importance of ECCD centers providing children with outdoor and play yard spaces was also acknowledged by heads/coordinators of these early childhood centers.

Based on the current findings, locations and sites of the ECCD centers should be maintained by supervising authorities (e.g., Ghana Education Service). Both private and public preschool establishments in the Metropolis should be supported financially for the provision of basic equipment for

these centers by governments, organizations, and private entrepreneurs. The establishing institutions should help improve the quality of the physical environments of these early childhood centers. The supervising institution (e.g., Ghana Education Service) could also provide in-service training for educators to boost their in-depth understanding of how physical environmental characteristics can effectively and developmentally promote effective teaching as well as learning. For a detailed understanding of the multidimensional perspective of the quality of physical environments and learning/developmental outcomes, future longitudinal and/or interventional studies could target which specific physical environmental features would elicit children's developmental outcomes across specific age cohorts in Ghana. Further exploration of children's perceptions of their preschools' physical environments could provide useful empirical information for appropriate policy interventions.

Author Contributions: All listed authors made significant, direct and academic contributions to the study and agreed to its publication. "Conceptualization, S.A.-E. and J.E.H.J.; methodology, S.A.-E.; software, S.A.-E.; validation, S.A.-E., J.E.H.J. and T.S.; formal analysis, S.A.-E.; investigation, S.A.-E.; resources, S.A.-E.; data curation, S.A-E.; writing—original draft preparation, S.A.-E.; J.E.H.J.; writing—review and editing, S.A.-E., J.E.H.J., and T.S.; visualization, S.A.-E., J.E.H.J., and T.S.; supervision, S.A.-E., J.E.H.J., and T.S.; project administration, S.A-E.; funding acquisition, S.A.-E., J.E.H.J., and T.S." All authors have read and agreed to the published version of the manuscript.

Funding: The article processing charge (APC) was funded through the Open Access Publication Fund of Bielefeld University.

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

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European Journal of
Investigation in Health, Psychology and Education

MDPI

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The English Version of the Health Profession Communication Collective Efficacy Scale (HPCCE Scale) by Capone and Petrillo, 2012

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Received: 17 October 2020; Accepted: 11 November 2020; Published: 13 November 2020

Abstract: Communication is a crucial component in all steps of the health care process. Therefore, it is important to have knowledge about the communication skills of the whole health organization. From the socio-cognitive perspective, collective efficacy beliefs are the main indicators of the capacity of functioning of the system. This work aimed to contribute to the validation of the English version of Health Profession Communication Collective Efficacy Scale (HPCCE scale) a self-report questionnaire measuring hospital doctors' beliefs to succeed as a group to meet the needs of internal and external communication and of communication with patients, examining the structure, reliability and convergent validity. This study was a cross-sectional investigation conducted using snowball sampling. The participants were 287 doctors working at different hospitals in UK. Explorative factor analyses and Rasch analysis confirmed the one-factor solution. Results revealed high internal reliability. The HPCCE scale correlated positively with Social Self-Efficacy. The English version of HPCCE is a valid instrument to measure communication efficacy beliefs in hospital, involving different type of doctors. It can contribute to the implementation and evaluation of management interventions in a health organization aimed at its optimization.

Keywords: communication efficacy; health organization; collective efficacy; doctors; Rasch model

1. Introduction

Over the last years, many works have dealt with doctor-patient communication, emphasizing the many advantages of effective communication for both interlocutors [1–6]. More specifically, a hospital doctor's communication has a dual dimension. He/she is responsible both for the quality of communication with the patient, and together with other figures, for hospital communication. He/she has to coordinate individual work with that of others, is influenced by beliefs, the motivation and the quality of the performance of colleagues and other components of the structure [7].

The studies on health organization have noted that the presence of an effective communication strategy is one of the structural and organizational features to the success of programs for improving the success of the organization [8,9]. The achievement of optimal results in communication is a primary aim for the entire hospital, in which doctors are an essential part [10].

According to the model of human agency [11], from the perspective of social cognition, collective efficacy beliefs have a central role among the beliefs that most contribute to the smooth functioning of a working team and to the achievement of an effective performance [12]. Bandura [11] defines collective efficacy as the belief shared by a group about the abilities of group members to organize and implement a series of actions required to meet the organizational goal [13,14] referring to collective efficacy as the revelation of group-level characteristics and the result of group members'

interactions, and indicating that the characteristics displayed by the group are greater than the sum of individual-level characteristics.

On the subject, several studies attest the significant impact of efficacy beliefs on the functioning of the group and in achieving collective performance [11,15]. In the last years, tools for measuring collective efficacy have been developed for a variety of topics and populations [16], but few, however, have been deployed in health organization contexts [7,17].

An organization's capacity of delivering better performance depends partly on the collective efficacy of its members. Usually, hospitals organize their staff into units or teams to maximize performance level through collective activities, such as team building. Hence, it is necessary to understand how collective efficacy influences health professionals' performance in a unit. Depending on its collective efficacy, a unit would perform in a more synergistic manner than an individual health worker. In general, organizations with strong communication policies can enrich their patients' health [18].

Hospitals involve a complex socio-technical health system [19], where communication failures influence the quality of an organization's work and contribute to adverse clinical events and outcomes [20]. Health care professionals and institutions need to recognize the importance of communication in health care in order to thrive. In communication acts, health workers perceive not only their own capability but also capabilities of their colleagues and of the whole organization, and form the impression of how well the organization can produce the expected outcomes. In an economic perspective, the Stakeholder theory [21] pointed out that health organizations need to consider the importance of developing a comprehensive discourse with different stakeholders, and to incorporate their responses into health care scenarios. Freeman defines stakeholders as "any group or individual who can affect or is affected by the achievement of the organization's objectives" [21] (p. 46). In the context of our study, stakeholders are patients, employees, users and external institutions. They expect a hospital to behave responsibly to relieve problems and to adequately present procedures and processes. Therefore, health organizations feel they must meet the expectation of the stakeholders to maintain a good reputation in an increasingly very complicated landscape, to maximize their performance and value generated, and to motivate employees and satisfy users [22]. In this perspective, communication plays a central role in serving the organizational process [23].

The communication collective efficacy of health organization refers to the beliefs of health workers, that their organization is able to communicate with different stakeholders. Conceptually, whereas collective efficacy involves members' beliefs about the prospective capabilities of their group, the team performance is about the actual performance of a task. Despite this conceptual distinction, correlations between collective efficacy and performance have been extensively verified in the literature [24]. Hence, the communication collective efficacy of health organization could be a useful indicator of the performance of health workers.

On the subject, the Health Profession Communication Collective Efficacy Scale [7] was designed to assess collective beliefs of the physicians about the hospital's capability to successfully manage, with the help of various health workers, problematic situations related to internal, external and with patients' communication. The scale, consisting in 16 items, has a one-dimensional structure and excellent psychometric properties. It could be used in training aiming to enhance the individual and collective resources of health professionals.

1.1. Communication in Health Organization

Effken [25] describes health care as a complex dynamic system in which people cooperate for patient care and are faced with numerous contingencies that often cannot be anticipated. Health care occurs in a variety of physical and organizational settings, but hospitals are the institutions that play one of the most important roles as they have an impact on the social, economic and environmental issues and also on health promotion [26].

Despite the division into wards and departments, a hospital gives an image of unity. This also applies to communication: the individual operators' communication acts on hospital communication; hospital communication influences individual operators' communication. Organizational communication is not only an exchange information between the two or more individuals or group in an organization, who created the common basis understanding and feelings [27]. When the members of the organization communicate with each other on an individual basis as well as in groups, they need to take into account the norms, values, standards and principles of the organizational culture [28]. It is not easy to define the characteristics of an effective communication at the organizational level. In general, "the communication system at an organization is both a reciprocal, dynamic process and a structural construct, determined by a set of internal and external factors, enabling horizontal, vertical, and diagonal information flow throughout the organization and also effectively and efficiently operating a number of communication categories with the aim to help individuals reach both their own and organizations' communication goals, creating synergy among communicators" [29]. In the perspective of the stakeholder theory [21], stakeholder principles lead organizations to develop cooperative and trusting relationships with their major stakeholders, leading to higher levels of innovation, efficiency and value creation [30]. Based on these considerations, hospital communication fulfils some main functions, at different levels and with different stakeholders: (1) allowing the organization of the operational structure and the connection between the individual units; (2) improving the relationship between doctor and patient and accompany the therapeutic and diagnostic process; (3) improving the information relationship with social, family and territorial background [31]. So, each health care system has multiple forms of communication that administrators and staff must be trained to use properly and efficiently.

A hospital needs to manage internal communication between staff, to convey medical information about patients between departments quickly and with respect for privacy, but also to share the objectives of hospital corporation, retrain operators, and provide information service.

Communication becomes a central element in the functioning of the hospital, both in the care organization and in the management of conflicts between health professionals and patients. Without communication, the quality of healthcare would be impaired. It falls within hospital corporation's brief to promote among health care workers the importance of good communication and facilitate communication between staff and patient [32–34].

Health care corporations that do not update and fail to inform and to accommodate the patient adequately may create hostility in the patient before his/her meeting with the doctor [35].

Improving the quality of the relationship between the health care corporation and the territorial institutions, as well as with the citizen, which is the principal recipient of the services offered, is one of the objectives of external communication. In this regard, the "Health Services Charter" is the tool of communication par excellence. A hospital corporation is responsible for identifying and communicating information on how to access diagnostic and specialistic services. In the pre-reception phase, front-office staff must provide comprehensive information to users who need these services, including an information pack. Each hospital also has the task of implementing an Internet site containing key information on the structure and consistency with the Health on the Net Foundation specifications. Even listening to citizens and the management of complaints has taken, in recent years, an important role in the hospital's organizational structure [36]. The hospital also has a central position in promoting health. As it is well explained in the "Vienna Recommendations on Health Promoting Hospitals" [37], hospitals, by reaching a broad sector of the population, can implement effective health promotion campaigns in the territory.

The lack of integration between the various members of the structure, inadequate technologies to facilitate communication, and disincentives, such as too long work shifts, are the main causes of communication problems in the hospital [38].

Clinicians, for example, put the blame for having little time for their patients and still having to cope with full waiting rooms on the lack of support by the health care organization: these two conditions make it impossible for effective evaluations and comprehensive answers to patients' requests [39].

As Bandura [40] states, "now being the communication a tool essential in modern public organizations, both in the field of production processes and in the improvement of relations with citizens, but especially of the quality of services, it is necessary to strengthen the whole communication of health corporation".

1.2. Collective Efficacy in Working Group and Organization

The socio-cognitive theory [11] pays a lot of attention both to personal and collective agency. It defines collective efficacy as "a group's shared belief in its conjoint capabilities to attain their goals and accomplish desired tasks" [40] (p. 19). The members of a group not only must coordinate their individual work with the work of others, but are influenced by the beliefs, the motivation and the quality of the performance of their collaborators [11,41].

Perceived collective efficacy is interesting for several reasons. Firstly, group members' perceptions on the group capacity to perform various tasks are a first indicator of the possible methods of undertaking the task itself. Moreover, collective efficacy is a valid and robust support to achieve group successes. The more the functioning of an organization is derived "from the capacity to access the skills of each and to concentrate their use in the service of common objectives, and the more the members have reason for trusting in the achievement of common goals, the more shared collective efficacy beliefs have a decisive role in supporting the commitment and trust" [42] (p. 10). The findings of an important meta-analysis showed that collective efficacy beliefs explain a good part of variance in the quality of group functioning [43]. In other words, collective efficacy is about the performance capability of the group as a whole.

From the socio-cognitive perspective, collective efficacy beliefs are the main indicators of the capacity of functioning of the system [41]. Stronger collective efficacy perceptions are related to higher aspirations of the group and to a motivational investment in its tasks, as well as to a stronger ability to control the setbacks, a higher morale, a greater resilience to stressors and a greater commitment [44]. Collective efficacy may influence the pursuit of success and how people manage their resources, projects, and strategies, as well as the efforts they make in group attempts and the vulnerability to discouragement [11,45,46].

People with high levels of collective efficacy orient their behavior towards the planning and use of shared resources and the willingness to persist, despite internal conflicts, changes in political or social concerns [47]. Collective efficacy is not simply the sum of individual efficacy beliefs: it is a group attribute resulting from the dynamics of interaction and cooperation. On the other hand, however, as Whyte [48] states, "inflated" perceptions of collective efficacy are possible antecedents to the failure in the implementation of specific tasks.

Zaccaro [49] defines collective efficacy as "a sense of collective competence shared among members when allocating, coordinating, and integrating their resources as a successful, concerted response to specific situational demands" [49] (p. 309).

As Karrasch [50] stresses, this definition encompasses several key elements: collective efficacy as a shared belief, the perceptions of competence in a collective's coordination activities, the consideration of other members' resources and the specificity of the situation, the behavior and the task of collective efficacy.

Collective efficacy motivates or demotivates individual behavior of the members of the group, influencing its goals and commitment to achieve them. Several studies show that efficacy beliefs contribute significantly to the levels of motivation and performance [51–53]. Karrasch [50] (p. 143) argued in this regard that "perceptions of collective efficacy influence what people choose to do as a group, their efforts and their power to stay together when the efforts of the group fail the objective". This positive relationship between collective efficacy and team goals was confirmed by Prussia and Kinicki [53]: groups with high efficacy are more tied to their prefixed goals compared to groups with low efficacy.

Probably one of the more recognized reasons for the growing interest in the construct is the positive link between collective efficacy and the aims achieved by the group. Many works have shown the strong correlation between collective efficacy and the implementation of good group performance: a high sense of collective efficacy, not illusory, but based on experience, determines the success of an organization and protects its solidity in times of difficulty and crisis [12,24]. Conversely, when high personal efficacy beliefs are associated with low collective efficacy beliefs, there is the basis for an increase of demotivation, disengagement and conflict that inevitably exacerbate or accelerate the decline of an organization [11].

Those with low levels of collective efficacy do not believe that the group is able to achieve its prefixed goals and this causes a state of apathy and indifference to it [54–56]: these perceptions directly affect the care and determination with which groups choose to pursue their own purposes. In a hospital setting, collective communication efficacy was correlated positively with well-being and quality of life [57] and negatively with burnout, and lack of professional fulfilment of health professionals (doctors and nurses) [58].

1.3. Aims and Hypothesis

The aim of the work is to contribute to the validation of the Health Profession Communication Collective Efficacy Scale (HPCCE scale) by Capone and Petrillo [7], a self-report questionnaire for doctor' perceptions of collective efficacy in the communication of their hospital. We aimed to evaluate the validity of the English version of the scale by examining the structure, reliability and convergent validity.

We expect to confirm the mono-dimensional structure of the scale as found in the original study.

We hypothesize that the English version of HPCCE scale has a high internal reliability, similar to earlier findings in the Italian sample.

We hypothesize that our study confirms the convergent validity of the English version of the scale, correlating positively with a corresponding measure.

2. Materials and Methods

2.1. The English Version of Health Profession Communication Collective Efficacy Scale

The English translated HPCCE was back translated to ensure translation equivalency. Psychometric testing of the HPCCE (English HPCCE) was then conducted. Two bilingual PhD researchers were involved in the translation process. One of the researchers who translated the original tool to English was a researcher in Social Psychology from a university in the UK. The other translator, who had been educated in Italy and had a PhD in Psychology, translated the English HPCCE back to Italian, without any discussion with the first translator. Subsequently, adjustments were conducted to ensure understandability, psychological equivalence, and the accuracy of the translation from Italian to English. The original and back-translated Italian versions did not differ appreciably as judged by the translators.

The questionnaire was presented to a panel of experts to establish content (face) validity prior to conducting the study. This panel of experts consisted of three academic researchers, who have successfully validated measures of efficacy beliefs, and two UK hospital doctors.

Convenience sampling was then used to test the survey questionnaire to 10 doctors working in hospitals. They were asked to provide feedback on content for improvement. Feedback from respondents during this pilot test provided guidance for making necessary amendments on the questionnaire items [59].

2.2. Participants

This study was a cross-sectional investigation conducted using snowball sampling. The participants were 287 doctors working at different public hospitals in UK. Participants were initially recruited through direct contact with a researcher living and working in UK. Additional participants were recruited through snowball sampling guided by the social networking efforts of study

participants. No compensation for participation was provided. Completion lasted 15 min. Doctors received an explanation of the study aims and reassurance of anonymity, confidentiality, and use of their responses solely for the purposes of the research. Subjects gave their informed consent.

The subjects were mostly men (M = 68.8% and F = 31.2%), with an age ranging from 27 to 69 years (mean = 48.65 years, SD = 10.02). Most of the doctors held an important position in the hospital: 60.0% of the sample were first-level managers, 20.0 % were second-level medical directors, 18.0% were responsible for the service, while 4.0% were specializing.

The length of service of the medical profession is 17.83 years on average (range = 1–40, SD = 9.73). The length of service in ward is instead 13.42 years (range = 1–37, SD = 9.71). The weekly working hours in the ward are on average 37.91 (range = 15–70, SD = 5.98).

2.3. Measures

The survey instrument was a self-report questionnaire that included, in addition to the HPCCE scale, a form for the collection of socio-demographic data and, to verify the construct validity, the scale of Perceived Social Self-Efficacy [60].

In its original version, the HPCCE scale consists of 16 items assessed on a five-point scale (1 = "not at all capable" to 5 = "completely capable"). It measures the beliefs of hospital doctors about their capacity of succeeding as a whole (physicians and other hospital professionals) to cope with different critical situations related to internal and external communication, and communication with patients.

The scale of Perceived Social Self-Efficacy notes individuals' beliefs relating to their capacity of fitting easily, feeling at ease and playing a proactive role in social, sometimes new, situations. It consists of 15 items; for each item, respondents rated to what extent they considered to be capable of managing social relations on a five-point scale (1 = "not at all capable", 5 = "very capable").

2.4. Procedure

The first step, in order to validate the HPCCE scale, was an exploratory analysis of data collected. To this end, using the SPSS 21.1 software [61], normality was tested through skewness and kurtosis, and the number of latent dimensions was determined by Factorial Analysis (method of principal axis factoring and Oblimin rotation of the factors) and through Scree test; finally, the internal consistency of the scale was measured with Cronbach's Alpha.

Subsequently, the Rasch model was used to confirm the mono-dimensionality of the scale and to obtain a more accurate analysis of the items. To this end, using the software RUMM 2030 [62], it was possible to calculate the overall fit of the model—which provides a summary measure of adaptation of the model to the data—and the indices of adaptation of the items, with particular reference to their significance in terms of Chi-square (items possessing values of $p > 0.05$ adhere consistently to the latent dimension), to residuals (normal values are considered between −2 and +2) and to the thresholds (Andrich [62] speaks about thresholds as he assumed that between a category and the following one that there is a threshold, a kind of border which is a parameter that "qualifies" the item position).

3. Results

3.1. Exploratory Analysis

Skewness and kurtosis of the 16 items of the scale have shown that all the items are near the normal curve. Therefore, Factorial Analysis was conducted on all the items, from which two factors emerged with eigenvalue > 1: the first explains the 57.85% of the total variance (eigenvalue = 13.69), while the second factor explains 2.97% of the total variance (eigenvalue = 1.06). The reading of the Scree test has suggested the interpretation of a single dimension. Therefore, the analysis was again carried out with the extraction of a single factor that explains the 57.72% of the total variance. The saturation of the items ranges from 0.82 to 0.67. The Cronbach's Alpha coefficient was very high, equal to 0.97,

as well as from the analysis of item-total correlations which did not yield the required elimination of any item (Table 1).

Table 1. Exploratory Factorial Analysis, item-total correlation and Cronbach's Alpha if item deleted.

	Factors' Loading	Item-Total Correlation	Cronbach's Alpha If Item Deleted
Item 12	0.82	0.81	0.97
Item 4	0.82	0.80	0.97
Item 2	0.81	0.79	0.97
Item 10	0.80	0.79	0.97
Item 6	0.80	0.79	0.97
Item16	0.80	0.79	0.97
Item15	0.79	0.78	0.97
Item 3	0.79	0.77	0.97
Item11	0.78	0.77	0.97
Item 8	0.77	0.76	0.97
Item 9	0.77	0.76	0.97
Item 13	0.77	0.75	0.97
Item 7	0.76	0.75	0.97
Item 5	0.75	0.74	0.97
Item 14	0.75	0.74	0.97
Item 1	0.75	0.74	0.97

3.2. Mono-Dimensionality Tested through the Rasch Model

An analysis conducted on the responses given by participants to the 16 items of the HPCCE scale founded that the Chi-square—index for the assessment of levels of total matching—cannot be considered satisfactory (χ^2 = 129,679 (92), p = 0.006), although the index of separation, sensitive to the discriminatory power of the categories of response is very good (excellent: 0.96). Therefore, the requirements outlined above were more deeply analyzed and assessed: first, the thresholds are all ordered, that is, there is a correct choice of the number of modes of response in order to detect all the different positions of the participants contacted; second, the analysis of the items showed no items had significance levels below 0.05 or residual non-acceptable. So, the English version of the scale consisted of 16 items with five modes of response, has a probability of Chi-square > 0.05 (χ^2 = 68,538 (64), p = 0.33) and excellent separation index (0.95) (Table 2).

Table 2. Items' order of Health Profession Communication Collective Efficacy Scale (HPCCE) according to scores in logit (Location) and its residues (FitResid), Chi-square (ChiSq), grades of liberty (DF) and probability of Chi-square (Prob).

Item	Location	FitResid	ChiSq	DF	Prob
8	–0.506	–0.39	4.624	4	0.33
11	–0.495	–0.30	7.774	4	0.10
5	–0.266	1.82	2.710	4	0.61
13	–0.238	1.72	9.017	4	0.06
16	–0.234	–1.39	8.037	4	0.09
6	–0.202	–0.47	0.576	4	0.97
9	–0.148	0.10	1.598	4	0.81
15	–0.097	–0.59	6.898	4	0.14
2	–0.065	–0.17	0.184	4	1.00
3	0.101	0.17	2.134	4	0.71
4	0.132	–0.40	5.038	4	0.28
1	0.208	1.43	1.442	4	0.84
7	0.284	0.54	1.874	4	0.76
12	0.302	1.05	7.977	4	0.09
14	0.323	–1.65	6.663	4	0.15
10	0.903	–1.83	1.993	4	0.74

The test of item-person adaptation indicates that there was a good consistency of patterns of responses of the participants and the items (Table 3). The standardized average of residuals' fit of the items was −0.06 and the relative standard deviation was 1.13, the standardized average of residuals' fit of persons was −0.46 and the relative standard deviation is 1.77.

Table 3. The test of item-person.

	ITEMS		PERSONS	
	Location	Fit Residual	Location	Fit Residual
Mean	0.00	–0.06	–1.58	–0.46
Standard dev	0.36	1.13	1.94	1.77

3.3. Construct Validity

The construct validity of the English HPCCE scale has been tested through an analysis of the bivariate correlations between it and the scale of Perceived Social Self-Efficacy (Pastorelli and Picconi, 2001), as in the original validation study. The two scales were positively and significantly correlated ($r = 0.37$, $p < 0.001$).

The validation procedures show that the HPCCE scale measures hospital doctors' beliefs to succeed as a group (physicians and other professionals) to meet the needs of internal and external communication and of communication with patients (Appendix A).

3.4. Descriptive Data for the Whole Sample

As for the variables considered, we found the following trends. Doctors have low levels of perceived collective efficacy in communication in the hospital (2.30, SD = 0.78). They have, however, higher values of social perceived efficacy (3.20, SD = 0.74): they considered themselves, in fact, quite able to fit easily in a group and play a proactive role in social situations.

3.5. Differences between Groups According to Length of Service

The participants were divided into three groups according to the working years of the medical profession: (a) young doctors (from 1–10 years), (b) doctors in career (11–21 years), (c) medical experts (22–37 years).

The univariate analysis of variance (Table 4) and post hoc Tukey test showed that the doctors in career and young doctors have levels of collective efficacy in communication in the hospital higher than medical experts (doctor in career = 2.42, young doctors = 2.21, medical experts = 2.06). There are significant differences between the groups, however, with regard to perceptions of social self-efficacy.

Table 4. Analysis of variance. Differences between groups according to working years of the medical profession.

	Young Doctors N = 76	Doctors in Career N = 97	Medical Experts N = 101	F(df)	*p*
HPCC	2.28 [a]	2.43 [a]	2.06 [b]	6.325 $_{(2,281)}$	0.02
Social self-efficacy	3.14	3.16	3.24	6.845 $_{(2,140)}$	0.63

[a] and [b] show graphically the results of the Tukey test.

4. Discussion

The shared beliefs of people in their collective power to attain desired goals are a key ingredient of collective action. The results achieved by a group are, in fact, not only the product of knowledge and skills shared by its members, but also of interactive and synergic dynamics of their transactions [63]. Bandura [11] introduced the concept of collective efficacy as an extension of the social cognitive theory at the group level. A high and widespread feeling of collective efficacy, which results from

the tests actually passed and the successes achieved, is a driving force allowing the best use of social system resources [44]. In the context of interdependence, "as many organizational contexts, success (also) depends on beliefs of collective efficacy, namely the practices of acting together and the beliefs that sustain these practices" [64] (p. 16). The sense of efficacy also plays a key role in human functioning not only directly but also through the influence it exerts on other important personal determinants, such as objectives and aspirations, expectations of performance, emotional inclinations, perceptions of obstacles and social opportunities. Many of the results that people reach are available only through efforts that are interdependent: the effectiveness of a health care organization depends on the multidisciplinary collaboration of a working team, on its ability to communicate, integrate, share and collaborate. The hospital has to ensure successful communication: internal, external and with patients. Effective communication, both intrahospital and interhospital, is important for providers to protect their patients, save on costs, and increase day-to-day operating efficiency [1]. For an optimal functioning of the organization, increasing importance has not only examined the perceived quality of service to users, but also analyzed the perceived communication capacities of the system by the staff.

The scale presented in this work aims to measure the hospital professionals' beliefs to face, as a group, specific situations they may encounter at the hospital with reference to the communication between the various components of the hospital, between health professionals and patients, and between the hospital and the background. The psychometric characteristics of the English HPCCE scale were similar to those of the original version. The instrument has shown good properties, and the use of Rasch model has enabled not only its streamlining through a more careful analysis of the items [65], but also to ensure that perceptions about hospital communication beliefs are not differentiated in different dimensions, as aspects related to internal, external communication and communication with patients are part of a single dimension of collective communication efficacy.

The results of correlational analyses highlighted the goodness of the instrument in identifying the construct of our interest. The positive correlation found between the scale of perceived HPCCE and the scale of Perceived Social Self-efficacy means that there is a degree of interdependence between the constructs, as both reported to efficacy perceptions in areas brought together by their common relational feature; but considering the values of the correlation, this is not, such as, to call into question the relative autonomy of the constructs. This result lays an emphasis on the nature of collective efficacy as a socially shared perception and an emergent property of the social system. It does not coincide with the simple sum of perceptions of personal efficacy [49], even when the areas of functioning are the same. This finding contributes to the theoretical debate on the relative autonomy of these two constructs [16,66]. However, in future studies, it would be appropriate to use an organizational efficacy scale for convergent validity.

The descriptive analysis results are in line with the literature, which generally shows the tendency of individuals belonging to different spatial and organizational backgrounds to express collective efficacy beliefs lower than self-efficacy assessments [67]. This is understandable according to an optimistic bias in the assessment of self-reported features, involving, more directly, aspects of their identity, while assessments related to aspects of a collective entity, which inevitably are influenced by the social shared image of the organization, are those with whom they can identify themselves in a different individual way, including mutual images that tend to develop between the various components.

The assessment of doctors' collective communication efficacy refers, in fact, also to their assessment of communicative efficacy of departmental colleagues, nurses, and managers of the structure, and to their assessment of the capacity of integration between these different competences. The English version of HPCCE results as a useful scale to retain the differences between subgroups of doctors. In this sense, length of service within the hospital was particularly significant, which has highlighted a gap between medical experts, with more than 20 years of work, who expressed greater confidence in communicative collective efficacy, and other groups. Probably, their perceptions are slightly, but significantly less negative for different reasons, and different interpretations about it make clearly understood the choices made in attributing the labels to the subgroups of doctors. One can infer that for those working less

time in hospital, it was not yet possible to fully assimilate the organizational culture and establish the continuity of practices, routines and decision-making processes in co-constructed and collaborative ways, which characterize working groups at high interdependence; neither were they able to have adequate positive confirmations of the practices shared that were recently undertaken, to know the consequences in the medium and long term of choices made in a team and with a shared responsibility. For young doctors, therefore, less pessimism towards the efficacy of communication is related to a still imperfect knowledge of organizational mechanisms that, combined with an ideal charge toward the corporate mission, leads them to develop a minor criticism compared to older doctors. Their adjustment around values closest to mean scoring makes them closer to doctors in career, who are more internal to organizational processes and hold management positions or are closest to achieving goals of success, so they are also more motivated to contribute and enhance the development of a positive atmosphere and a cooperation in working groups.

We must also consider the possibility of a larger impact on perceptions of older doctors with malpractice experience in the specific contexts of belonging, and of recent changes in public health organizational structures, which have strongly marked the Italian health system: these elements, taken together, may have contributed to their increased pessimism and to a lesser identification with the hospital.

5. Limitation

The cross-sectional design of our study limits the interpretation of our findings and did not allow us to infer causal relationships. Watson et al. [68] found that collective efficacy was relatively stable over time: it will be necessary to verify the stability of the measure with a test-retest reliability. We also recommend that future researchers consider a longitudinal design that would provide greater clarification regarding the relationships between variables. Future studies may also benefit from gathering collateral information from employing organizations in order to establish the convergent validity of participants' efficacy beliefs and to enhance the interpretability of our results [69]. All participants worked in public hospitals. Research evidence suggests that globally, health care personnel in public hospitals work under appalling conditions [70]. Future studies should take into account the differences between public and private structures. Finally, we were limited by our convenient and small sample size. The sample was not balanced by gender. Even if in 2019, there were approximately 162.1 thousand registered doctors in the United Kingdom who were male, compared to 139 thousand females [71], future studies should investigate the specific contribution of demographic variables.

Another limitation concerns the variety of the number of hospitals participating in the study. This latter limit did not allow to use organization as a unit of analysis; considering that we took into account efficacy at the collective level, this might be expected. Thus, future studies should try to collect data in a higher number of hospitals and track participants' health organizational affiliation in an effort to identify and reduce possible bias in recruitment. The self-report instruments have the potential for issues of social desirability bias. Although we need to consider this limitation, it is reasonable to think that our data was not highly influenced by this bias because anonymity was guaranteed in data collection [72].

Finally, although the original version of the scale was developed thinking of the concertation between all the components of the hospital, our work presented the results of the validation for doctors. A validation study of the HPCCE scale with nurses and other professionals, such as technical and administrative profiles, equally involved in communicative practice, would be desirable.

6. Conclusions

We can conclude that findings from the current study provide evidence for the factorial validity and reliability of the HPCCE scale. This instrument covers a methodological and instrumental gap in the existing literature and responds to a very specific need in health communication. Based on the good psychometric properties of the scale, we recommend a wide use of it in health communication research. Therefore, it could be usefully employed with different purposes of intervention. The scale can be best applied, in fact, in the empirical study of factors that affect communication in the hospital. Hoping for, more generally, an increasing focus on communication by health professionals, this tool can also be used in training aimed at enhancing communication skills directed to various professions involved in prevention, treatment and rehabilitation, and to develop a sense of membership and collaboration within a hospital community. Reasons for measuring the quality of care include identifying potential areas for improvement. The HPCCE scale could be used as a tool in local quality improvement initiatives as well as in national health care strategies. Hospital managers should recognize the characteristics of a working group (for example: leadership style, efficacy of a leader, atmosphere of a team, collective efficacy).

The English version of the scale can be applied optimally to assess potential organizational problems prior to conducting major interventions; investigate dynamic problems in communication; target interventions designed to enhance perception of efficacy beliefs, and incorporate evaluation of communication collective efficacy as part of regular employee assessments. In future developments, we expect to verify the stability of the instrument in different populations implicated in hospital practice. The scale should also be tested and validated in languages other than Italian and English for usage across cultures.

Author Contributions: Conceptualization, V.C.; methodology, V.C., L.M. and A.R.D.; software, V.C. and A.R.D.; formal analysis, V.C. and A.R.D.; investigation, V.C.; data curation, V.C., L.M. and A.R.D.; writing—original draft preparation, V.C. and L.M.; writing—review and editing, V.C.; supervision, V.C. and A.R.D.; project administration, V.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

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

Appendix A

Below, you will find a series of statements concerning the Hospital where you work (along with all other coworkers). Mark, for each proposed statement, the score that comes closest to its location.

Table A1. The English Version of the Health Profession Communication Collective Efficacy Scale.

①	②	③	④	⑤
Nothing	**Little**	**Enough**	**Very**	**Completely**

In which instance is Assess of the Hospital where you work capable of achieving as specified below? Remember that Hospital refers to you, along with all other hospital workers: thus "My Hospital" means "I, along with all other operators".

1. My hospital is able to provide contacts between the company and users by implementing effective health promotion campaigns on the territory.
2. My hospital can achieve the goal of good communication by providing a Service Charter that is comprehendible and accessible.
3. My hospital is able to facilitate communication with other public and social services operating in the area.
4. My hospital is able to provide opportunities to qualified medical staff to update on all patient communications.
5. My hospital knows how to foster information to various operational units, in the exchange of patient information quickly, while keeping privacy in respect.
6. The hospital where I work is able to face difficult issues, confronting operators to develop viable solutions.
7. The hospital where I work is able to demonstrate, with clear communication and motivation, strengths, and those that could be improved through joint work.
8. My hospital is capable of sending out a positive image of itself.
9. My hospital is able to achieve the goal of ensuring that optimum communication operators in the front office are knowledgeable and helpful.
10. The various health workers of the hospital where I work, know that working together can ensure optimal communication with the patient.
11. The hospital where I work is able to meet the needs and gather any reports or complaints by patients.
12. My hospital is able to foster communication between myself and the other operators.
13. The hospital where I work is able to ensure adequate communication between health professionals and administration.
14. My hospital is able to ascertain the strengths and weaknesses of the company by doing surveys among operators and analyzing the information provided.
15. My hospital is able to ensure that inner hospital communication ensures adequate organization with the patients, such as avoiding overcrowded waiting rooms.
16. My hospital is able to provide adequate space to allow communication with patients in quiet and privacy.

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European Journal of
Investigation in Health, Psychology and Education

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Characteristics of Academic Adaptation and Subjective Well-Being in University Students with Chronic Diseases

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Received: 10 July 2020; Accepted: 17 August 2020; Published: 20 August 2020

Abstract: Studying academic adaptation and subjective well-being in students with chronic diseases can help to explain psychological compensatory mechanisms and help with the development of socio-psychological support programs. It is supposed that the defining role is played by general adaptive potential, and the presence of chronic diseases results in variations in academic adaptation, which, alongside other variables, acts as a predictor of subjective well-being and satisfaction of basic needs. The sample consisted of first-year university students aged 17–26 years (mean = 19.6, SD = 2.8, 18.4% male; n = 419 persons, of which 34.8% with chronic diseases of various etiologies). To evaluate the components of students' academic adaptation, we used the Academic Adaptation Scale; general adaptive potential was measured using the Multilevel Personal Adaptability Questionnaire; to evaluate subjective well-being, we used the Subjective Well-Being Scale; and satisfaction using the Life Scale. Satisfaction of basic needs was defined with the Basic Needs Satisfaction in General Scale. Students with chronic diseases demonstrated lower manifested adaptive potential, general markers of academic adaptation, subjective well-being, and satisfaction of basic psychological needs. The results showed that interrelations between various markers in students are largely mediated by academic adaptation and adaptive potential. Thus, the interconnection between adaptive potential and satisfaction of basic needs is significantly mediated by students' academic adaptation, whereas the interconnection between chronic diseases and academic adaptation is mediated by adaptive potential. In other words, the findings support the assumption regarding the significant mediating role of these variables in subjective well-being. Cognitive, motivational, and communicative components of academic adaptation can serve as compensatory factors for experiencing subjective well-being in students with chronic diseases.

Keywords: academic adaptation; subjective well-being; university students; chronic diseases

1. Introduction

Modern life, which is marked by deteriorations in the environment, poor nutrition quality, and chronic stress, negatively influences human health. Only 66.6% of young Russians aged 15–19 years and 68% of young Russians aged 20–24 years describe their health as "good"; 15.8% aged 15–19 years and 16% aged 20–24 years describe their state of health as "satisfactory"; and 1.1% and 1.7% of the respondents evaluate their health as "poor" or "very poor," respectively [1]. According to data from the Ministry of Health of the Russian Federation, which were presented at the All-Russian Forum on Public Health, about 50% of the Russian population has chronic disease [2]. Currently, there are different approaches to understanding the phenomenon of chronic diseases. Thus, Hale wrote, "... the state of chronic illness involves impairment of physiological processes that restricts activity and function,

even if the underlying impairment is poorly understood and intangible" [3] (p. 8). All chronic diseases are characterized by a significant decrease in the body's endurance. Chronic disease differs from other disorders and diseases in that it affects global functions, both physical and cognitive, and is not localized to a specific organ, being unstable and fluctuating. Health disorders can influence human psychology and negatively impact the human ability to adapt.

Significant changes are occurring in both the lifestyle and activities in the course of study at higher educational institutions. When a person enters university, they undergo changes in their life situation, such as moving to a new place or changes in routine commute, inclusion in a new social environment, changing forms of education, and mental stress. The necessity to adapt to educational conditions, the new collective, and professional activity requires mobilization of all resources of the human system. It is also important to create conditions for equal opportunities for education regardless of the presence or absence of diseases within educational environment.

However, research on the academic adaptation of students with chronic diseases clarifying the psychological compensatory mechanisms of their adaptation is still insufficient. This is why versatile analysis is needed on adaptation of students with chronic diseases compared to students without chronic diseases, as well as comparative analyses of factors that characterize attitude to life in general, which is expressed through their subjective well-being. This knowledge will assist with the development of programs for adaptation and the provision of socio-psychological support for students with chronic diseases.

1.1. Academic Adaptation as a Health Factor

Academic adaptation is the process and result of student adjustment to the educational environment, including the system of interpersonal relations in education, educational activities, and educational space, which characterizes the experience of a dynamic balance between the individual and the educational environment. Academic adaptation of university students has been studied in its interconnection with academic performance and personal-emotional adaptation [4], academic self-control [5], nature of relationships within the student environment [6], characteristics of the family situation [7], and ethical convictions [8], which are important components of the academic environment and, particularly, the accepted norm of academic honesty [9], as well as many other variables. Many studies focused on the academic adaptation of international students in host universities all around the world [6,10–12]. This is a relevant problem due to increasing academic mobility. These investigations allowed for tracing students' characteristics, which are important for their academic adaptation, and for defining the connection between adaptation and internal personal resources, as well as the connection between adaptation and general psychological and physical health. Thus, recent studies found that academic self-efficacy, social support, and low levels of perceived discrimination predict both psychological and academic adaptation of Chinese students in English-speaking countries [12]. These variables are relevant for students that attend university in their home country. Despite prejudices in the student environment (based on the signs of otherness, i.e., physical or social) being manifested to a lesser degree than in other environments, the projected discrimination lowers young people's adaptive potential [13].

An important condition for students' academic adaptation at the beginning of their academic career at university is an orientation that defines the purpose of their study using a wide range of learning strategies and level of academic involvement [14]. Transition from a school educational environment to university presupposes adaptation to a new social and spatial environment and to a new academic environment, which does not have such strict control but simultaneously requires academic skills, which have not yet been fully developed in former schoolchildren. A change in learning strategies is required, which is often a dramatic process and affects not only academic performance but also university students' psychological state [15]. However, academic adaptation of university students is important for productive learning. Thus, a number of studies showed that academic

performance is predicted by successful adaptation to university (emotional and personal adaptation) and pre-university performance [4].

Students that do not succeed can demonstrate perseverance driven by desire to complete their course of studies and to live up to expectations and thereby pursue academic adaptation [16]. Researchers reported that adaptation of such students is mostly associated with changes in their own learning habits and prioritization, as well as support from family and friends [16] (p. 90). A study regarding effects of academic stressors on mental health [17] established that evaluative stress is the strongest type of stress, and strong social connections at university are the health factor. In other words, inclusion in a student group, as one of the indicators of academic adaptation, acts as an important factor of students' mental health. Zimina et al. [18] emphasized the significant influence of the state of both physical and psychological health on adaptive resources of the human system. Thus, the authors found that adaptation mechanisms in students are reduced, as indicated by the low level of psychological well-being, low level of stress resistance, reduced activity, negative attitude toward themselves, and dissatisfaction with the circumstances of their lives. Despite available data on a possible interconnection between academic adaptation and subjective well-being, there has been no specific study of this issue.

1.2. Academic Adaptation of Students with Chronic Diseases

The academic adaptation of students with chronic diseases is burdened by a number of problems that are not only related to their state of health, but also to their attitude to their physical condition, state of health, the need to constantly monitor a number of its parameters, as well as identity with good health or ill health.

A special group, which has so far not attracted any close attention from researchers and practitioners, is represented by students with chronic diseases, despite their impressive number [19–21]. Students with chronic diseases are often not viewed as subjects in need of directed psychological support. Researchers [22] noted that chronically ill people often experience a dissonance between "healthy" identification and the need to prove the status of their ill health at university to receive academic support, which causes contradictions in their adaptation to the educational environment. The peculiarities of one's state of health are interconnected with the mental and psychological states of an individual [23,24], which may affect the success of their academic adaptation and experience of subjective well-being. Recognizing individual characteristics, like health status and psychological state of each person with a chronic disease, is necessary to acknowledge the possible impact of the disease on their psychology and the formation of some aspects of activity that can occur in people with various diseases, including restrictions in the exercise of their requirements. Thus, according to data provided by Sidorov et al. [25], when examining students with chronic diseases, manifested signs of psychosocial maladaptation are observed in 77% of cases. Such students are characterized by a tendency to depression and anxiety, timidity, restraint, low activity, low self-esteem, and a noticeable dissonance in personal relationships. In addition, male students are more at risk of academic maladaptation [26]. Gavrilova [27] revealed that motivation for success in female students with chronic diseases is slightly lower than in healthy students, whereas it is better expressed in young males with chronic disorders. Having analyzed the psychological characteristics of students with various chronic diseases, Gazova and Khushtova [28] reported that students with chronic diseases are worse at coping with problem situations; they choose non-productive coping strategies (humility, confusion, dissimulation, ignoring), and do not use cognitive coping strategies. These features, in our opinion, do not provide grounds for the formation of a negative stereotype of students with chronic diseases, but allow us to recognize the difficulties in their academic adaptation and the need to implement support measures in the process of obtaining education. Notably, admission to university requires significant efforts from a person with a chronic disease, including updating their existing abilities, and overcoming many barriers, which can be considered as a significant personal achievement and a step toward social integration. This position is consistent with the positive model of disability [29],

which is associated with the refusal to understand the phenomenon of health disorders as a personal tragedy, and the emphasis on positive aspects of social identity. However, in the future, in the process of obtaining education, students with chronic diseases may face various difficulties, such as the inaccessibility to various aspects of the educational environment, which may negatively affect their ability to adapt and their psychological well-being. Hughes et al. [30] noted the presence of special needs in students with chronic diseases, for which many of them seek help from disability support services. As possible prerequisites for difficulties in adapting to university, most of them note less violations of physical, intellectual, or sensory health, but more report emotional and psychological problems. Njoku [21] stated that such students need educational support; however, it is not provided in the traditional educational model. Their unfavorable position is associated with reasons such as the negative attitude of teachers, breaks in study, as well as insufficiency of their own resources. Hutcheon and Wolbring [31] considered it necessary to thoroughly study the experience of students with different abilities. The existing abilities and their development, not the possible shortcomings of students, should be the basis for analyzing the policies in the field of higher education, ensuring access to adaptive technologies for students with diverse needs.

According to Shiu [32], understanding educational needs of students with chronic diseases is required to ensure that they have equal educational opportunities. However, as noted by L. Royster and O. Marshall, given the specificity of such students, in most cases, they do not identify themselves with disabled people, but they may also experience difficulties with learning and academic adaptation. To minimize this problem, the Chronic Illness Initiative (CII) program, implemented at the DePaul University (USA), was proposed. It includes various aspects for increasing student self-efficacy, social support, academic support, and teacher training [33]. The implementation of the program includes such aspects as the organization of distance education for students with chronic diseases who may experience difficulties in visiting an educational institution. According to the authors, 80% of students with chronic diseases used the online option when completing the educational program. A significant aspect involves working with teachers and staff on issues related to chronic diseases to form an adequate attitude to students. There is also support for students, including issues related to health, living conditions, administrative issues, financial support, employment, etc. Much attention is paid to the social integration of students with chronic diseases, regardless of whether they attend classes or study online. As a result of the implementation of this initiative, positive trends have been observed in the education of students with chronic diseases. This is manifested by a decrease in the number of students who are expelled, their higher academic success, and their increased educational activity. These circumstances allowed the evaluation of the capabilities of the Chronic Illness Initiative in optimizing the academic adaptation of students with chronic diseases. Thus, the researchers noted the possible presence of psychological disorders in people with chronic diseases, the need and ability to overcome difficulties in the process of self-realization in various fields, and the special educational needs of students with chronic diseases. Investigations in this problem field have not been complete, but rather fragmentary.

1.3. Subjective Well-Being and Health

The problem of subjective well-being in connection with health was posed by psychologists when the first empirical studies of this phenomenon were conducted. It is primarily related to the subjective well-being being defined as a lack of ill-health (disease) [34], as well as to subjective well-being being perceived as psychological health in humanistic concepts [35]. The notions of a healthy person's chances of satisfying needs being high and of a person's activities contributing to achievement of goals, which collectively create conditions for experiencing satisfaction and happiness, can be traced in many studies. Attempts have been made to correlate eudemonistic and hedonistic well-being with biological body parameters [36], which proved to be successful. Scientists revealed the close interconnections between biomarkers (neuroendocrine, immune, and cardiovascular) and markers of eudemonistic well-being; moderate interconnections were revealed between biomarkers

and hedonistic well-being [36]. Argyle generalized that there is a two-directional relationship between health and well-being: Health is the reason for happiness (sometimes subjective health is more closely interconnected with well-being), and well-being influences health through activation of the immune system, which is caused by good mood [37]. The recent studies of L.I. Wasserman et al. support this statement. In the case of diseases that obviously threaten a person's life, personal psychological maladaptation occurs; withdrawal into illness and withdrawal from fight are observed; all of the above reflect the negative tendencies in subjective well-being. Next, prevalence of negative emotions together with the specific type of cognitive-affective organization condition's actualization of somatization processes in psychosomatic and somatopsychic correlations [38]. Thus, the psychosomatic circle appears; one of its psychological features is negative perception and low assessment of quality of life and one's own well-being. A number of recent studies proved this to be right. Therefore, analyzing the relationship between internal positive personal resources and indicators of happiness in endocrinology patients, A.N. Samsonova, O.Yu. Khabarova, T.V. Yakimova [39] found that average (40.6%) and low (37.5%) indicators of happiness prevail. T.V. Kaurova and G.L. Mikirtichan [40] showed that all components of the quality of life, which is closely associated with the concept of subjective well-being, are significantly lower in adolescents and young people with chronic dermatoses than in their healthy peers. Among adolescents with impaired renal function, higher rates of egocentricity were observed, which were less critical; their self-image was quite superficial and poorly differentiated, and low self-esteem was combined with high level of aspirations. Psychological ill-being of such children is evidenced by significant gaps between assessing their current state, particularly state of health, and their desired state [41]. Uncertainty, which is characteristic of people with chronic diseases, determines actualization of stress, emotional maladaptation, and activation of psychological protection mechanisms [42]. Finally, satisfaction with quality of life is lower in patients with cicatricial deformities of the face and neck [43]; a decrease in the quality of life in patients with motor disorders of various etiologies was also reported [44].

Additionally, personal characteristics are important as they form attitude toward health and disease, as well as mood; all of these predict variations of subjective well-being. Later, Diener pointed out that adaptation to conditions is not always full and that sometimes circumstances have a huge impact on subjective well-being, but high levels of well-being positively influence human health [45]. In other words, problems related to adaptation to a change in situation can significantly influence achievement of subjective well-being. However, adaptation is never complete because a situation change constantly creates certain stress related to the necessity to adapt.

Recent studies [46] showed that presence of a chronic disease not only negatively influences self-esteem with one's physical and psychological state, but also negatively influences subjective well-being as a whole. Researchers identified the relationship between subjectively perceived health and subjective well-being. Notably, subjective well-being of chronically ill students depends on social support regardless of the stress they experience [47]. Social support is a factor that influences evaluation of personal resources as sufficient for adaptation. An important aspect of the interconnection between health and subjective well-being is the socio-ecological environment, which can explain where the differences lay, e.g., in college students [48]. Environmental factors play an important role in reducing anxiety and increasing trust. This role could be partly played by the university educational environment, which could create an atmosphere of trust and stability by implementing a strategy of equal opportunities for students with chronic diseases. This would help facilitate their adaptation to university and, therefore, contribute to their subjective well-being.

The purpose of the study was to investigate characteristics of academic adaptation and subjective well-being of students with chronic diseases, including (1) a comparative analysis of the components and general indicators of academic adaptation, as well as adaptive potential of students with chronic diseases and healthy students; (2) a comparative analysis of indicators of subjective well-being (happiness and life satisfaction) and satisfaction of basic needs (in autonomy, competence, and relatedness with other people) in students with chronic diseases and healthy students; and (3) based on structural

modeling, testing the hypothesis regarding the role of academic adaptation and adaptive potential in subjective well-being and basic needs satisfaction in students, considering the presence/absence of chronic diseases.

We assumed that the academic adaptation and subjective well-being of students with chronic diseases have certain features in comparison with that of healthy students. The academic adaptation and adaptive potential of students play a mitigating role in the subjective well-being and satisfaction of basic needs of students due to the presence/absence of chronic diseases.

2. Materials and Methods

2.1. Sample

First-year university students aged 17–26 years (mean (M) = 19.6, SD = 2.8 years) participated in this study (sex: 18.4% men and 81.6% women). Of the n = 419 participants, 34.8% had chronic diseases of various etiologies (21.2% vision disorders, 8.2% musculoskeletal disorders, 2.1% emotional-volitional disorders, 8.4% combined disorders, 9.8% other, which correlates with the "norm" of today and the results of other studies [18,19]); 373 were single (89.4%), nine married (2.2%), and 27 other (6.4%). Before entering university 5.7% of students lived in a metropolis, 42.3% in a city, 38.8% in a town, and 13.6% in a village. All subjects provided their informed consent for inclusion before they participated in the study. The experimental studies were performed in accordance with the Ethical Standards (2000) and were approved by the local research Ethics Committee of the Saratov State University (faculty of psychological, pedagogical, and special education).

2.2. Design of the Study

The study was designed as follows: First, the socio-demographic parameters of students with chronic diseases and students that had not been diagnosed with any diseases were analyzed. A comparative analysis was conducted of the components of academic adaptation and its integral indicator, the overall adaptive potential, characteristics of subjective well-being (life satisfaction and happiness experience), and satisfaction of the basic needs of students (for students with and without chronic diseases). Finally, structural equation modeling (SEM) was used to test the hypothesis about the role of academic adaptation and adaptive potential in subjective well-being of students.

2.3. Measurements

To identify socio-demographic markers, we developed a questionnaire to capture data regarding age, sex, diseases, place of residence before entering university, and level of income in the family.

To assess the components of students' academic adaptation, we used the Scale of Students' Academic Adaptation (Shamionov, Grigoryeva, Grinina, Sozonnik). The scale contains 44 points, each of which is evaluated by the respondent according to a Likert scale (from 1 to 5 points). Seven scales are obtained as a result of filling out the questionnaire: Personal, emotional-evaluative, cognitive, motivational, psycho-physiological, communicative, and integral assessment of academic adaptation. The scale demonstrated good psychometric indicators: Cronbach's α = 0.93 when the item was removed; the normality of distribution of the integral assessment distribution check produced an acceptable result (Z = 0.701; p = 0.71).

To study the adaptive capabilities of an individual based on the assessment of certain psycho-physiological and socio-psychological characteristics, we used the multilevel personal questionnaire called Adaptability (Maklakov, Chermyanin, 2006). The technique includes 165 points with which respondents agree or disagree. Four major scales are obtained based on the key: Behavioral regulation, communicative potential, moral normativeness, and personal adaptive potential (all scales are regressive), as well as the reliability scale. The scales had sufficient reliability, Cronbach's α = 0.81–0.88.

To assess the degree of needs satisfaction in autonomy, competence, and relatedness, we used the Basic Needs Satisfaction in General Scale [49] adapted for the young Russian population by R.M.

Shamionov. The scale contains 21 points and three subscales (autonomy, competence, and relatedness). The scales had sufficient reliability, Cronbach's $\alpha = 0.77–0.82$.

The assessment of subjective well-being included two major parameters: Satisfaction with life and experiencing happiness. The subjective happiness scale was constructed by S. Lyubomirsky and H. Lepper (1999) and adapted by D.A. Leontiev and E.N. Osin (four-item scale). The scale has acceptable reliability level happiness (H) with Cronbach's $\alpha = 0.78$. The Satisfaction with Life Scale by E. Diener, R.A. Emmons, R.J. Larsen, S. Griffin (1985) and adapted by D.A. Leontiev and E.N. Osin (five-item scale) had a good reliability level satisfaction with life (LS) with Cronbach's $\alpha = 0.88$. Subjective well-being scales are assessed according to a seven-point scale depending on the agreement/disagreement with the statement, or manifestation/lack of manifestation of the trait.

2.4. Statistical Analysis

To process primary data, we used the statistical software package IBM SPSS Statistics + PS IMAGO PRO, which includes AMOS software, which can be used for modeling with structural equations.

First, the scales were checked for internal consistency by using the Cronbach's alpha coefficient and the data were checked for normality of distribution. Then, the socio-demographic data were studied with the help of descriptive statistics (depicting in the averages, standard deviations and percentages). After that, the average values in two groups (with and without chronic diseases) were compared according to the students' criterion. All the previous indicators meet the requirements for the usage of this criterion.

In the next stage, we conducted a simulation procedure using AMOS for structural equation modeling. This program helped us to confirm the preliminary hypotheses, to establish the directions of relationship and the criteria for model acceptance were set (chi-square (CMIN), degrees of freedom (df), comparative fit index (CFI), adjusted goodness-of-fit index (AGFI), goodness-of-fit index (GFI), root mean square error of approximation (RMSEA)). In accordance with the model requirements [50], the statistical significance of all regression coefficients, covariance between variables and variances were verified. Next, we analyzed the calculation results, detected the direct and indirect effects, coefficient of determination (R^2) as a measure of the proportion of the variance of the dependent variable about its mean which is explained by the independent variables (it is indicated in the image top right number on each dependent variable).

3. Results

Table 1 presents the socio-demographic and academic performance parameters at the university for individuals manifesting chronic diseases without any serious health disorders and the general sample.

Table 1 shows that parameters of distribution of students according to age and sex were approximately the same. We found significant discrepancies in the distribution of parameters of residence before starting university and income. Individuals with chronic diseases have slightly more excellent marks (53.4% vs. 42.5%), and, correspondingly, fewer good marks (33.6% vs. 42.9%). Notably, the average academic success of students, which is assessed based on the results of the examination period, had practically no discrepancies ($t = 1.73$, $p < 0.08$).

Table 2 shows that the integral assessment of academic adaptation in students with chronic diseases was significantly lower than in students without chronic diseases. Psycho-physiological, emotional-evaluative, and personal components of academic adaptation contributed to these differences. For all these components, students with chronic diseases demonstrated lower figures than their healthy peers. Assessments of psycho-physiological component varied the most.

Table 1. Socio-demographic information and parameters of academic performance and health disorders.

	With Chronic Disease (n = 146)		Without Chronic Disease (n = 273)		Total (n = 419)	
	%/Mean	SD	%/Mean	SD	%/Mean	SD
Age	**19.94**	**(3.83)**	**19.41**	**(2.04)**	**19.60**	**(2.80)**
Sex						
Male	17.1%		19%		18.4%	
Female	82.9%		81%		81.6%	
Residence						
Village	7.5%		16.90%		13.60%	
Town	39.7%		37.50%		38.30%	
City	44.5%		41.20%		42.30%	
Metropolis	8.2%		4.40%		5.70%	
Income	**1.86**	**(0.75)**	**2.14**	**(0.42)**	**2.05**	**(0.04)**
Significantly below average	4.8%		1.50%		2.60%	
Below average	19.2%		10.00%		13.20%	
Average	63%		64.60%		64.00%	
Above average	11%		20.70%		17.30%	
Significantly above average	2.1%		3.30%		2.90%	
Examination period (in student's perception)	**4.4**	**(0.71)**	**4.28**	**(0.43)**	**4.32**	**(0.04)**
Mostly 3 (satisfactory marks)	13%		14.70%		14.10%	
Mostly 4 (good marks)	33.6%		42.90%		39.60%	
Mostly 5 (excellent marks)	53.4%		42.50%		46.30%	
Total	34.8%		65.2%		100.0%	

Table 2. Components and integral assessment of academic adaptation in students with/without chronic diseases.

Components of Academic Adaptation	Without Chronic Disease (n = 273)		With Chronic Diseases (n = 146)		Student's t-Test	
	Mean	SD	Mean	SD	t	p
Personal (self-organization)	5.43	0.94	5.23	1.02	–2.01	0.05
Emotional-evaluative	5.36	1.02	5.07	1.11	–2.59	0.01
Cognitive	5.40	0.88	5.38	0.97	–0.12	0.90
Motivational	5.76	1.19	5.55	1.28	–1.65	0.10
Psycho-physiological	4.48	1.15	3.95	1.06	–4.71	0.00
Communicative	5.45	0.88	5.40	0.96	–0.53	0.60
Integral assessment of academic adaptation	31.91	4.13	30.54	4.37	–3.11	0.00

The personal component of academic adaptation was also lower in students with chronic diseases (Table 2). Students with chronic diseases were less able to organize space around themselves in the learning process, set fewer educational goals, found it difficult to fix material in lectures, planned their educational activities less often, and so on. The disease and physical difficulties in the learning process do not provide a full opportunity to focus on academic achievements and the desire for better

organization of their educational activities. Accordingly, the emotional and evaluative component of academic adaptation was also lower (Table 2): Students with chronic diseases were less satisfied with the process and results of training at the university, relationships with teachers, the convenience of academic facilities, the information environment of the university, etc. To a lesser extent, students with chronic diseases expressed positive emotions in the educational process compared to others.

Overall assessment of adaptive potential in the group of healthy students was significantly higher than in the group of students with chronic diseases (Table 3). Behavioral self-regulation was higher due to higher self-esteem, adequate assessment of the surrounding reality, and a good level of neuro-psychic resistance [51].

Table 3. Components and general assessment of adaptive potential in students with/without chronic diseases (based on A.G. Maklakov and S.V. Chermyanin's technique [50]).

Parameters of General Adaptation	Without Chronic Disease (n = 273)		With Chronic Diseases (n = 146)		Student's t-Test	
	Mean	SD	Mean	SD	t	p
Behavioral regulation	36.24	16.43	30.25	14.45	3.55	0.00
Communicative potential	14.23	5.38	13.55	4.83	1.23	0.22
Moral normativeness	7.78	3.27	8.03	3.02	–0.75	0.45
Personal adaptive potential	57.64	22.06	51.14	19.38	2.80	0.01

The results obtained using two methods (Scale of Academic Adaptation of Students and the Multi-Level Personal Questionnaire (MLO) "Adaptability") were consistent. Students with chronic diseases were found to be more sensitive to the difficulties of the educational process. Due to the disease and the load on the physical and neuropsychic structures of the body, they have limited opportunities for self-organization and overcoming adaptive difficulties, which negatively affect the adaptation to the conditions of education.

Table 4 shows that students with chronic diseases had a lower level of satisfaction with almost all basic needs, except for the need for relatedness (ability to connect with other people). Their satisfaction with the need for autonomy was significantly lower than in other students, which is conditioned by their certain dependence on the environment and lack of confidence in their independent actions. This, in turn, can be the consequence of negative experiences with independent actions, as well as learned helplessness. In this regard, their satisfaction with competence was satisfied to a lesser degree.

Table 4. Basic needs satisfaction, happiness, and satisfaction with life in students with/without chronic diseases.

Markers of Needs' Satisfaction and Subjective Well-Being	Without Chronic Diseases (n = 273)		With Chronic Diseases (n = 146)		Student's t-Test	
	Mean	SD	Mean	SD	t	p
Autonomy	5.19	0. 86	4.96	0.93	–2.49	0.01
Competence	4.78	0. 83	4.57	0.88	–2.34	0.02
Relatedness	5.20	0.85	5.05	0.82	–1.69	0.09
Happiness	5.17	1.09	4.58	1.22	–4.87	0.00
Satisfaction with life	4.94	1.19	4.29	1.22	–5.29	0.00

Experiencing happiness and general satisfaction with life were less manifested in students with chronic diseases compared to other students (Table 4). This may be due to recognition of their differences from healthier people, experiencing physical distress, self-regulation difficulties due to health limitations, and other factors mentioned above.

Next, we tested the hypothesis about the direction of connections from students' academic adaptation to satisfaction of basic needs and satisfaction with life from adaptive potential to satisfaction of basic needs and academic adaptation (Figure 1, Table 5). The model complied with the initial data. All evaluated parameters were statistically valid at the $p < 0.05$ level. This model explained up to 24% in the variation in experiencing happiness and 34% of the variation in experiencing satisfaction with life. The model showed that the major contribution to academic adaptation was by adaptive potential (regressive scale) and the presence/absence of chronic diseases. In both cases, presence of chronic disorder was a factor affecting the decrease in numbers.

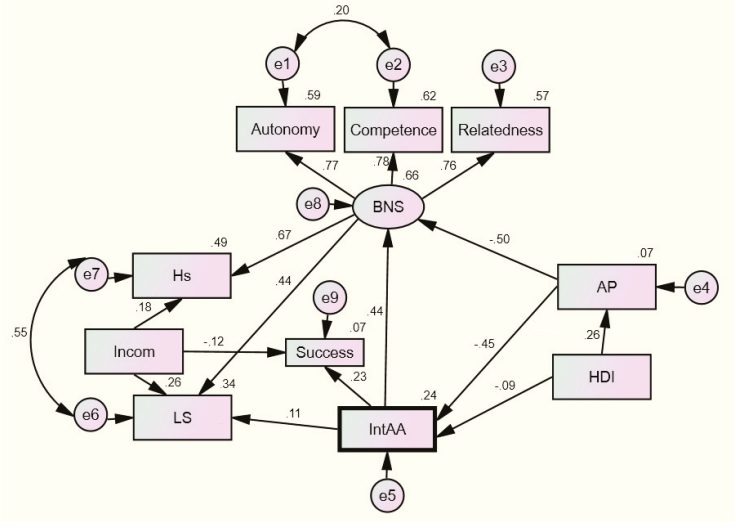

Figure 1. Roadmap for parameters of academic mobility and subjective well-being. Hs, happiness; LS, life satisfaction; BNS, satisfaction of basic needs; Income, level of income in the family; Success, Educational success; IntAA, Academic adaptation; AP, Adaptive potential; HDI, Presence/absence of chronic diseases.

Table 5. Fit indices for the model.

Model	χ2	df	χ2/df	*p*	CFI	AGFI	GFI	RMSEA	PCLOSE
Indices	30.198	28	1.08	0.354	0.999	0.972	0.986	0.014	0.991

4. Discussion

From the obtained results, we found that the number of male and female students was distributed approximately equally in both groups, which corresponded to general sample indicators. Distributions by place of residence before entering a university were notable. Among healthy students, more than twice as many healthy students were from the countryside and half as many from metropolises than chronically ill students. These data may indicate that chronic diseases develop less intensively under rural conditions, which are more environmentally friendly. However, this finding may be the result of better medical care and services in cities, due to which chronic diseases are detected at an earlier stage. In other words, better medical diagnostics in a large city or metropolis contribute to a greater number of detected diseases in cities compared to rural settlements. The increase in the number of chronic diseases in cities compared to rural areas is also influenced by factors such as the higher risk of spreading viral diseases in the city, a higher level of competition that increases psychological stress, amongst others.

Comparative analysis of academic adaptation of students with chronic diseases and healthy students revealed a number of findings. The difference in markers in terms of the emotional-evaluative component manifested in lower satisfaction of students with chronic diseases with the spatial-subject and social components of university educational environment, which may be due to increased educational environment requirements and sensitivity of the body and psyche to external influences in chronic diseases [30].

Markers of the personal component of academic adaptation in students with chronic diseases were significantly lower than in students without chronic diseases. In the former, students coped worse with self-organization in the academic process worse and were less focused on self-changes and had less desire to plan and achieve academic goals. They had a less manifested ability to organize their living space in the course of the academic process. Restrictions on the ability of students with chronic diseases to self-organize and organize the living space around them, which affect the redistribution of their internal reserves from academic achievements to combat ill health, create problems with having a more focused organization of the educational space and with identifying physical and subject barriers that cause difficulties in interacting with students with chronic diseases within the educational environment.

The internal reserves of the system and psychology of students with chronic diseases are limited due to re-distribution of energy aimed at struggling with the physical problem; they require compensatory and primarily external factors and reserves to increase academic adaptation [52,53].

The approximately equal cognitive, motivational, and communicative components of academic adaptation in groups of students with and without chronic disorders (Table 2) indicated the possibility of achieving a good level of academic adaptation due to their desire to acquire knowledge and well-developed educational competencies, which are primarily associated with processing and storing large volumes of information, correlating it with existing knowledge, and the ability to design difficult learning situations and solutions. Absence of differences in the level of development of the communicative component of academic adaptation in the two groups also testified to the possibility of students with chronic diseases equally interacting with the social environment and other students, openly expressing and proving their point of view, cooperating with others, fulfilling tasks, and presenting themselves to others. Perhaps, cognitive, motivational, and communicative components, in the course of their further development, act as compensation for the less-manifested psycho-physiological, emotional-evaluative, and personal components of academic adaptation.

Comparative analysis of adaptive capabilities markers showed the absence of differences in the level of manifestation of communicative potential, which, once again, confirmed the inclusion of students with chronic diseases in social relationships as being a par with other students.

Moral normativity and perception of moral standards of behavior accepted in the society, as well as understanding of the requirements of the immediate social environment (Table 3), were expressed at approximately the same level. This indicates that chronic disease presence does not have any impact on their deep personal structures. These data are consistent with a number of studies that reported that students with chronic diseases have the required personal resources to establish relationships with others and to communicate but are less able to cope with adaptation difficulties [21].

Finally, comparison of the mean indicators of subjective well-being (happiness and satisfaction with life) and satisfaction of the basic needs of students with chronic diseases and healthy students allowed us to establish the presence of significant differences on all scales, except satisfaction of the need for relatedness with other people. The absence of differences in personal characteristics determined by social relations was a theme throughout the entire study [29]. This means that students with chronic diseases, alongside healthy students, fulfill their relationships in society and, due to this, they can compensate for a number of objective difficulties associated with learning and fulfilling other needs that they have. Despite, for some researchers, subjective health being a more important indicator of well-being [46], we state that students with chronic diseases are characterized by less-manifested subjective well-being. Overall satisfaction with life and its various aspects is an important indicator of adaptation, including academic adaptation. The low indicators of satisfaction of basic needs

indicated a problem with the lack of equal opportunities for students with chronic diseases and other students in the educational process. Compensation for these different opportunities can be partially realized by reorienting students with chronic diseases to other needs, such as fulfilling the need for communication, creativity, etc. The university also needs to consider the special needs of students with diseases, monitor these needs, and organize the educational environment with these needs in mind. Chronic diseases are more long-term predictors of less-manifested subjective well-being, which means that we need measures of socio-psychological support for students that would contribute to formation of an attitude toward one's life as prosperous according to the criteria of an actual life situation. In addition, the remaining prejudices against people with disabilities [13] create subjective barriers regarding equal opportunities for students with chronic diseases. The university educational environment should be organized considering elimination of physical as well as socio-psychological barriers.

Based on the SEM, we designed a model explaining about one-quarter of the variation in the academic adaptation of students. This model indicated the significant role of adaptive potential and chronic diseases in the determination of academic adaptation. In terms of indicators of subjective well-being, academic adaptation also acts as a determinant, as does satisfaction of basic needs. This result is consistent with data previously reported by us [54] and other researchers regarding the influence of the process of partial (local) adaptation on life satisfaction under different conditions and prediction of well-being through basic needs [45]. The direct causal relationship between academic adaptation and basic needs' satisfaction can be seen from this model. This prediction does not seem accidental, since academic adaptability means a comfortable relationship with others, acquisition of learning methods, and self-consistency, which determine satisfaction of basic needs for relatedness, competence, and autonomy. These connections were confirmed by other studies that established the importance of relatedness [17], acquiring one's own teaching methods [14], and autonomy [15] for various adaptation characteristics.

An important aspect of this model is that chronic diseases are an influential reducing factor in both academic adaptation and adaptive potential. This finding is fairly well represented in clinical psychology studies [28,46]. Finally, the model confirmed the orientation of the relationship from family income to life satisfaction and experiencing happiness, which is consistent with studies reporting that income is a subjective well-being factor in poor countries [55,56]. The direct interconnection between academic adaptation and academic performance of university students was also visible from the model, which is consistent with the previously mentioned studies by Spanish psychologists who found that academic and personal-emotional adaptation are direct predictors of academic performance [4]. The designed model also allowed the definition of the special mediating role of academic adaptation and adaptive potential. Thus, academic adaptation is a mediator of the connection between adaptation potential and satisfaction of students' basic needs as it reduces its causal connection, and adaptation potential acts as a mediator of the connection between chronic diseases and academic adaptation. In other words, the assumption of a significant mediating role of these variables in subjective well-being is confirmed. Finally, the model confirms the causality of adaptation for satisfying basic needs and satisfaction with life, which was noted by Diener [45].

The research results raise the question of finding mechanisms for academic adaptation of students with chronic diseases that would allow them to use the potential of the educational environment to improve their self-organization and to find opportunities for their emotional support. The search for these mechanisms involves three directions: Teaching students the skills of self-regulation and self-organization in the process of academic adaptation (for example, during special training courses, socio-psychological trainings, tutor support, etc.); medical rehabilitation and maintenance of somatic health; and administrative measures to organize the educational space and facilitate the activity of students with chronic diseases (for example, an individual training plan, rest rooms, differentiated requirements from teachers, etc.)

5. Conclusions

Academic adaptation of students with chronic diseases has its own specifics compared with the academic adaptation of healthy students. This can be observed through low indicators of their psycho-physiological, emotional-volatile, and personal (regulatory) components, as well as preservation of cognitive, motivational, and communicative components. This specificity leads to an overall lower indicator of academic adaptation in students with chronic diseases.

Students with chronic diseases have less of an ability to demonstrate behavioral self-regulation and general adaptive potential than other students. Nevertheless, students with chronic disorders, similar to their healthier peers, are included in social interactions in the educational process due to sufficient academic motivation, desire to learn, and the ability to design a complicated academic situation and to find the solution.

Experiencing happiness and subjective well-being in students with chronic diseases are lower than in other students due to lower level of satisfaction of the need for autonomy and competence.

As a result of structural modeling, we tested the hypothesis about the mediating role of academic adaptation and adaptive potential in determination of students' subjective well-being. Presence of chronic diseases is a factor influencing adaptation. We found the cognitive, motivational, and communicative components of academic adaptation of students with chronic diseases remain well developed.

6. Limitations

The limitations of this study are related to a number of circumstances. First, this research was comparative and descriptive. We did not distinguish between students with specific disease diagnoses. There may be significant differences between students with different diagnoses, making it difficult to adapt academically. In future studies, this issue should be studied. Another aspect is the subjective (declarative) nature of many issues, due to the study raising questions about the subjective attitudes of students to their psychological state and adaptation at the university. The questions of including whether the diseases are congenital or acquired and the reason for the limitations faced or discovered were also not considered. For further research, it would be appropriate to ask questions about self-assessment of the current state of health, fatigue, sleep quality, bad habits, physical activity, and specific difficulties experienced in the process of adaptation at the university.

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

Funding: This research was funded by the Ministry of Science and Higher Education of the Russian Federation within the framework of the project "Socio-psychological, psychological, and psycho-physiological factors, characteristics and mechanisms of academic adaptation in students with special educational needs," grant number FSRR-2020-0003.

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

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European Journal of
Investigation in Health, Psychology and Education

MDPI

Article

A Mobile-Based Tailored Recommendation System for Parents of Children with Overweight or Obesity: A New Tool for Health Care Centers

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Received: 12 June 2020; Accepted: 6 August 2020; Published: 7 August 2020

Abstract: Childhood obesity is associated with unbalanced lifestyle patterns, and new strategies are needed to support parents in the compliance with the guidelines for children's age. Tailored automatic recommendations mimic interpersonal counseling and are promising strategies to be considered for health promotion programs. This study aimed to develop and test a mobile recommendation system for parents of preschool children identified with overweight/obesity at health care centers. Evidence-based recommendations related to children's eating, drinking, moving, and sleeping habits were developed and tested using a questionnaire. A pilot study was conducted in a health care center to test how using an app with those tailored recommendations, in video format, influenced parents' perceptions of the child's weight status and their knowledge about the guidelines, compared to a control group. The chi-squared test was used for categorical variables and the Mann–Whitney U test for continuous variables ($p < 0.05$). A high proportion of parents were already informed about the guidelines, but their children were not meeting them. After watching the tailored recommendations, there was an increased knowledge of the guideline on water intake, but there was no improvement in the perception of the child's excessive weight. Parents may benefit from a mobile-based tailored recommendation system to improve their knowledge about the guidelines. However, there is a need to work with parents on motivation to manage the child's weight with additional strategies.

Keywords: e-health; guideline adherence; healthy lifestyle; children; obesity

1. Introduction

Obesity remains one of the most common and complex health conditions worldwide. In 2017, over 38 million children under the age of five lived with overweight or obesity [1]. Childhood obesity is frequently preceded by unbalanced lifestyle patterns, such as an unhealthy diet and insufficient physical activity (PA). The earlier these behaviors can be altered, the better the chance of healthy physical development and its maintenance until adulthood. In fact, the preschool age is especially important to guarantee healthy growth because better energy balance at this age may contribute to a delayed adiposity rebound, which is associated with a lower risk of future excessive weight [2]. To prevent and treat childhood obesity, family-based lifestyle interventions are recommended [3,4]. It is also recommended to design programs that incorporate a combination of key lifestyle factors related

to excessive weight, namely, by promoting healthy eating and drinking patterns; encouraging the consumption of fruit, vegetables, and water; avoiding high-fat/high-sugar foods and sugar-sweetened beverages [3–6]; as well as promoting healthy PA [7] and sleeping habits [8,9].

Well-child visits at health care centers are ideal opportunities to detect deviations in weight trajectories and improve family habits. However, there are restrictions on time, resources, and knowledge that limit the ability to comprehensively counsel parents and properly enable and motivate them to adhere to healthy lifestyle guidelines [10–12]. Therefore, parents are usually counseled on a few lifestyle topics based on the dissemination of information regarding the recommendations for the child [13,14]. It would be crucial to also include well-studied behavior change techniques when counseling parents, such as promoting environmental restructuring [15]. Interventions to promote healthy behavior based on behavior change theories, particularly those grounded on the theory of planned behavior (TPB), have been associated with better outcomes compared with non-theory-based interventions [16]. According to the TPB, people may fail to accomplish a behavior because they lack resources, opportunities, or skills, and, therefore, they do not have control over it [17]. The TPB suggests that the intention to perform a behavior is predicted by attitudes, subjective norms, and perceived behavioral control [17]. In addition to providing information to parents about the guidelines, it would be important to work with them on practical skills to perform the behavioral change [17,18]. In relation to the management of children's food intake, those strategies are called "food parenting practices". Previous studies have indicated that when parents decide to control their child's weight, they often use coercive controlling practices (such as pressure to eat vegetables and overt restriction of energy-dense foods), which have been shown to be counterproductive [19,20]. A recent compilation on food parenting practices by Vaughn et al. proposed alternatives to controlling practices, namely, practices of structure (e.g., changing the availability of foods at home) and autonomy support (e.g., nutrition education) [21]. These constructs are aligned with self-determination theory (SDT) [21,22], as they aim to promote decision-making skills in children, developing in them a sense of ownership and endorsement of their behaviors and, ultimately, self-regulation in eating.

Technology-based solutions, such as computer and mobile applications, are promising for health care promotion, as they can include interactive and personalized components to engage users [3]. Tailored recommendations conveyed through those solutions have been shown to be effective in health education programs covering a wide range of behaviors [23]. These recommendations mimic interpersonal counseling, where they return only the necessary information to the user profile in an automated way [23]. Knowledge-based filtering may be an appropriate technique for tailored digital health programs [24]. It works by predicting items based on explicit knowledge about users (e.g., via questionnaires) and is able to predict items that are relevant and tailored to the user's interest. Therefore, this filtering would possibly enhance the efficiency and effectiveness of the health care recommendations [24].

Based on this, an evidence-based tailored recommendation system was developed as a mobile application (app) in order to target parents of children aged 3–6 years who were identified in health care centers as having overweight/obesity. It was intended to be a TPB evidence-based system, in which the recommendations to parents were structured according to different predictors of behavior, i.e., beliefs, attitudes, and perceived behavioral control. The recommendations promoted positive food parenting practices in line with SDT and in expectation of an improvement in parents' perceived behavioral control over their child's eating behaviors. A pilot test in a health care center was designed to test the procedures of a randomized controlled trial (RCT). This study aimed to describe the effect of its use on changing parents' knowledge about the guidelines related to children's lifestyle, as this can be seen as a short-term outcome that represents a potential mechanism of efficacy of the designed intervention [17,25]. This study aimed to indicate barriers to acceptance and adherence to this e-health intervention in order to perform potential adjustments before running the RCT in health care centers for the prevention and treatment of overweight/obesity.

2. Materials and Methods

2.1. Study Design

In order to tailor recommendations, an automated filtering system was designed based on parents' answers to a questionnaire that evaluated (a) their knowledge of the guidelines for the child's age (about eating, drinking, moving, and sleeping habits), (b) their perception of the child's weight, and (c) the children's behaviors (eating, drinking, moving, and sleeping habits). This questionnaire was included in an Android app as well as recommendations for each topic through videos that were recommended to parents according to the needs identified in the questionnaire. This app, called Fammeal, was part of a system developed by the research team.

The recommendation system was tested by (a) the application of the questionnaire that tailored recommendations to analyze the percentage of parents who would be recommended to watch videos on each topic and (b) describing how using the app with the recommendation system affected parents' beliefs about the guidelines for children with overweight/obesity compared to a control group.

2.2. Recommendation System Development

2.2.1. Defining Recommendations for Parents

The decision on recommendations to parents was supported by the need to raise awareness of the child's excessive weight, assuming that this factor is an important determinant of the parent's motivation to improve the family environment [26]. Thus, this issue was the first addressed. The recommendations that were given to parents focused on the promotion of key lifestyle factors identified in the literature as relevant to be included in programs to prevent and treat childhood obesity [3,4], namely, healthy eating, drinking patterns [3–6], PA [7], and sleeping habits [8,9].

For each topic, parents received recommendations related to some dimensions of the TPB [17,18]. The TPB suggests the intention to perform a behavior (i.e., the individual's conscious plan or decision to exert effort in order to engage in a particular behavior) is predicted by [17,18]:

- Attitudes, i.e., one's evaluation of performing an action, highly determined by beliefs related to the behavior;
- Subjective norms, i.e., one's belief about social expectations; and
- Perceived behavioral control, i.e., one's perception of the degree of ease and difficulty of the behavior.

The recommendations were based on some dimensions of this model, namely:

1. Parents' perceptions about the children's weight status and knowledge about the guidelines for their age as determinants of their behavioral beliefs and, consequently, of their attitudes toward the behavior;
2. The importance attributed to their children's weight status and the guidelines for their age, reflecting their attitudes; and
3. Practical strategies to improve those outcomes and to improve perceived behavioral control.

The practical strategies to improve food intake were food parenting practices recommended in the map by Vaughn et al. [21]. The aims of each recommendation for each lifestyle component are represented in Table 1.

Table 1. Aims for Each Lifestyle Component (Based on the Theory of Planned Behavior).

	Behavioral Beliefs[1]	Attitudes toward the Behavior	Perceived Behavioral Control
Weight Status	Parents are aware of their children's excessive weight.	Parents are concerned about their children's excessive weight.	Parents feel confident about improving their children's excessive weight.
Food and Beverage Intake	Parents know that their children consume less fruit and vegetables, more energy-dense foods, more sugar-sweetened beverages, and less water than recommended.	Parents believe it is important that their children eat and drink as recommended.	Parents feel confident about improving their children's intake.
Physical Activity and Sleep	Parents are aware that their children move less and sleep less than recommended.	Parents recognize that it is important that children move enough.	Parents feel confident about improving their children's sleeping time.

[1] The theory of planned behavior model also included normative beliefs and control beliefs, which were not included in this first version of the recommendation system.

2.2.2. Defining the Tailored Recommendation System

To tailor recommendations, a questionnaire was developed (Table 2) to survey parents' knowledge about their children's weight status (question 1a) and their concern about it (question 1b); the lifestyle guidelines regarding their child's dietary intake (Question 2a), PA, and sleeping habits (question 3a); and their children's behaviors related to those lifestyles (Questions 2b and 3b). The cutoffs for the guidelines (see Table 2) were used as the condition for receiving a recommendation. Parents' knowledge being discordant with the guidelines defined the attribution of recommendations related to beliefs, while parents' unconcern about their child's weight or behaviors being discordant with the guidelines led to recommendations related to attitudes and perceived behavioral control.

2.2.3. Development of the App

A system that consisted of an Android app, called Fammeal, for parents of children with overweight/obesity attending health care centers was developed. To protect the participants' personal data, a personal ID was generated to be introduced by parents into the app during the registration process. That ID matched the one used to identify the participant in the study database, where personal data were stored, complying with the data protection guidelines. Additionally, no personal information was saved or removed from the device.

The app included the recommendation system, i.e., the questionnaire to be filled out during the registration process (that took no more than 15 min to complete), the cutoffs to tailor recommendations, and educational videos that appeared automatically as "recommended" or as "other videos" (users could access all the videos) based on parents' answers to the questionnaire. A website to store the videos was created, and, as the user accessed the video in the app, it connected with the website via the Internet, and the video could be watched in the app (Figure 1) [27].

This website included private access for the administrator with monitoring tools that displayed parents' usage reports, namely, their answers to the registration questionnaire and a checklist with the videos that were recommended and those watched by parents ("recommended" and "other" videos).

Scripts for 15 videos were developed (Table 3).

Table 2. Questionnaire Developed to Tailor the Recommendations with Cutoffs to Receive a Recommendation Based on Different Dimensions of the Theory of Planned Behavior.

	Questions		Cutoff	Recommended Content TPB
1. Weight Status	(a) How do you classify the weight of your child for their age, sex, and height?[1]		≤5	Behavioral Beliefs
	(b) How concerned are you about your child's weight status?[2]		≤5	Attitudes
2. Food and Beverage Intake	(a) What are the guidelines for your child's age?[3]	Fruits (F) (portions per day) Vegetables (V) (portions per day)	F + V<5	Behavioral Beliefs
		Energy-dense foods (portions per week)	>3	
		Water (glasses per day)	<8	
		Sugar-sweetened beverages (glasses per week)	>3	
	(b) What is the usual intake of your child?[3]	Fruits (F) (portions per day) Vegetables (V) (portions per day)	F + V<5	Attitudes and Perceived Behavioral Control
		Energy-dense foods (portions per week)	>3	
		Water (glasses per day)	<8	
		Sugar-sweetened beverages (glasses per week)	>3	
3. Physical Activity and Sleep	(a) What are the guidelines for your child's age?[4]	Moderate to intense PA (periods of 20 min of active play, speed walking, or any sport per day)	<3	Behavioral Beliefs
		Sleep (hours of nighttime sleep and napping per day)	<10	
	(a) How long does your child usually spend on each of these activities?[4]	Moderate to intense PA (periods of 20 min of active play, speed walking, or any sport per day)	<3	Attitudes and Perceived Behavioral Control
		Sleep (hours of nighttime sleep and napping per day)	<10	

[1] Rating scale 0–10: 0—too slim; 10—too heavy; 5—healthy; [2] Rating scale 0–10: 0—not concerned at all; 10—extremely concerned; [3] Rating scale 0–10: in "portions" for fruits, vegetables, and energy-dense foods and "glasses" for water and sugar-sweetened beverages; [4] Rating scale 0–10: in "periods of 20 min" for moderate to intense PA and "hours" for sleep; TPB—theory of planned behavior; F—fruit; V—vegetables; PA—physical activity.

Table 3. Distribution of Videos by Lifestyle Component and Dimensions of the Theory of Planned Behavior.

	Theory of Planned Behavior			Food Parenting Practices Map
	Behavioral Beliefs[1]	**Attitudes[2]**	**Perceived Behavioral Control[2]**	
Weight Status	Video 1Healthy Development	Video 2Consequences of having overweight	Video 3How to help a child return to a healthy weight[3]	↓ Weight Talk↑ Guided Choices↑ Modeling
Food and Beverage Intake	Video 4 5 portions of fruit and vegetables daily[4]	Video 5Why 5 portions of fruit and vegetables a day?[3]	Video 6 Teach them to like, without pressure Video 7Eating variety: Why does it matter?	↓ Pressure to Eat↑ Availability and Accessibility of Healthy Foods↑ Attractive Presentation of Foods↑ Nutrition Education↑ Modeling↑ Monitoring↑ Rules and Limits↓ Distractions↑ Availability and Accessibility
	Video 8 Addictive foods[4]	Video 9 How to recognize addictive foods[3]	Video 10 How to regulate the intake of addictive foods Video 11 Distractions while eating	
	Video 12Hydration[4]		Video 13How to select a juice	
Physical Activity and Sleep	Video 14Move[4,5] Video 15Sleep[4,6]			

[1] Recommended if parents did not know or recognize their child's excessive weight/the guidelines; [2] Recommended if children were not meeting the guidelines (with the exception of [3], which were "obligatory videos" recommended to all parents); [4] Priority videos; [5] Also focused on attitudes; [6] Also focused on perceived behavioral control.

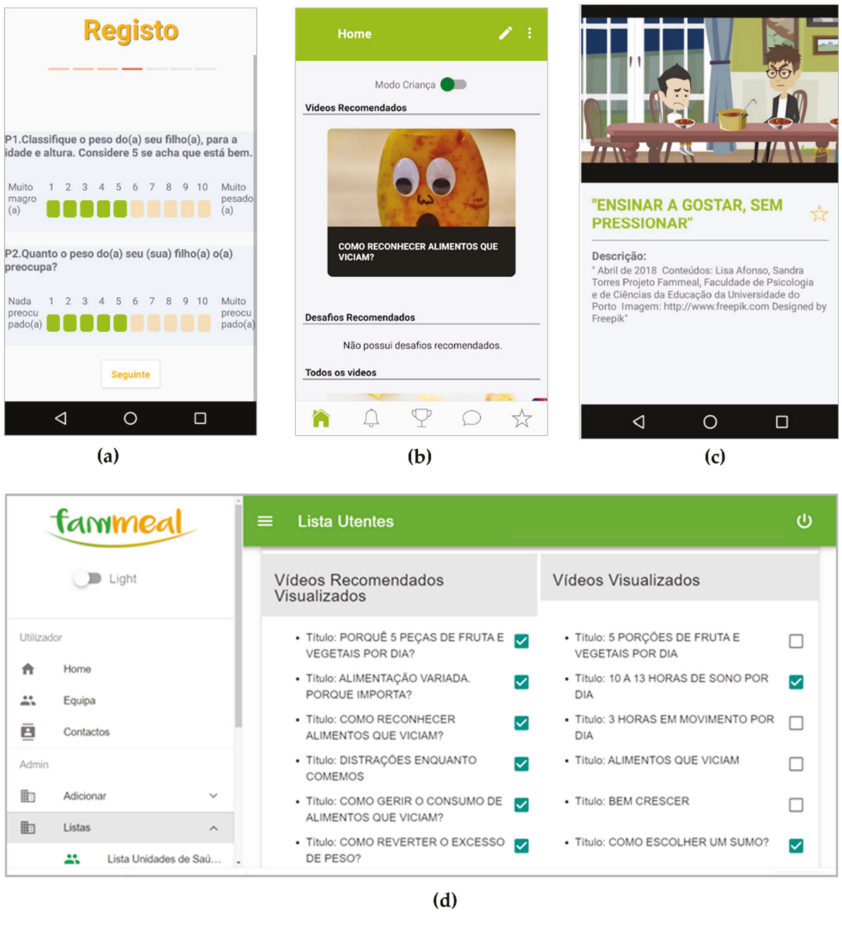

Figure 1. Fammeal app and monitoring website screenshots: (**a**) app—Registration questionnaire; (**b**) app—Home page; (**c**) app—Video; (**d**) monitoring website—Checklist with "recommended" videos on the left and all the "other" videos on the right (with a check mark whenever watched).

Each video targeted one dimension of the TPB previously described. The exceptions were the videos related to PA and sleep, which promoted more than one dimension of the TPB. Because the tailoring system was based on self-reporting, which is subject to socially desirable responding [28], three videos (Table 3: Videos 3, 5, and 9) were defined as default on the list of recommended videos, regardless of parents' answers to questionnaires.

Parents were recommended to watch 8–10 videos (three of which were recommended by default). If parents had more than 10 videos recommended by the system, then some were randomly excluded, with the exception of the five videos related to beliefs, which were defined as priorities (one for each lifestyle topic) because this is the first step to promoting change according to the TPB. If less than eight videos were recommended to parents, then the remaining videos were randomly selected to fill the eight videos required.

The app also included gamification strategies in order to motivate parents' adherence, which are described in another scientific manuscript.

2.3. Testing of the Recommendation System

To test the recommendation system, two studies in a health care center in Porto, Portugal, were developed over three months. Parents of preschool children were invited by medical doctors to participate during the annual well-child care visit. These studies were addressed using different samples.

In Study 1, medical doctors invited parents to answer the questionnaire developed by the team to tailor recommendations, independently of the weight status of their child. This study intended to describe the adequacy of the recommendation system to parents of children of this age range.

In Study 2, medical doctors invited parents of children with overweight/obesity to participate in the pilot study. This pilot study was registered prior to the enrollment of participants [29]. Due to the pilot nature of this study, no sample size calculations are provided. However, a minimum of 12 participants has been reported as enough to estimate average values and variability in pilot studies with continuous variables [25]. Due to the small sample size, data analyses were mainly descriptive and exploratory. This study intended to describe parents' perceptions regarding their child's weight status and their knowledge about the guidelines in order to monitor the recommended videos that they watched in the app and the changes in their perceptions and knowledge afterwards and to compare these to the control group.

2.3.1. Participants

Participants were parents/caregivers of children between 3 and 6 years of age. To participate, they should be involved in the child's feeding management (≥5 for involvement on a 0–10 rating scale, from "not at all" to "extremely involved", regarding food acquisition and meal planning and preparation). In Study 1, participants were selected regardless their child's weight status. In Study 2, participants were invited to participate if they simultaneously:

1. Were parents of children with overweight/obesity for their age (according to the World Health Organization criteria [30]);
2. Had access to an Android device with an Internet connection;
3. Were interested in participating in two interviews in the health care center; and
4. Were willing to install the app and use it for four weeks.

For both studies, parents of children with any medical conditions that affected growth, intake, or PA or with any professional dietary advice in the previous six months were excluded.

Informed consent was obtained from all participants. This study complied with the ethical principles of the Declaration of Helsinki [31] and was approved by the Ethics Committee of the Faculty of Psychology and Educational Sciences of the University of Porto (reference number: 2017/10-4). This study also complied with data protection principles, and the Portuguese Data Protection Authority approved the study (reference number: 14441/ 2017).

2.3.2. Study 1—Test of the Adequacy of the Recommendation System

In Study 1, 35 parents were invited to answer the questionnaire after the well-child care visit with the help of the project technician. All parents invited agreed to participate. The questionnaire was developed by the team to tailor recommendations (Table 2). The exception was food intake, which was evaluated using a more accurate method, namely, a qualitative food frequency questionnaire, administered by a trained researcher [32]. Parents reported the usual frequency of intake of fruits and vegetables, sugar-sweetened beverages, and energy-dense foods, from "never" to "more than four times a day", for a list of foods. The food frequency resulted from the sum of frequencies of foods that composed each group.

2.3.3. Study 2—Pilot Study

This was a pilot randomized controlled trial with a parallel assignment: a 1:1 ratio of the intervention and control group. Medical doctors invited 44 parents to participate. To encourage parents to participate, medical doctors explained why the child was selected and what the consequences of having too much weight at this age range are. They also raised awareness about the need to improve family lifestyle habits in order to reduce their child's excessive weight. Additionally, medical doctors explained to parents that the intervention allowed for flexibility, as they could use the app in accordance with their schedules. Of those invited, 28 agreed to participate (63.6%). The main barrier to adherence was the parents' denial of their child's excessive weight: nine of the invited parents (n = 9; 20.5%) refused to participate because they reported that they still did not perceive their child as having overweight/obesity, even after an explanation from the medical doctor. Five parents (11.4%) reported that they were not interested in the intervention (without specifying the reasons), and two (4.5%) did not have an Android device to use in the intervention (iOS system only). Parents that agreed to participate were randomized by the block randomization method into either the control or the intervention group using the random number generator in Excel. Of those, 21 attended to the baseline assessment, where they completed the questionnaire (see Table 2). Parents in the intervention group (n = 11) were provided with the app and invited to use it for a four-week period. Parents in the control group (n = 10) were treated as usual, namely, by receiving recommendations to improve the family lifestyle in the well-child care visit given by the medical doctor. Fifteen parents attended the post-test assessment. The flowchart of the pilot study is depicted in Figure 2.

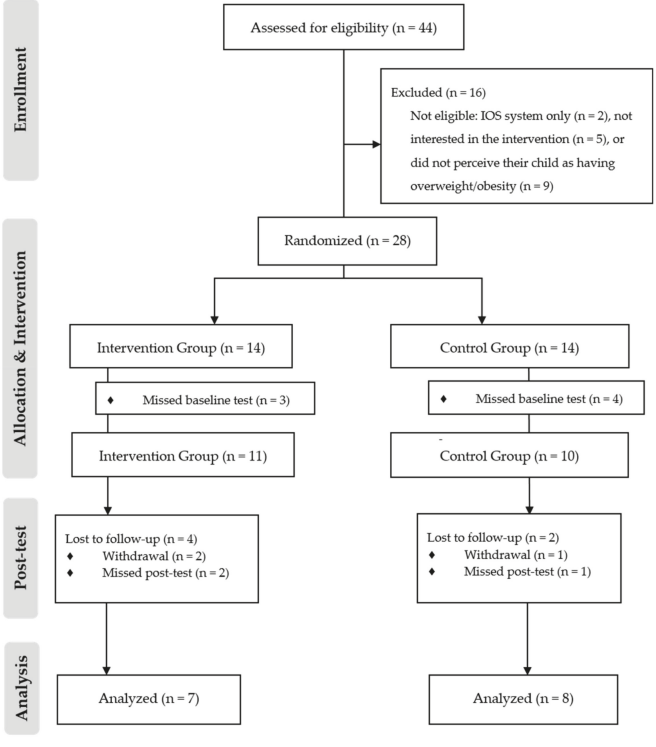

Figure 2. Flowchart of the pilot study.

2.4. Statistical Analysis

In Study 1, to test the adequacy of the recommendation system, each variable was transformed into a binary classification according to the cutoff value determined to receive a recommendation. The proportion of parents that would receive recommendations on each topic was evaluated as well as the percentage of children that failed to meet the guidelines, regardless of parents' knowledge about the guidelines.

In Study 2, due to the small sample size, we performed an analysis of change, comparing the change scores between groups before and after the intervention. The change scores were calculated by post-test scores minus baseline scores. Data normality was tested using the Kolmogorov–Smirnov test. The chi-squared test was used for categorical variables (comparison of group characteristics at the baseline). Regarding the analysis of change, due to a lack of normal distribution of the scores and the possibility of a strong ceiling effect, the Mann–Whitney U test was used ($p < 0.05$). All statistical analyses were performed with SPSS v24 [33]. The magnitude of the difference in the knowledge between the baseline and post-tests was described by the effect size, represented by the coefficient of determination (r^2). The cutoffs considered for a small, medium, and large effect size were 0.20, 0.50, and 0.80, respectively [34].

3. Results

3.1. Participants

Participants' characteristics are described in Table 4. Characteristics for Study 2 refer to the baseline (n = 21). Participants allocated to the intervention group did not differ significantly from those in the control group prior to the intervention (baseline) in sex, age, and education ($p > 0.05$).

Table 4. Characteristics of Parents/Caregivers and Children in Study 1 and Study 2 (Baseline).

		Study 1 (n = 35)	**Study 2**	
			Intervention Group (n = 11)	**Control Group (n = 10)**
Parents/Caregivers				
Sex	Female, n (%)	31 (88.6)	7 (63.6)	8 (80.0)
	Male, n (%)	4 (11.4)	4(36.4)	2 (20.0)
Age (years), mean (SD)		35.2 (4.6)	36.9 (3.1)	38.8 (3.7)
With university degree, n (%)		29 (82.8)	8 (72.7)	6 (60.0)
Children				
Sex	Female, n (%)	17 (48.6)	2 (18.2)	3 (30.0)
	Male, n (%)	18 (51.4)	9 (81.8)	7 (70.0)
Age (years), mean (SD)		4.4 (1.1)	4.9 (1.1)	5.2 (1.2)
Weight status, n (%)	Underweight	0 (0.0)	n.a.	n.a.
	Normal weight	25 (71.4)	n.a.	n.a.
	Overweight	7 (20.0)	6 (54.5)	4 (40.0)
	Obesity	3 (8.6)	5 (45.5)	6 (60.0)

n.a. = not applicable.

3.2. Study 1—Testing the Adequacy of the Recommendation System

Table 5 presents the percentage of parents who were discordant with, not concerned about, or whose children were not meeting the guidelines and, thus, would receive recommendations according to the cutoffs considered in the recommendation system. The majority of parents knew the guidelines for energy-dense food intake (n = 34; 97.1%), sugar-sweetened beverage intake (n = 35; 100.0%), and PA time (n = 30; 85.7%).

Table 5. Parents' Eligibility to Receive Recommendations, According to the Answers to the Questionnaire and Considering the Cut-Off Selected to Receive a Recommendation (n = 35).

	Questions		Cutoff	Parents Eligible to Receive Recommendationsn (%)
1. Weight Status[1]	(a) How do you classify the weight of your child for their age, sex, and height?[2]		≤5	7 (70.0)
	(b) How concerned are you about your child's weight status?[3]		≤5	6 (60.0)
2. Food and Beverage Intake	(a) What are the guidelines for your child's age?[4]	Fruits (F) (portions per day)	F + V<5	13 (37.1)
		Vegetables (V) (portions per day)		
		Energy-dense foods (portions per week)	>3	1 (2.9)
		Water (glasses per day)	<8	30 (85.7)
		Sugar-sweetened beverages (glasses per week)	>3	0 (0.0)
	(b) What is the usual intake of your child?[4]	Fruits (F) (portions per day)	F + V<5	20 (57.1)
		Vegetables (V) (portions per day)		
		Energy-dense foods (portions per week)	>3	20 (57.1)
		Water (glasses per day)	<8	32 (91.4)
		Sugar-sweetened beverages (glasses per week)	>3	9 (25.7)
3. Physical Activity and Sleep	(a) What are the guidelines for your child's age?[5]	Moderate to intense PA (periods of 20 min of active play, speed walking, or any sport per day)	<3	5 (14.3)
		Sleep (hours of nighttime sleep and napping per day)	<10	14 (40.0)
	(a) How long does your child usually spend on each of these activities?[5]	Moderate to intense PA (periods of 20 min of active play, speed walking, or any sport per day)	<3	9 (25.7)
		Sleep (hours of nighttime sleep and napping per day)	<10	16 (45.7)

F—fruit; V—vegetables; PA—physical activity;[1] For the 10 children with overweight or obesity; [2] Rating scale of 0–10: 0—too slim; 10—too heavy; 5—healthy; [3] Rating scale of 0–10: 0—not concerned at all; 10—extremely concerned; [4] Rating scale of 0–10: in "portions" for fruits, vegetables, and energy-dense foods and "glasses" for water and sugar-sweetened beverages; [5] Rating scale of 0–10: in "periods of 20 min" for moderate to intense PA and "hours" for sleep.

Among parents aware of the child's excessive weight or the guidelines (i.e., those not eligible to receive recommendations in 1a, 2a, and 3a, in Table 5), a relevant proportion was not concerned about it, or their child was not meeting the guidelines:

1. Regarding weight status, of the three parents who perceived their child's excessive weight, one (33.3%) was not concerned about it.
2. Considering only parents who knew the guidelines, 55.8% of parents (n = 19) reported that their children ate more energy-dense foods, 25.7% (n = 9) that their children drank more sugar-sweetened beverages, and 13.3% (n = 4) that their children moved less than recommended.
3. From those parents that knew the guidelines for fruit and vegetable intake (n = 22), 63.6% (n = 14) reported that their children ate less than recommended.
4. Regarding water intake, considering only parents who knew the guidelines (n = 5), 60% of the children (n = 3) failed to meet them.

3.3. Study 2—Pilot Study

In the baseline test, all parents (n = 15) were aware of the guidelines for the intake of energy-dense foods and sugar-sweetened beverages and for sleep and PA time. Despite this, 73% of parents (n = 11) reported that their children ate more energy-dense foods, 33.3% (n = 5) that their children drank more sugar-sweetened beverages, 40.0% (n = 6) that their children moved less, and 6.7% (n = 1) that their children slept less than recommended.

Parents in the intervention group only received recommendations to watch videos related to beliefs concerning their perceptions about their child's weight and related to the guidelines for fruit, vegetable, and water intake. Therefore, only the change in parents' perceptions and knowledge about the guidelines for those topics was determined (Table 6). The monitoring reports allowed for confirming that parents in the intervention group watched all the recommended videos and that they watched a mean of three extra videos beyond those that were recommended.

Table 6. Change in Parents' Perceptions about Weight and Knowledge about the Guidelines, Represented by Post-Test Scores and Differences Compared to the Baseline Test, for the Control and Intervention Groups (n = 15).

	Cutoff	Control (n = 8) Median (IQR)		Intervention (n = 7) Median (IQR)		Differences between Groups[1]		
		Post-Test	Dif.	Post-Test	Dif.	U	*p*-Value	r^2 (effect size)
Perceptions about the child's excessive weight[2]	≤5	5.5 (1.8)	0.0 (2.0)	6.0 (1.0)	0.0 (1.0)	28.0	0.976	0.00
Fruits and vegetables (portions/day)[3]	<5	5.0 (1.75)	0.5 (3.0)	5.0 (3.0)	2.0 (3.0)	19.0	0.336	0.08
Water (glasses/day)[3]	<8	5.0 (3.0)	0.0 (2.0)	8.0 (1.0)	3.0 (2.0)	0.0	<0.001***	0.78

[1] To compare the change between the control and intervention groups, the Mann–Whitney U test was used; [2] How do you classify the weight of your child for their age, sex, and height? (Responses on a 0–10 rating scale: 0—too slim; 10—too heavy; 5—healthy); [3] What are the guidelines for your child's age? (Responses on a 0–10 rating scale, in "portions" for fruits and vegetables and "glasses" for water); IQR—interquartile range; Dif.—difference compared to baseline test; r^2—coefficient of determination; ***$p < 0.001$.

A significantly greater increase in the knowledge scores for water intake (U = 0.0, $p < 0.001$; large effect size) was found for the intervention group than for the control group. No significant differences between the intervention and control group were found for perceptions about the child's excessive weight and for knowledge about the guidelines for fruit and vegetable intake ($p > 0.05$).

4. Discussion

A mobile recommendation system for parents of preschool children with overweight/obesity was developed and tested. Of all the planned recommendations, the most needed recommendation was the one related to the guidelines for water intake. A high awareness of parents toward the guidelines for the children's age was found, especially regarding energy-dense foods, sugar-sweetened beverages, and PA. In Study 2, that awareness was even more pronounced, with all parents knowing those guidelines. As Study 2 only included children with overweight or obesity, this may indicate that those parents have already been informed due to the weight condition of their children. However, a high percentage of the children of informed parents had failed to meet those guidelines, especially concerning energy-dense foods. These results were observed in other studies, which found satisfactory knowledge of parents related to the child's excessive weight but low compliance with the guidelines [35]. This may be related to difficulties and barriers that parents may face, such as low management over children's environments beyond the home or children's high interest in energy-dense foods [36]. This reinforces the need to give recommendations that may contribute to improving parents' perceived behavioral control on those topics, namely, by promoting positive food parenting practices [13,14]. The system developed included recommendations on those topics (not tested in this pilot study) to contribute to improving parents' ability to change the child's eating habits. Additionally, a high percentage of parents underestimated the child's excessive weight, which is consistent with the previous literature [37].

A pilot study with the mobile recommendation system was carried out with parents of children with overweight/obesity. That study aimed to describe the change in parents' knowledge about the guidelines for the child's age and their perception of their child's weight status after using the recommendation system in an app, compared to a control group. The main barrier to adherence was the parents' denial of their child's excessive weight: 20.5% of parents refused to participate because they reported that they still did not perceive their child as having overweight/obesity, even after an explanation from the medical doctor. Even after accepting to participate and after the medical doctor's explanation, 40% of the parents continued to not recognize the child's excessive weight in the baseline test. Additionally, the parents who were in the intervention group still did not recognize their child as having overweight/obesity in the post-test, even after watching the video about healthy growth, which explained what deviation from the normal percentile means as well as the short- and long-term

consequences of their child's weight status. This means that, in order to change parents' beliefs about their children's weight status, it is not enough to provide them with knowledge.

After watching all the recommended videos, there was an increased knowledge of the guidelines for water intake, the topic identified as the most in need of recommendation. This reinforces that the system can be useful to inform parents about lesser-known lifestyle guidelines. Strategies employed in this intervention, such as using an app with recommended videos, may have led to higher engagement of parents because all the parents in the intervention group watched their recommended contents. However, this may not be enough to make them aware that the children need to change their lifestyle because they first have to recognize the importance of changing the child's weight status [26]. This can also explain the low compliance with the guidelines despite their knowledge about them. The fact that this intervention was targeted to children with overweight and not only to children with obesity may make it difficult for parents to recognize their excessive weight. Studies indicated that the parents only recognized a child's excessive weight if there was a substantial deviation in the child's body size from perceived normality, especially if they were between the ages of 2 and 6 years old [37,38]. This indicates that new methodologies to motivate parents to manage their child's weight have to be considered. One hypothesis would be to facilitate at least one session of motivational interviewing because it showed positive effects in the improvement of behaviors in parent–child health interventions, including those related to excessive weight [39]. This may be included in an e-health format (such as a chat or a video consultation), as the development and testing of these e-health programs as a sole modality has been recommended [40].

It would also be important to include other dimensions of the TPB, namely, subjective norms and control beliefs, in the recommendation system before running the RCT. For instance, subjective norms may explain the parental underestimation of their child's weight status and, eventually, the rejection of this reality after receiving this information [41]. Parental overweight status was also seen as a determinant to this underestimation [37], as parents may deny the idea of their children's excessive weight to avoid having to take action on their own excessive weight [42]. It is also important to recognize the need to promote patient-centered communication rather than weight-focused communication in order to decrease the parent's feelings of blame and to improve adherence and motivation while avoiding weight stigma [43]. This may be important to consider in the enrollment protocol for the RCT.

This study has some strengths and limitations that deserve attention. As strengths, this recommendation system was evidence-based, comprehensively promoted different lifestyle guidelines, and included an automated tailoring process. Furthermore, the recommendation system was tested in a pilot study in a real context, within a health care center, following the procedures of an RCT. This design and the detailed description and control of each procedure [29] will contribute to the external validity of the study in the future. The major limitation of this study is the small sample size. Nevertheless, the number of participants has been reported as enough to estimate average values and variability in pilot studies with continuous variables [25]. Additionally, our tailoring system was based on self-reported measures, which are susceptible to social desirability response bias [28]. Thus, in the RCT, it would be important to have more accurate measures to be used as the cutoff for the recommendation system—for instance, using devices with accelerometers (e.g., smartwatches or fitness bands) to evaluate PA. Additionally, to tailor recommendations, the system could use more than parents' beliefs and children's behaviors. Parents want these programs to take into account their concerns, so the system could also include their reported needs or preferences [44]. In the future, a qualitative study may help with understanding those preferences and concerns. Due to service and time constraints, it was not possible to run this qualitative study before the development of the recommendation system. In the RCT, it may also be important to involve more than one adult of reference (such as grandparents) or other environments frequented by children (such as kindergartens) in order to collect additional information and to raise awareness regarding the guidelines for children's age.

5. Conclusions

An evidence-based, tailored recommendation system was developed in order to target parents of children aged 3–6 years identified in health care centers as having overweight/obesity. A pilot test in a health care center was designed to test the procedures of the RCT. This study aimed to describe the effect of its use on changing parents' knowledge about the guidelines related to children's lifestyle, as this can be seen as a short-term outcome that represents a potential mechanism of efficacy of the designed intervention. This study aimed to indicate potential adjustments before running the RCT.

Our study suggested that there is a need to work on parents' motivation toward the desire to change the condition of their child's weight status with additional strategies to those considered in the study. Providing knowledge to parents of preschool children about their child's excessive weight or explaining the consequences of having too much weight at this age is not enough to motivate them to adhere to an e-health lifestyle intervention. Therefore, it would be important to promote patient-centered communication rather than weight-focused communication in order to decrease the parent's feelings of blame and to improve adherence to the intervention. In the RCT, it would also be important to consider other strategies to change parents' perception of their child's excessive weight, for instance, by including one session of motivational interviewing. Additionally, a qualitative study may help with understanding parents' preferences and concerns and give important feedback to improve recruitment.

This tailored recommendation system improved parent's knowledge about the guideline for water intake, which was the least-known lifestyle guideline. However, a high percentage of parents that were already informed about the guidelines had failed to meet those guidelines. Thus, there is also a need to promote more than knowledge to help parents change their child's lifestyle, as knowledge is not the only determinant of behavior. In the RCT, it will be possible to test the effect of recommendations related to food parenting practices on children's eating behavior. Additionally, it may also be important to involve other caregivers of children or contexts to exert a higher influence on behavioral changes.

Author Contributions: Conceptualization, L.A., R.R. and S.T.; methodology, L.A., R.R., J.C., N.P., C.T., A.F. and S.T.; data curation, L.A., R.R. and S.T.; validation, L.A., R.R. and S.T.; formal analysis, L.A., R.R. and S.T.; investigation, L.A., R.R., J.C., N.P., C.T., A.F. and S.T.; writing—Original draft preparation, L.A.; writing—Review and editing, L.A., R.R., J.C., N.P., C.T., A.F. and S.T.; supervision, R.R. and S.T. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Foundation for Science and Technology (grant numbers PD/BD/128309/2017 and UID/PSI/00050/2013) and by the Center for Psychology at the University of Porto and EU FEDER(European Regional Development Fund); (COMPETE 2020 program; POCI-01-0145-FEDER-007294).

Acknowledgments: The authors gratefully acknowledge the families that participated in this study, the health care center's professionals involved in their recruitment, and the students involved in the development of the Fammeal system. They also acknowledge the Maia-Valongo Health Center Group and particularly Emília Mendes and Isabel Cortijo for their support in testing the system within the Viver Mais and Íris Family Health Units, respectively. The authors would also like to thank Susana Santos, Xana Sá-Pinto, and Sara Aboim for their contributions in improving some videos' contents.

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

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European Journal of
Investigation in Health, Psychology and Education

MDPI

Article

Development and Validation of the Social Network Addiction Scale (SNAddS-6S)

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Received: 23 June 2020; Accepted: 22 July 2020; Published: 26 July 2020

Abstract: The use of social networks has increased exponentially, especially among youth. These tools offer many advantages but also carry some risks such as addiction. This points to the need for a valid multifactorial instrument to measure social network addiction, focusing on the core components of addiction that can serve researchers and practitioners. This study set out to validate a reliable multidimensional social network addiction scale based on the six core components of addiction (SNAddS-6S) by using and adapting the Bergen Facebook Addiction Scale. A total of 369 users of social networks completed a questionnaire. Exploratory and confirmatory factor analyses were performed, and different competing models were explored. The external validity of the scale was tested across its relations with different measures. Evidence for the validity and reliability of both the multidimensional SNAddS-6S and the unidimensional Short SNAddS-6S was provided. The SNAddS-6S was composed of 18 items and five different factors (time-management, mood modification, relapse, withdrawal, and conflict), with the time-management factor as a higher-order factor integrated by salience and tolerance as sub-factors. The Short SNAddS-6S was composed of six items and a unifactorial structure. This scale could be of relevance for researchers and practitioners to assess the extent to which individuals suffer from social network addiction and to study the potential predictors and risks of such addiction.

Keywords: social network addiction; scale development; scale validation; confirmatory and exploratory factor analyses

1. Introduction

Social networks (SN) are attractive entertainment tools, especially for youths [1–3]. New technologies are integrated into their lives, so it would be impossible for individuals to imagine their existence without SN [1]. The attractiveness of SN lies in the many possibilities they offer—easy and real-time communication, sharing photos and videos, identity construction, etc. [4–6].

At the same time, SN have some risks—bullying, the loss of intimacy, the possibility of developing social network addiction (SNA), etc. [7]—and its abuse might involve physical, cognitive, and emotional problems [1,8–10].

In their conceptualization of SNA, Andreassen and Pallesen [11] noted the six symptoms that necessarily appear in all kinds of addiction (both chemical and behavioral), as described by Griffiths [12]. On the other hand, the Diagnostic and Statistical Manual of Mental Disorders [13] does not include SNA as an addictive disorder; however, a body of studies supports the existence of this addiction [14]. People between 16 and 31 years old spend more and more time surfing the net and (ab)using SN [15]. SN are attractive, act as immediate reinforcers, and present ease of access, all of which are key factors in any addiction [16]. While non-addicted people also use the Internet for social functions, and while

social purposes are not a pre-requisite for addiction, it may be observed that addicted people use the Internet more for social functions than non-addicted people [17]. Nevertheless, it is difficult to draw the map of prevalence of SNA due to the types of studies performed—usually non-representative student samples, with different screening methods and cut-off points [18]. Thus, more studies are needed on this topic.

As far as we know, currently only the Bergen Social Media Addiction Scale (BSMAS) measures a very similar concept to SNA, focusing on the six core components of addiction [8,19]. This instrument represents an adaptation of the Bergen Facebook Addiction Scale (BFAS) and contains six items based on the components of addiction outlined by Griffiths [12]. Although an extensive validation of the scale was not performed during the aforementioned studies, some psychometric data for this scale were presented. Multiple language adaptations of the BSMAS were made, being available, among others, in Italian [20] and Persian [21], but as far as we know, there is no Spanish version. Moreover, although the BSMAS and its multiple language adaptations focus on the six core components of addiction, they only contemplate six items, one for each of the six core components of addictions. This means that the BSMAS is presented as a six-item unifactorial scale. Thus, in this form, this scale does not allow professionals and researchers to work independently of each of the six core components of SNA. For this reason, in this study we intend to develop and validate a Spanish multifactorial scale with three items for each of the six core components of SNA. The advantage will be the obtention of a multifactorial scale validated in Spanish that will allow researchers and professionals not only to measure SNA, but also to investigate each of the six core components of SNA. Moreover, in the BSMAS, the authors focused on "social media" and not on SN; nevertheless, social media and SN are not the same [1]. Social media refers to the possibility to produce and share content online, while SN refers to virtual communities that allow users to create profiles and interact online with other people [1]. In this study, we are focusing on SNA, acknowledging SN as a specific type of social media use. In this sense, SN imply interconnectedness between people [1] and an "always on" lifestyle, as well as a way of being and relating, referring to how we are, how we introduce ourselves, and how we relate to other people [1]. Then, SN fulfill basic human needs such as the need to belong [22], identity construction [5], social support, and expression [23]. Accordingly, we are not addicted to the technology [1,24,25] (that is only the medium or tool that individuals use to engage in social networking, gaming, and other particular behaviors), but to interacting and connecting with people and to the positive feelings produced by the "likes" and approvals made by individuals pertaining to our SN [1]. Consequently, SN may be potentially addictive [1,5]. In this sense, and taking into account that interconnectedness is the key function of SN, Kuss and Griffiths [1] have argued that "social networks addiction" may be the appropriate denomination. As such, it was the terminology we have used in our scale.

However, there are other similar scales that are supposed to specifically focus on SNA, but not in the way we want to focus on this study. For example, the Social Networks Addiction Scale (SNAS) measured attitudes toward SN and not addiction as such [4]. Another recently validated SNA scale [26] did not represent the six core components of addiction but only three factors: Control difficulty, negativity in social relations, and decreased functions. While those scales are of interest, the core components (or symptoms) of addiction are not measured. This underscores the need for a reliable and valid instrument for the measurement of SNA based on the symptoms of addiction, and that allows the measurement and analysis of each of the six components separately. Thus, the main aim of this study was to develop and validate a multifactorial SNA scale that reflects those symptoms.

1.1. Social Network Addiction: Concept and Measurement

Griffiths' component model of addiction [12] highlighted that both chemical and behavioral addictions are composed of six core components: Salience, mood modification, tolerance, withdrawal, conflict, and relapse. These six components should be present to determine that the person suffers from addiction. Thus, SNA should present those six symptoms. Subsequently, for individuals with SNA, using SN should be their biggest concern and highest priority motivation (salience), as it changes

their mood by exciting or relaxing them (mood modification). Moreover, individuals addicted to SN should want to use SN more and more (tolerance), spending so much time to the point of impairing other social and normal activities (conflict) and suffering psychological and physical symptoms when they cannot use the SN (withdrawal). Lastly, when individuals addicted to SN finally get control of their use, using them again should lead to a relapse of addiction (relapse).

Accordingly, an SNA instrument should also reflect those six components of addiction. Based on the component model of addiction [12], Andreassen et al. [27] developed the BFAS initially with 18 items (three items for each of the six core components of addiction), but retaining a single item for each of the six core components of addiction. The BFAS items were worded according to the criteria of diagnostic addiction, and the BFAS obtained good psychometric properties [27]. To generate our SNA scale (SNAddS-6S), we used the 18 items created by Andreassen et al. [27] and changed the word "Facebook" to "Social Networks." We expected that the SNAddS-6S would have a factorial structure with six factors representing the six core components of addiction (Hypothesis 1). Moreover, we expected that when retaining the items with higher loading in each factor, the resulting six-item scale (Short SNAddS-6S) would show a unifactorial structure (Hypothesis 2).

1.2. Social Network Addiction and Related Variables

Several authors have argued that the abuse of SN can lead to addiction [28]. The expansion of SN can involve a risk to their addictive use [29]. Due to the intrinsic relation between abuse and addiction [30], we expected to find a positive correlation between the SNAddS-6S (and each of the six factors) and the abuse of SN.

Another variable potentially related to SNA is social anxiety. SN can be conceived as a protective barrier to interaction problems and social anxiety, as the mediation of computer communication reduces the fear of the interaction and evaluation [31,32]. Moreover, people with high levels of social anxiety are more likely to be addicted to the Internet, Facebook, and mobile phones than people with low levels of social anxiety, likely because virtual socialization eliminates the physical symptoms produced by social anxiety [33–35].

Loneliness and problematic use of the Internet are also related [36,37]. People who feel lonely use the Internet as a way of escaping from everyday life. Internet addiction increases the feeling of loneliness since social network users prefer the use of SN to communicate with other people rather than face-to-face interactions because they find it easier to express themselves online [38].

A meta-analysis [39] highlighted that Internet addiction is related to dissatisfaction with life in general, reporting Internet users' lower levels of both subjective (life satisfaction) and objective (quality of environmental conditions) quality of life. As with other addictive behaviors (gambling, sex, work, etc.), subjective well-being is negatively affected by Internet addiction [40], and smartphone addiction has been related to (dis)satisfaction with life [41]. Moreover, different studies have identified a positive relationship between abuse of the Internet and different psychological indicators like depression, anxiety, sleep disturbance, and social disfunction, all of which are associated with worse subjective well-being [42]. Indeed, loneliness, life satisfaction, and self-esteem were predictors of Internet addiction [37]. Addictive use of social media was also related to life satisfaction [43]. Finally, in a systematic review of Bergen addiction scales, the authors [44] find that almost all the works included in their study (except one) have demonstrated a significant association between the BSMAS and well-being.

Self-esteem is also potentially related to behavioral addictions related to the Internet [37]. It was found that low self-esteem was related to Internet addiction [37], to the use of Facebook [45], and to the use of SN [9,37,43].

In line with these findings, we expected our SNAddS-6S and its different factors to be positively related to social network abuse, loneliness, and social anxiety (Hypothesis 3) and negatively related to life satisfaction and self-esteem (Hypothesis 4).

Finally, regarding socio-demographic factors, women seems to (ab)use the Internet for social interactions more than men [46] and are more prone to behavioral addiction involving social interaction than men [27]. Then, we expected higher scores on the SNAddS-6S and its different factors for women (Hypothesis 5).

2. Materials and Methods

2.1. Participants

A sample of 369 users of SN (67% female, 33% male), on average 21.82 years old (SD = 3.65, age range = [18, 40]) completed the questionnaire. Most of the sample had a level of university (53.9%) or secondary (38.3) education while 7.8% had primary education. Finally, 56.1% had a partner.

2.2. Procedure

Approval from the Cordoba Research Ethics Committee was obtained. After the participants gave their informed consent, they completed an anonymous and confidential online questionnaire hosted on various SN. The questionnaire was shared by the researchers and a master's thesis student on their SN (WhatsApp, Facebook, Instagram). Both participation and diffusion of the questionnaire were solicited. The questionnaire took approximately 10 min to complete.

2.3. Measures

Participants responded to all of the psychosocial measures on five-point Likert scales.

2.3.1. Social Networks Addiction

To measure the extent to which participants engage in addictive behavior toward SN (using them compulsively, pathologically, and without self-control), we adapted the 18 original items that Andreassen and colleagues used to develop their final six-item BFAS [27] by changing the term "Facebook" to "Social Networks." This modification of the BFAS was largely the same as the modification that the authors made to construct their BSMAS [19], but in the present study we used the 18 original items used by Andreassen and colleagues to construct their final six-item BFAS scale [27]. In the BSMAS, in contrast, the authors used only the final six items of the BFAS. Moreover, in the BSMAS, the authors used the term "Social Media." On the basis of the argument that social media and SN are not the same (social media refers to the possibility to produce and share content online, while SN refers to virtual communities that allow users to create profiles and interact online with other people) [1], for our scale we used the more specific term "Social Networks." The resulting instrument of the present study was called the Social Networks Addiction Scale-6 Symptoms (SNAddS-6S) and was the subject of validation in this study. The Spanish form used in this study can be found in Supplementary Table S1.

2.3.2. Social Network Overuse

To measure participants' overuse of SN, a behavioral frequency scale was created for the purposes of the study. The four items ("The first thing I do when I get up is look at social networks"; "The last thing I do when I go to bed is look at social networks", "I usually eat with my mobile nearby to check social networks", and "When I go out with my friends, we usually carry our mobile phones and check Social Networks while we are together") created reflected abusive behaviors that can be carried out by SN users. The items were constructed to capture the behavioral pattern of being "always online," "always-on-and-connected," and always checking SN [47,48]. Reliability was good (Cronbach's $\alpha = 0.72$).

2.3.3. Social Anxiety

To measure participants' concerns of feeling judged by others or ashamed in social situations, a brief form (10 items; e.g., "I worry about what others say about me") of the Spanish version of the Social Anxiety for Adolescents Scale [49] was used. Reliability was high (Cronbach's $\alpha = 0.90$).

2.3.4. Loneliness

To measure participants' feelings of loneliness, a short (five items; e.g., "I lack companionship") version of the Revised UCLA Loneliness Scale [50] was used. Reliability was good (Cronbach's $\alpha = 0.81$).

2.3.5. Life Satisfaction

To measure global cognitive judgments of one's life satisfaction, the five-item ("In most ways my life is close to my ideal") Satisfaction with Life Scale [51] was used. Reliability was high (Cronbach's $\alpha = 0.85$).

2.3.6. Self-Esteem

To measure the extent of participants' self-esteem, the abbreviated (seven items; e.g., "I feel that I am a person of worth, at least on an equal plane with others") form of the Rosenberg Self-esteem Scale used by Marsh [52] was applied. Reliability was high (Cronbach's $\alpha = 0.93$).

2.4. Statistical Analyses

First, to test for plausible bias due to common method variance (CMV), Harman's single-factor test was performed. To this end, an exploratory factor analysis (EFA) was performed by introducing all the items of understudy variables (SNA, social network overuse, social anxiety, loneliness, life satisfaction, and self-esteem) and running a principal component analysis. In the first step, we observed how many factors emerged in the unrotated factor solution to assess the number of factors that could cause the variance in the variables. Because six variables were introduced, with one (SNA) expected to have six factors, we expected to find between six and 11 factors that could cause the variance in the variables. In any case, the presence of CMV would be confirmed if a single factor emerges or if one general factor leads to the majority of the covariance [53]. Then, the same test was performed but by extracting one unique factor. In this case, the presence of CMV will be evident if the percentage of the variance explained by the unique factor extracted is equal to or greater than 50%.

To validate rigorously new measures, EFA should be first performed, and then, with a different sample, the analyses should continue with a confirmatory factor analysis (CFA) [54]. Subsequently, the general sample was randomly divided into two samples. In the first stage, with the first split sample (182 participants), we first explored the suitability for inclusion of the items in further analyses by carrying out preliminary data checks. Items displaying poor ($r < 0.20$) correlations with half of the items of the scale or more were removed. Items that considerably reduced the Cronbach's alpha values and items with low item-to-total correlations ($r < 0.25$) were removed for further analyses. Moreover, items with large amount of missing data (more than 10% non-responses) were removed. Then, we performed an EFA with varimax rotation to identify factors within the item pools and to exclude items that did not group in conceptually sound factors. Bartlett's test of sphericity (BTS) and the Kaiser-Meyer-Olkin (KMO) statistic were carried out to assess the suitability of using factor analysis [55].

In the second stage, we carried out a CFA with the second split sample (189 participants) by testing the chi-square (χ^2), the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the comparative fit index (CFI), the root-mean-square error of approximation (RMSEA), and the Akaike information criterion (AIC), and by using the rules of thumb recommended by Schermelleh-Engel, Moosbrugger, and Müller [56]. In accordance with those authors, the χ^2 statistic is highly sensitive

to the sample size, and thus not too much emphasis was placed on its significance. To demonstrate good fit, the ratio chi-square by degrees of freedom (χ^2/df) should not exceed 3.0. Also, CFI values greater than 0.95, GFI values greater than 0.90, and AGFI values greater than 0.85 were considered as having acceptable fit. RMSEA values between 0.05 and 0.08 were considered as an adequate fit, with the lower boundary of the confidence interval lower than 0.05 for close fit. For model comparisons, the parsimony indices considered were the RMSEA and the AIC, with lower values of these indices indicating a better model fit. At this stage, different competing models would be compared for the full scale (the SNAddS-6S) and the short scale (the Short SNAddS-6S).

Finally, using the overall sample, we explored the correlation between the SNAddS-6S (and its subscales) and other variables conceptually related to it (with Pearson correlation analyses), as well the differences between men and women on the scores to the scale (with ANOVA analyses), to explore the external validity of the final scale.

3. Results

3.1. Preliminary Analyses: Common Method Variance

The EFA performed with all the items of understudy constructs showed a 12-factor solution congruent with the number of variables and expected factors included in the study. Moreover, no general factor leads to most of the covariance. The second EFA performed by fixing one factor for extraction explained only 27.56% of the variance. As such, no common method bias was observed.

3.2. Stage 1: Reducing the Items and Exploring the Factorial Analysis

3.2.1. Missing Data, Correlation between Items, and Reliability Analyses

The results revealed that no items had more than 10% of missing data (in fact, no missing data were found for the items of the SNAddS-6S, except for item 1, with 0.6% of missing data). No items of the scale displayed correlations lower than 0.20 with half (or more) of the items of the scale. When including all 18 items, high reliability was found (α = 0.91), and no items had low item-to-total correlations. As a result, no items were removed.

3.2.2. Exploratory Factorial Analysis for the Social Networks Addiction (SNAdd) Scale

For the 18 items, the KMO index (0.87) and BTS (χ^2 = 1612.74; *df* = 153; $p < 0.001$) supported the use of EFA. The EFA showed a five-factor solution with a balanced factorial structure that explained 69% of the variance (Table 1). All the items saturated in the expected factors except for those of salience and tolerance factors, which saturated in a unique factor (the first factor). We have called this higher-order factor "time-management" in accordance with results of the literature in which those two symptoms also merge in a unique factor [57–59], and because it includes the two factors related to the difficulty that individuals have in managing time regarding (a) their thoughts about SN, spending most of their time thinking about them, thus reflecting salience, and (b) the time they need for SN to continue to be enjoyable, thus reflecting tolerance. Factor 2 corresponded to mood modification, factor 3 to relapse, factor 4 to withdrawal, and factor 5 to conflict. The global scale (α =0.91) and each of the five factors presented high reliability.

Because the component model of addiction [12] and the subsequent BFAS [27] and SNAddS-6S considered six theoretical factors, to explore the suitability of the six-factor structure, we conducted another EFA by fixing six factors for extraction. Again, the KMO index (0.8) and BTS (χ^2 = 1612.74; *df* = 153; $p < 0.001$) supported the use of EFA. The six extracted factors explained 73.38% of the variance. All items were loaded congruently to their proposed dimensions (Table 2). Factor 1 represented mood modification, factor 2 relapse, factor 3 withdrawal, factor 4 conflict, factor 5 salience, and factor 6 tolerance. The global scale (α = 0.90) and each of the six factors presented acceptable to high reliability. Consequently, Hypothesis 1 was partially supported.

Table 1. Results of the exploratory factor analysis (EFA) of the SNAddS-6S: Factors loading and reliability estimates.

Items	Highest Loading for Each One of the Five Factors				
	F1	**F2**	**F3**	**F4**	**F5**
SNAdd 1	0.642				
SNAdd 2	0.633				
SNAdd 3	0.662				
SNAdd 4	0.531				
SNAdd 5	0.638				
SNAdd 6	0.548				
SNAdd 7		0.863			
SNAdd 8		0.882			
SNAdd 9		0.864			
SNAdd 10			0.409		
SNAdd 11			0.815		
SNAdd 12			0.865		
SNAdd 13				0.760	
SNAdd 14				0.803	
SNAdd 15				0.662	
SNAdd 16					0.808
SNAdd 17					0.754
SNAdd 18					0.669
	Scale reliability estimates				
Cronbach's Alpha values	0.81	0.89	0.80	0.80	0.78
Percentage of explained variance	14.77	14.42	13.61	13.46	12.74

Table 2. Results of the EFA of the SNAddS-6S when fixing six factors for extraction: Factors loading and reliability estimates.

Items	Highest Loading for Each One of the Six Factors					
	F1	**F2**	**F3**	**F4**	**F5**	**F6**
SNAdd 1						0.659
SNAdd 2					0.694	
SNAdd 3						0.732
SNAdd 4						0.667
SNAdd 5					0.634	
SNAdd 6					0.629	
SNAdd 7	0.865					
SNAdd 8	0.883					
SNAdd 9	0.862					
SNAdd 10		0.400				
SNAdd 11		0.806				
SNAdd 12		0.859				
SNAdd 13			0.779			
SNAdd 14			0.829			
SNAdd 15			0.472			
SNAdd 16				0.797		
SNAdd 17				0.801		
SNAdd 18				0.668		
	Scale reliability estimates					
Cronbach's Alpha values	0.89	0.80	0.80	0.78	0.75	0.70
Percentage of explained variance	14.36	12.87	12.25	12.11	11.25	10.52

3.2.3. Exploratory Factorial Analysis for the Short SNAddS-6S

To explore the unidimensionality of the Short SNAddS-6S, we performed an EFA by using the items with higher loadings in each of the five factors found in the EFA without fixing factors for extraction (items 3, 8, 12, 14, and 16), and another EFA by using the items with higher loadings in each

of the six factors found in the EFA fixing six factors for extraction (items 2, 3, 8, 12, 14, and 17). In both analyses, the unidimensionality of the short scale was supported.

When using the five items with higher loadings in each of the five factors found in the EFA conducted without fixing factors for extraction, the KMO index (0.74) and BTS ($\chi^2 = 113.99$; $df = 10$; $p < 0.001$) supported the use of EFA, and the unifactorial structure explained 43.17% of the variance. Reliability was unacceptable ($\alpha = 0.66$).

When using the six items with higher loadings in each of the six factors found in the EFA conducted by fixing factors for extraction, the KMO index (0.78) and BTS ($\chi^2 = 166.46$; $df = 15$; $p < 0.001$) also supported the use of EFA, and the unifactorial structure explained 41.73% of the variance. Reliability was good ($\alpha = 0.71$). In accordance with these results, Hypothesis 2 was partially supported.

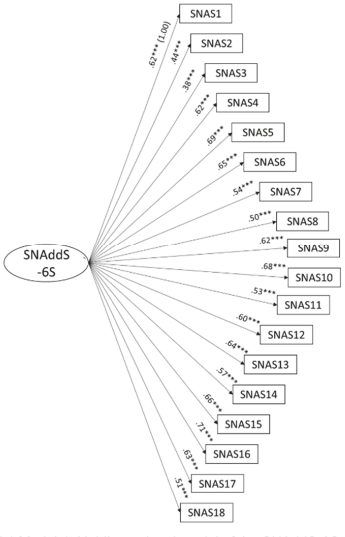
3.3. Stage 2: Confirming the Factorial Analysis

3.3.1. Confirmatory Factorial Analysis for the SNAddS-6S

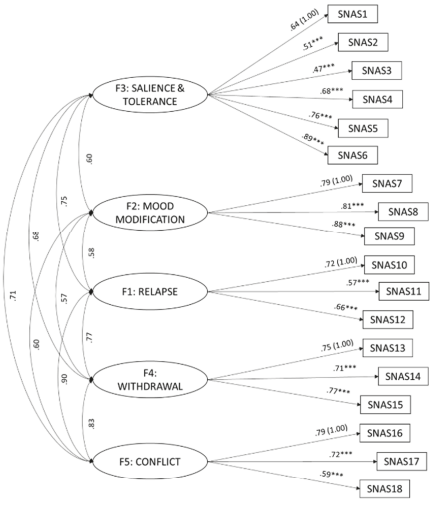
To test the unidimensionality or multidimensionality of the large scale (SNAddS-6S), four competing models were compared. In the first model, the unidimensionality of the scale was assumed by performing a single-factor CFA. In the second model, the five-factor structure found in the first EFA conducted was explored. In the third model, we explored the six-factor structure found in the second EFA conducted by fixing six factors for extraction according to the theoretical framework of the Griffiths' model [12]. In the fourth model, a higher-order factor was explored in which the SNAddS-6S can be partitioned into five factors, with the first being the time-management higher-order factor with two different sub-factors (one corresponding to salience and one to tolerance). This fourth model could conciliate the EFA found with five factors that includes salience and tolerance in one large factor and the theory about six different symptoms of addiction. The four models are presented in Figure 1. The two models with the worse fit were the single-factor model (Model 1; Figure 1a) and the six-factor model (Model 3; Figure 1c), with no acceptable fit indices. The five-factor model (Model 2; Figure 1b) and the higher-order factor model (Model 4; Figure 1d) were the best ones with good fit indices.

3.3.2. Confirmatory Factorial Analysis for the Short SNAddS-6S

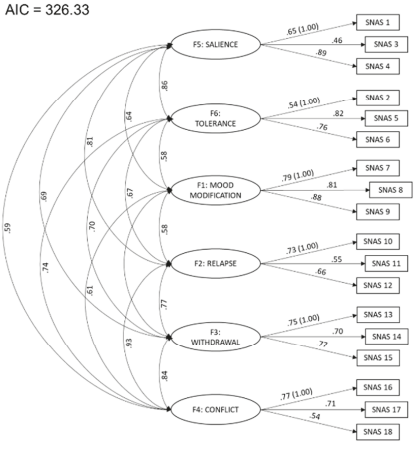
To test the unidimensionality of the Short SNAddS-6S, two competing models were compared. In the first one (Model 5), a single-factor CFA was performed with the five items that showed higher loadings when performing the EFA without fixing factors for extraction. In the second one (Model 6), a single-factor CFA was performed with the six items that showed higher loadings when performing the EFA by fixing six factors for extraction, in accordance with the Griffiths component model of addiction [12]. The two models had good to excellent fit indices (Figure 2). The five-item model (Model 5) was the worst short scale model despite its good fit indices. The six-item model (Model 6) was the best, with excellent fit indices.



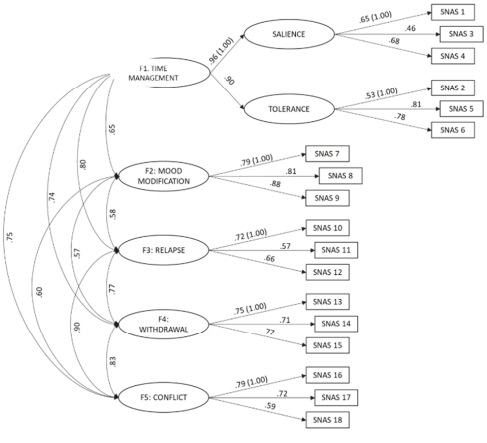
(a) Model 1: Unidimensional model of the SNAddS-6S
Fit indices:
X^2(gl = 122) = 228.327, p <. 001; X^2/DF = 1.87
RMSEA (95% CI) = 07 (05; 08)
CFI = .94; GFI = .88;
AGFI = .84
AIC = 326.33



(b) Model 2: 5-factor model of the SNAddS-6S
Fit indices:
X^2(gl = 116) = 201.266, p <. 001; X^2/DF = 1.74
RMSEA (95% CI) = 06 (05; 08)
CFI = .95; GFI = .90; AGFI = .85
AIC = 311.27

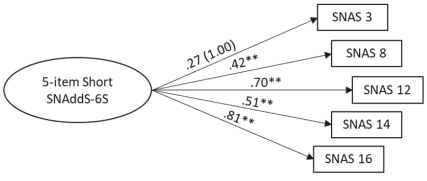


(c) Model 3: 6-factor model of the SNAddS-6S
Fit indices:
X^2(gl = 116) = 219.921, p <. 001; X^2/DF = 1.90
RMSEA (95% CI) = 07 (06; 08)
CFI = .94; GFI = .89;
AGFI = .83
AIC = 329.92

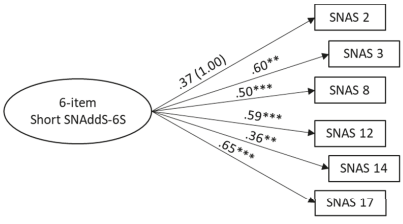


(d) Model 4: Higher-order factor model of the SNAddS-6S
Fit indices:
X^2(gl = 111522) = 199.100, p <. 001; X^2/DF = 1.73
RMSEA (95% CI) = 06 (05; 08)
CFI = .95; GFI = .90;
AGFI = .85
AIC = 311.10

Figure 1. Comparison between the four tested models (**a**–**d**).



(a) Model 5: 5-item model of the Short SNAddS-6S
Fit indices:
$X^2(gl = 4) = 4.439$, $p < .350$; $X^2/DF = 1.11$
RMSEA (95% *CI*) = .024 (.001; .12)
CFI = 1.00; GFI = .99; *AGFI* = .97
AIC = 26.44



(b) Model 6: 6-item model of the Short SNAddS-6S
Fit indices:
$X^2(gl = 5) = 2.689$, $p <. 611$; $X^2/DF = 0.67$
RMSEA (95% *CI*) = .001 (.001; .09)
CFI = 1.00; *GFI* = 1.00; *AGFI* = .98
AIC= 36.69

Figure 2. Comparison between the two tested models (**a**,**b**).

3.4. Exploring the External Validity of the Large and Short SNAddS-6S

To obtain additional evidence of the instrument's validity, we performed Pearson correlation analyses with the SNAddS-6S, the six-item Short SNAddS-6S (that obtained better fit indices), and the five factors of the higher-order SNAddS-6S (by using the model that obtained better fit indices). As illustrated in Table 3, the expected correlations with other variables of interest were found, thus confirming Hypothesis 4. The SNAdd-6S, the Short SNAddS-6S, and the different factors of the SNAddS-6S positively correlated with SN abuse, loneliness, and social anxiety, and negatively so with life satisfaction and self-esteem.

Table 3. Correlation analyses.

	SN Abuse	Loneliness	Social Anxiety	Life Satisfaction	Self-Esteem
SNAddS-6S	0.54 ***	0.28 ***	0.31 ***	−0.27 ***	−0.35 ***
Time-management higher-order factor	0.49 ***	0.16 ***	0.20 ***	−0.13 ***	−0.21 ***
Salience sub-factor	0.48 ***	0.10 ***	0.16 ***	−0.11 ***	−0.18 ***
Tolerance sub-factor	0.40 ***	0.18 ***	0.20 ***	−0.12 ***	−0.19 ***
Mood modification factor	0.42 ***	0.32 ***	0.34 ***	−0.34 ***	−0.40 ***
Relapse factor	0.33 ***	0.24 ***	0.22 ***	−0.17 ***	−0.24 ***
Withdrawal factor	0.41 ***	0.16 ***	0.23 ***	−0.19 ***	−0.26 ***
Conflict factor	0.41 ***	0.22 ***	0.22 ***	−0.25 ***	−0.28 ***
Six-items Short SNAddS-6S	0.50 ***	0.28 ***	0.30 ***	−0.27 ***	−0.36 ***

*** $p < 0.001$.

One-way and multifactorial ANOVA analyses performed confirmed Hypothesis 5. The one-way ANOVA analyses performed demonstrated higher scores for women in both the six-item Short SNAddS-6S ($F(1,361) = 8.56$, $p < 0.01$) and the SNAddS-6S ($F(1,361) = 8.58$, $p < 0.01$). Moreover, the multifactorial ANOVA analysis performed by introducing the six factors of the SNAdd-6S as dependent variables, and gender as factor, has shown higher significant differences (F (6,355) = 2.30, $p < 0.05$) with higher scores for women in all the factors of the scale ($F_{salience}$ (1,361) = 10.94, p <0.001; $F_{relapse}$ (1,361) = 3.83, $p < 0.05$; $F_{withdrawal}$ (1,361) = 7.93, $p < 0.01$; and $F_{conflict}$ (1,361) = 4.04, $p < 0.05$), except for mood modification (F (1,361) = 2.55, *ns*) and tolerance (F (1,361) = 2.64, *ns*), for which no differences were found (Figure 3).

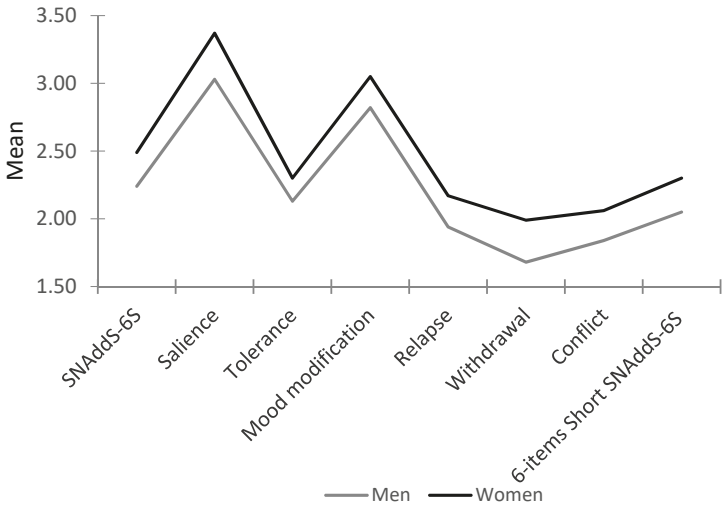


Figure 3. Differences between men and women in the SNAddS-6S and its factors and in the Short SNAddS-6S.

4. Discussion

There has been an increase in the use of the Internet and SN [15] and individuals cannot now imagine their lives without SN. But this increase of SN use also has some potential risks, such as addiction, especially for young people [29]. Nonetheless, to the best of our knowledge, there is not any multifactorial SNA scale properly validated in the scientific literature based on the six core components of addiction described by Griffiths [12]. Consequently, there is a need to develop a comprehensive and psychometrically sound scale in which those symptoms are reflected to detect possible addiction or problematic SN use in individuals and to carry out research on the potential predictors of SNA and its different factors.

4.1. The SNAddS-6S, a Multidimensional Valid and Reliable Scale, and the Short SNAddS-6S, a Unidimensional Valid and Reliable Scale

The results of our analyses confirmed the multidimensionality of SNA. The results of the EFA and CFA performed confirmed a robust adjustment for the higher-order five-factor structure. The six-factor and one-factor solutions presented unacceptable fit indices, while the five-factor solution presented correct but poorer fit indices in comparison to the higher-order factor solution. Thus, Hypothesis 1 was partially supported. The 18 items of the scale had saturated in five factors that approximately correspond to those highlighted in the component model of addiction [12]. The results of the EFA and CFA were congruent with this model, and the five dimensions identified corresponded, in this order of relevance, to the time-management symptom of addiction (which includes two different related symptoms that emerged as sub-factors of the time-management higher-order factor: Salience and tolerance), the mood modification symptom, the relapse symptom, the withdrawal symptom, and finally the conflict symptom. Thus, this large scale and its different factors are especially relevant when researchers or practitioners want to know more about the determinants of addiction, considering that salience and tolerance saturated into a unique factor. This merging of the components of salience and tolerance into a higher factor called time-management is congruent with previous literature [57,58]. The time-management higher factor represents the difficulty that individuals have in managing time regarding (a) their thoughts about SN, spending most of their time thinking about them, and (b) the time they need for SN to continue to be enjoyable. In this sense, Chang and Law [57], in the addiction to Internet context, also found that both factors—salience and tolerance—merged into a

single unique factor they called "time management"; and Charlton and Danforth [58] classified criteria of Internet game addiction into core criteria and peripheral criteria, the latter including both salience and tolerance together. In the same way, salience and tolerance presented the higher correlation in a study investigating the context of game addiction [59]. In future studies regarding behavioral and Internet related addiction, the relation between salience and tolerance must be explored.

Moreover, the Short SNAddS-6S was demonstrated to be a unidimensional reliable and valid scale. Both EFA and CFA analyses confirmed a robust adjustment for the unifactorial structure when using six items with higher loadings in each factor found in the EFA performed by fixing six factors for extraction. The six-item short scale has shown better fit indices than the five-item short scale. Moreover, the five-item short scale demonstrated low reliability, with a low Cronbach alpha value. Thus, the six-items short scale—but not the five-item short scale—can be used by researchers and practitioners. Another reason to adopt the six-item short scale is because it corresponds to the inclusion of one item of each of the six core components of addiction, which then represents all of them in this short scale form. In any case, the use of the Short SNAddS-6S could be relevant in studies and interventions in which a valid, rapid, and cheap evaluation of SNA is needed, without the need for the evaluation of each of the symptoms of addiction separately.

The external validity of the SNAddS-6S and the Short SNAddS-6S were tested across the relation of the scales with different measures. The pattern of relations among the SNAddS-6S (and the Short SNAddS-6S) and its factors with other psychological variables provided strong evidence for construct validity. As expected, and in congruence with previous literature, we found the SNAddS-6S and each of its factors to be correlated with social network abuse. In accordance with different authors that argued and demonstrated the intrinsic relation between abuse and addiction [28–30], the results show that the more individuals presented addictive symptoms to SN (high scores on the SNAddS-6S and the Short SNAddS-6S) or the more their scores on the different dimensions of SN addiction were high, the more they abuse SN. Moreover, women reported higher scores on the different dimensions of the scale, as per the assumption that they used the Internet more for social interaction and that they are more prone to be implicated in addiction involving social interaction than men [27,46]. However, results about sex differences in SNA are sometimes incongruent, with some studies indicating higher levels of addiction in men, and others in women [60,61]. Future researchers should therefore focus on the plausible interaction between age and sex or between other socio-demographic and personal variables to explain the sex differences.

The expected relations also emerged between the SNAddS-6S and loneliness. There are several authors who have claimed that Internet addiction and SNA are related to loneliness [36–38]. Previous studies discovered that loneliness was a relevant variable associated with Internet addiction and its different symptoms [37] and highlighted the potential risk for lonely individuals to develop Internet (or SN) addiction because they might prefer online social interaction [62]. In accordance with the results of previous literature, the SNAddS-6S and the Short SNAddS-6S positively correlated with loneliness. Thus, the results showed that the more individuals presented addictive symptoms to SN (high scores on the SNAddS-6S and the Short SNAddS-6S) or the more their scores on the different dimensions of SNA were high, the more they felt lonely.

The relation between the SNAddS-6S and social anxiety was also confirmed. Previous literature has demonstrated that individuals with high levels of social anxiety tended to be addicted to the Internet and SN, perhaps because of the reduction of fear to the interaction that the communication mediated by a computer provides [31–33,35,63]. In accordance with this literature, our SNAddS-6S, Short SNAddS-6S, and the different factors of the SNAddS-6S correlated positively with social anxiety.

Moreover, the relation between the SNAddS-6S and the Short SNAddS-6S with life satisfaction was also congruent with the reviewed literature showing that Internet addiction and SNA are related to poorer levels of satisfaction with life [37,39,40,42–44]. Accordingly, our results showed that the scores on the SNAddS-6S (or on the different factors) were higher, the more they were dissatisfied with life.

Finally, the relation with self-esteem was also coherent with previous research [9,37,43,45], and the more individuals were addicted to the Internet and SN, the lower their self-esteem levels.

4.2. Limitations and Future Research

Although we had an adequate sample size for the validation of a sound scale, it should be noted that the data are cross-sectional, and that the findings cannot be generalized due to the non-representative sample. Consequently, future research should conduct cross-cultural studies.

Moreover, the sample was predominantly composed of women. While there is no reason to think that the results would be different in a more gender-balanced sample, future research should explore the scale in a more generalizable manner.

Additionally, although the SNAddS-6S can be used by practitioners in their routine clinical practice as well as by researchers, in the present study the authors did not examine the cutoff scores for SNA. As such, future studies should explore the adequate cutoff values for the categorization of SNA. In this sense, "a liberal approach would entail the use of a polythetic scoring scheme" [27] (applied to our scale, scoring 3 or above on at least four of the six factors of the SNAddS-6S, or scoring 3 or above on at least four of the six items of the Short SNAddS-6S). This kind of approach is consistent with the fact that people are usually categorized as addicted when they fulfil a given number of criteria [13].

Finally, it could be argued that the scale lacked three criterions included in the DSM-V for Internet gaming disorder (IGD). In this sense, van den Eijdnen and colleagues [64] developed a Social Media Disorder Scale which included an item for each of the nine diagnostic criterions of the DSM-V for IGD. The authors argued that IGD and social media disorder are two forms of Internet addiction, and social media addiction and IGD scales should include the same set of diagnostic criteria. In the DSM-V, in addition to the six-core components of addiction included here, three other diagnostic criteria are found, namely "problems," "deception," and "displacement." Although our scale focuses only on the six core components of addiction, it could be interesting in the future to expand this scale by adding three items for each of these three diagnostic criteria included in the DSM-V for researchers that will be interested in investigating these criteria further. The principal differences between our expanded scale and the Social Media Disorder Scale [64] will be that (a) our scale will focus on SN and not on social media; (b) in our scale participants respond with a Likert scale and not with yes/no answers; and (c) our scale was validated for the multifactorial (large scale) and unifactorial structure (short scale).

5. Conclusions

Our analyses provide evidence for the validity and reliability of both the large multidimensional SNAddS-6S, with its different factors, and the Short SNAddS-6S. Depending on whether researchers and professionals need to obtain information about the different factors of SNA, and whether they need a rapid and short version, they can choose the form of the scale best suited to their situation. In a society in which the use and abuse of the Internet and SN have become increasingly high, and taking into account that to our knowledge there is not any validated scale for measuring SNA on the basis of the six core components of addiction [12], this scale could be of relevance for researchers and practitioners to assess the extent to which individuals suffer from SNA and to study the potential predictors and risks of such addiction.

Supplementary Materials: The following are available online at http://www.mdpi.com/2254-9625/10/3/76\T1\textendash778/s1, Table S1: Spanish version of the SNAddS-6S.

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

Funding: This research received no external funding.

Acknowledgments: We appreciate the valuable collaboration of the participants.

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

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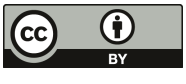

European Journal of
Investigation in Health, Psychology and Education

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Knowledge in Transition in Healthcare

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Received: 16 June 2020; Accepted: 14 July 2020; Published: 17 July 2020

Abstract: Organizations are challenged by the need to transform Dynamic Knowledge, embedded in each worker, into Static Knowledge, rooted in factual documental information. However, innovation and knowledge creation seem to be facilitated by the personal knowledge and life experiences of people, which appear to be dynamic. The tensions between Dynamic and Static Knowledge in facilitating the transfer and sharing of knowledge arise as compelling research as well as practical topic for organizations. Our paper aims to investigate such tensions by employing a case study. We decided to deepen such dynamics in the healthcare field, given its importance for business and society. In more detail, we analyzed one Emergency Room (ER) department through a series of interviews. Our findings highlight the importance of the right balance between Static and Dynamic Knowledge. On the one hand, the healthcare organization recognized the need to incorporate knowledge into practical and tangible instruments. On the other hand, the flows of Dynamic Knowledge must be fostered through a culture of knowledge translation and sharing, and the development of soft skills.

Keywords: healthcare organization; knowledge in transition; static knowledge; dynamic knowledge

1. Introduction

This article aims to understand the tensions between two opposite forces: Static Knowledge and Dynamic Knowledge, and the mechanisms of knowledge transition in healthcare organizations. It will present a literature review about knowledge and its nature, and it will analyze the role of the health professionals in knowledge transition processes within organizations.

A fundamental part of organizations' knowledge is dynamic [1], rooted in each worker—the so-called individual knowledge [2]—based on their work and life experiences [3]. Another essential part of organizations' knowledge is static, embedded in documental information [4].

Dynamic Knowledge can be expressed in opinions, behaviors, ideas, and informal conversation, through workshops, communities of practice [5], and meetings of various kinds [6]. Static Knowledge is usually stored in reports, memos, document procedures, databases, wikis, and other types of organizational documentation [7].

Dynamic Knowledge should be stored in repositories so that it can become a substantial source of relevant information and expertise. However, knowledge flows much better under informal networks, assuming a dynamic nature, than through the hierarchical structure, where Static Knowledge has a more significant importance in the form of reports, memos, and other organizational documents.

Starting from this premise, our work wants to examine in more depth how these dynamics work in one sensitive field, that of healthcare. Healthcare is essential due to its contribution to the wellbeing

of society [8,9]. At the same time, the healthcare sector is undergoing a relevant change [10], due to the introduction of always-new technologies [11], and protocols in surgery and care [12–14], the requests for more inpatient and outpatient services by an ageing population [15], and the need for accountability and transparency with a reduced budget [16]. In particular, we decided to examine how knowledge flows in the Emergency Room (ER), probably the most hectic department in hospitals [17]. At the ER, healthcare professionals need to cope with patients with a variety of different conditions, deciding whom they should assist first, which other departments to involve, which people to hospitalize or send home, and what to do in case of a global emergency (like the case of Covid-19) [18]. Using a case study approach, we carried on some interviews to map and deepen the knowledge dynamics, following the framework of Lopes at al. [19].

The article is the output of larger research being developed in one healthcare institution, as part of a project on competencies development and knowledge management processes. The whole research has the goal to identify the skills and knowledge forms of transition and to infer about future capabilities and new ways of knowledge transfer among health professionals. This first phase of the study's purpose is to identify the current processes and competencies, to define practical implications on the definition of new strategies for health professional management in terms of their future development, aiming at more efficient and agile management practices in health institutions. The article will also contribute to the knowledge management theory in terms of addressing more robust concepts of Dynamic and Static Knowledge, emerging from the field.

In this context, two research questions (RQ) were defined:

RQ1: 'What is the individual knowledge translated in the main competencies used by the health professionals of the ER to perform their jobs?';

and

RQ2: 'What are the main knowledge transition mechanisms used in the ER?'

The paper is structured as follows. First, it presents a literature review on knowledge transition, Dynamic, and Static Knowledge. Then, it highlights the methodology and the main findings and discussion. A conclusion paragraph ends the paper.

2. Literature Review

2.1. Knowledge in Transition Conceptualization

Knowledge in transition is a process of organizational innovation and needs to be modelled, structured, and partially formalized by the knowledge sharing process [20–22]. This idea is expressed in the research of Argote and Ingram [23], who conclude that knowledge sharing among workers represents a competitive advantage for organizations. They highlight that knowledge sharing is "the process through which the experience of one unit affects another" and argue that interactions involving workers allow more excellent knowledge sharing within organizations. They conclude that knowledge embedded in the interactions of workers and tasks potentiates the organization's capability to innovate and be more competitive. Hansen et al. [24], Massaro et al. [25], and Jacquinet et al. [26] also emphasize the importance of the worker's role in knowledge sharing activities. They consider the balance between the uses of technologies for knowledge sharing and transition activities versus relying on people to share knowledge through more traditional means. The transition process means codification through, i.e., information systems, opening up the possibility of large-scale reuse for organizations.

In contrast, a personalization approach invests more in facilitating conversations and the exchange of individual knowledge [27]. However, a primary aspect of knowledge sharing among individuals in organizations is trust, and Levin and Cross [28] pointed out its importance when they referred to the competence and trust among individuals in an organization that influences the link between them and the effective use of knowledge. Lee and Choi [29] also note that the lack of trust among employees is another critical barrier to knowledge sharing activities and posterior transition into organizational

knowledge. To overcome such obstacles, organizational studies point out the importance of democratic and participative leadership as the main factor to enable a culture of knowledge sharing [30–32]. In a culture of knowledge sharing, the transition process of individual knowledge into organizational knowledge may be facilitated with the use of a common and shared vocabulary. Cummings [33] reinforces that idea, considering the influence of structural diversity on work group performance, meaning that, when members of diverse workgroups are capable of sharing external knowledge to the group, their performance improves, and the organizations become more innovative.

2.2. Dynamic Knowledge versus Static Knowledge

Most knowledge in organizations is dynamic, rooted in each worker, and a small part is static, embedded in documental information [34]. Dynamic Knowledge should be stored in tangible repositories so that it can become a substantial source of relevant information and expertise [35], as reported in Table 1 [30,36].

Table 1. Dynamic and Static Knowledge.

Dynamic Knowledge	Static Knowledge
Opinions, behaviours, ideas, and informal conversation. Workshops, communities of practice, and meetings.	Reports, memos, document procedures, databases, and other kind of organisational documentation.

Source: Sousa, MJ (2010).

A similar distinction, in the literature, refers to explicit and tacit knowledge [37]. While explicit knowledge is the most basic form of knowledge, when data is stored, processed, organized, and structured, allowing sharing in an easier way, tacit knowledge is possessed by people, and it is garnered from personal experience and contexts [38]. Converting tacit knowledge into an explicit one is one of the biggest challenges for organizations [39], as it contributes to the competitive advantage, fostering knowledge transfer and sharing [40].

When referring to the healthcare sector, communities of practice (CoPs) can result in effective knowledge sharing among CoP participants, creation of new knowledge, and improvement of practice [41]. Telemedicine and new technologies can help healthcare professionals in sharing knowledge effectively [42], also considering the amount of information to be managed and shared [43]. The use of new technologies also involves social media networks [44]. Knowledge sharing may also include behaviors like best practices, mistakes, and feedbacks [45].

Workers that participate in the resolution of specific problems [31] develop strategies that can be learned by other workers and be applied in different situations—capturing knowledge shared in real-time—this is a process of capturing and reusing Dynamic Knowledge. Effective capture and reuse of Dynamic Knowledge within the organization, such as the capture of personal knowledge, may be achieved using a common and shared vocabulary. This can be promoted by the creation of a culture of knowledge sharing [36].

3. Methodology

In the paper, we employ a qualitative case study approach [46]. Qualitative methodologies enable investigators to uncover and understand the relationships among different variables, even when situations are compared, and to justify the influence of the social context [47]. Moreover, case study methods seem to fit the context better when a how or why question is asked on contemporary events where the investigator has no control [46]. Last but not least, case studies grant a deepening of a real-world case [48]. To ensure transparency [49], in the following subparagraphs, we explain the research context and the data collection and analysis.

3.1. Research Context

We picked one public healthcare organization located in the center of Portugal, selecting the ER as one of the most critical departments in terms of knowledge needed, and the necessity of agile and quick decision-making [17]. The healthcare organization is public, and it is also a University institution, ranked as one of the biggest health infrastructures in the country. The hospital was chosen as it is part of a larger project about health innovation, showing thus excellent innovative capabilities.

3.2. Data Collection and Analysis

Data were collected through three group semi-structured interviews (Appendix A), with at least two professionals in each group, meaning a total of 7 interviews. The healthcare professionals that participated in the research had the role of Operation Assistants, Emergency Room Nurses, and Emergency Medical Technicians. The research approach is based on a case study. The ER was the context studied, as it was the first department under the analysis of the research, and it represents the heart of the health institution. The interviews were conducted in a meeting room, and after the end of the working shift of the health professionals. The information was collected with the help of the tables of competencies (Tables A1–A3), and also notes regarding the other questions were taken. As a qualitative study, the number of interviews is made by convenience sample, according to the workload and the shifts of the health professionals. The duration of each interview was about 50 minutes. The Emergency Medical Technicians and the Operations Assistants were male, while the Emergency Room Nurses were female. The goal of the interviews was to understand how the knowledge was translated and transferred among the professionals. The interviews were coded and categorized, and then the information was analyzed according to those categories, with an excel sheet that was used to code and identify the categories.

For collecting data, researchers have taken field notes to register not only the comments from the different health professionals, but also their perceptions. Field notes were taken during visits to the health institution and informal conversations with the health professionals, with their acknowledgement, as the research is authorized and was communicated to the organization by the board of the health institution. The main goal of the interviews was to collect individuals' opinion about their competencies and the knowledge transition processes.

4. Findings

4.1. Static and Dynamic Knowledge Transition Processes in the Filed—the Perceptions of the Health Professionals

Knowledge shared in everyday work in the healthcare organization is a process of transition from individual knowledge (Dynamic Knowledge) to organizational knowledge (Static Knowledge) [30].

Static and dynamic knowledge are, by nature, extremely difficult to translate, not only because dynamic knowledge is, to some extent, individual and tacit—acquired during life experiences and learning processes; but also, because static knowledge is explicit in research, books, and organizational routines, practices, and contexts. All of the knowledge needs to be learnt and is the base of competencies development, to perform a job position or even to grow from a personal perspective.

According to their nature, Dynamic and Static Knowledge have completely different characteristics and are shared in completely different ways, needing different kinds of competencies for its effective translation. Static Knowledge is regarded as objective, free from individual subjectivity, while Dynamic Knowledge is highly subjective, being embedded within the cultural values and assumptions of those who possess and use it.

Knowledge translation requires extensive and direct social interactions between professionals, as it is during such processes that the dynamic component of knowledge can be shared [50–53]. This is confirmed by Nonaka and Takeuchi [54] who have crystallized the idea that it is the interaction of people that leads to the creation of new knowledge, in their "knowledge spiral."

Next, we will discuss forms of knowledge translation supported by the base idea of Nonaka and Takeuchi's Knowledge Spiral. However, we will not use the categorization of the model because we think that the processes of creation and use/share of knowledge cannot be separated. It is a dynamic process that blends all forms of knowledge sharing.

Transferring dynamic knowledge requires specific competences of interaction because it represents knowledge that people possess, but which is inexpressible and incorporates both physical skills and cognitive frameworks. In the health institution (our case study), the transfer of knowledge between the health professionals is based on long years of experience, especially when new professionals arrive at the institution. This knowledge is shared through an extensive amount of social interaction and face-to-face communication. One ER nurse declared:

"There are some concerns about the information and about procedures and problem-solving processes, especially because of new workers. We have some routines for their integration, and one of these routines is based on a coaching process that occurs with a more experienced colleague that knows the work procedures, and helps the new workers to develop their knowledge and competencies in the first weeks, showing them what to do and how to do it. "

To make this process of knowledge translation effective, the focus was the creation of a trustworthy atmosphere, making all the professionals more participative and more involved. One Operations Assistant stated:

"The health supervisor participates in the integration of new workers, helping with the coaching process. When some doubts arise, the new health professionals consult the colleagues and the supervisors."

These interactions among workers and managers are also important when they share and translate explicit knowledge, because of the inherent ambiguity of language and because people have different cognitive frameworks, creating scope for differing interpretations.

Tsoukas [55] gives validity to this idea when he suggests that tacit knowledge and explicit knowledge are inseparable and are mutually interconnected. Without a tacit understanding of the language in which explicit knowledge is written or the grammar and syntax used to structure it, any text will appear as a somewhat random series of letters, numbers, and images. Thus, there is no such thing as fully explicit knowledge, as all knowledge is 'either tacit or rooted in tacit knowledge' [56]. Alternatively, to state it succinctly, 'all knowledge has tacit dimensions' [57].

In this context, the coaching process assumes here a critical role because no matter how explicit and well defined the procedures and routines are, there will always be some element of ambiguity or uncertainty, creating a need for analysis and comprehension. After all, 'knowing' and 'doing' are two inseparable processes, and knowledge development occurs on an ongoing basis through the routine activities that workers undertake, based on the competencies they have.

In our case study, these ideas can be illustrated through the process of applying the Operations Assistants knowledge with the help of the Emergency Room Nurses and the Emergency Medical Technicians, together with experimentation, observation, and dialogue techniques, which allow the adaptation of existing knowledge to new and novel situations. This represents an important and undervalued source of learning, and the processes of learning by observing are crucial for the new workers. They learn through socialization, observation, and practice. One Emergency Medical Technician declared:

"The instruction sheets of procedures and the now existing competencies tables represents important information, which can be used by the new Operations Assistants, and the new Emergency Room Nurses. But first, they learn with the supervisors how to perform the work routines."

Davenport and Prusak [22] confirmed through their studies that the translation of knowledge can be made by formalized transfer mechanisms and also informal exchanges. The formalized transfer methods include documents, databases, and Intranets. Informal exchanges refer to the more casual events that usually take place face to face, such as a conversation. Applying this to our study we can state that to translate knowledge as rules, procedures, and routines, several techniques can be

applied, like procedures sheets; knowledge databases for emergency problems and solutions, and others repositories where information and documents are stored. Such documents can be reused and shared, for example, regarding operational specifications, manuals, and other information about medical procedures. In respect to Dynamic Knowledge, it flows during the operations in the ER, when the health professionals gather to save a patient's life, most of the time a situation which requires a mix of static knowledge—correspondent also to organizational knowledge, and Dynamic Knowledge—correspondent also to individual knowledge.

4.1.1. Individual Knowledge

Within the knowledge sharing processes, our interviews highlighted how workers continuously refine their organizational, technical, cognitive, and social competencies. To identify the skills related to individual knowledge use and sharing, we adapted Lopes et al. [19] typology of competencies based on the typology of Le Boterf [58] and Green [59].

The following Table 2 reports our results concerning the individual knowledge, following the above mentioned framework, and responding to RQ1: What is the individual knowledge translated in the main competencies used by the health professionals of the ER to perform their jobs?

4.1.2. Organizational Knowledge

A large portion of organizational knowledge is connected to information repositories in the form of stored documents across the company (Static Knowledge). This knowledge was initially rooted in the workers' heads (Dynamic Knowledge). Still, as a relevant organizational asset, the organization feels the need to create mechanisms to store such knowledge in different formats, such as text files, presentation slides, spreadsheets, email messages, and wikis, among others. These documents are a common source of information about the organization, and represent the organizational knowledge, embedding the strategies, products or services, corporate image, management systems, and the organizational structure, as reported in Figure 1.

Figure 1. Organizational knowledge.

This knowledge is most important for the organization and its continuous improvement, as it allows us to define the future direction of the healthcare organization.

4.2. Knowledge Transition Mechanisms

The case study main findings highlight that all the professionals participated in the resolution of specific problems and developed strategies that could be learned by other healthcare professionals. Such procedures could be applied in other areas or departments of the health organization, capturing knowledge shared in real-time. In essence, this involves a process of knowledge in transition from Dynamic to Static knowledge.

The following Figure 2 presents the main findings of the research, structured by the dimensions: Activities to promote the transition of knowledge; types of knowledge in transition; knowledge in transition through experiences exchange; knowledge in transition trough routinization, responding to RQ2: What are the main knowledge transition mechanisms used in the ER?

Table 2. Findings—individual knowledge.

Competencies	**Description**
Technical Competencies	They integrate concepts about technical knowledge, including context and processes, and operational methods and means. They are the basis for the organisations' strategic management of competencies. This kind of knowledge is easily shared because of its explicit nature.
Application in the Case Study	
The Healthcare Organisation does not have these competencies mapped. However, the participants in the interviews assumed the importance of developing a process of identifying the most valuable competencies for the organisation, not only technical competencies, but also organisational and social competencies, and creating some tables of competencies to identify the crucial competencies for each job position (Operation Assistants, Emergency Room Nurses, and Emergency Medical Technicians).	
Transition Process—translate into tables all the activities and tasks, and related competencies (reported in Appendix B).	
Competencies	**Description**
Organisational Competencies	They are the basis for the organization to develop beyond services and complement the technical aspects of the work. They create a sense of community, which can lead to an increase of trust and commitment by the workers that share beliefs and behavioral rules.
Application in the Case Study	
In the Emergency Room department, the health professionals have different visions about the healthcare organization, especially about the structure, even if they have the same perceptions about knowledge sharing. This becomes obvious when we analyse the different healthcare professionals' opinions and thoughts. These different perspectives of the organization may be a barrier to translate individual knowledge into the organizational dimension.	
Transition Process—use of a shared language and common understandings linked to organizational culture, which is necessary to facilitate efficient communications and common understandings that focus on the essential role of trust, shared norms, and common identification.	
Competencies	**Description**
Cognitive Competencies	They integrate complex thinking skills and analytical models used in problem-solving situations, including problem identification and definition, recognition, analysis, implementation, and monitoring.
Application in the Case Study	
In the Emergency Room department, the healthcare professional uses processes of reflection, including individual reflection and collaborative reflection, around specific and complex problems/situations.	
Transition Process—through ongoing learning, including formal training, informal learning, observations, and discussions, as well as work experiences, the healthcare professionals develop and refine their problem-solving capabilities. They approach many problems on a daily basis, without a great deal of conscious thought about method or approach. When complex problems emerge, they recognize that they face difficulties that require collaborative problem-solving and therefore needs the team help.	
Competencies	**Description**
Social Competencies	These competencies include working habits, communication styles, leadership skills, and teamwork.
Application in the Case Study	
The Healthcare Organization developed teamwork competencies, communication, and informal and formal relationships by working in teams on a daily basis.	
Transition Process—the complex environment demands that problem-solving should be carried on by teams with cross-functional collaboration and interaction using social competencies to support collaborative work. Effective problem-solving includes communication and conflict resolution skills.	

The table above shows that the basic principles of the organization are generally transmitted with low contextual reference, but as a continuous exchange of experience and also with work routines.

The health organization's goals are usually easily transmitted, enabling experience exchange, and establishing collective routines. Focal knowledge, such as knowledge about products or services, is transmitted explicitly, in particular through instruction manuals or other kinds of documentation.

Figure 2. Knowledge transition mechanisms—case study.

Observability and assessment are transmitted as explicit knowledge involving the operational results of the organization's activity. Design recommendation is transmitted through technical and social infrastructure. Finally, the transition process is made through presentations, reports, and IT systems.

Effective transition of Dynamic Knowledge within the health organization, such as the capture of specific knowledge, may be achieved using a common and shared vocabulary, and this can be promoted by the creation of a culture of knowledge sharing.

5. Discussion

Individual knowledge or Dynamic Knowledge underlies many possibilities for organizations when it is deeply embedded in its practices and procedures. It includes relationships, norms, values, and standard operating procedures, and it is very hard to detail, copy, and translate, in opposition to Static Knowledge, which is found in the manuals and procedures sheets.

This research analyses the forces between these two dimensions of knowledge and tries to capture the mechanisms of knowledge translation, and the individual knowledge translated into competencies needed to perform the job activities of the participants in the study: Operations Assistants, Emergency Room Nurses, and Emergency Medical Technicians.

To operationalize the study, we used Nonaka and Takeuchi's model on knowledge [54] as a framework in the analysis of the interviews, as a cyclic process involving four related activities: (1) Socialization, which is an interaction moving from tacit to tacit knowledge; (2) externalization, an interaction moving from tacit to explicit knowledge; (3) combination, an interaction moving from explicit to explicit knowledge; and (4) internalization, an interaction from explicit to tacit knowledge. However, not considering all these phases independently, but as an integrated process, and in this research, the externalization is the crucial activity that transforms individual knowledge into organizational knowledge, allowing the transition of knowledge.

In this context, health professionals may be involved in knowledge activities because of their intrinsic drive for learning, personal contentment, peer recognition, and self-actualization, in line with several studies in the subject that also confirm that these behavioral motives play a major role in

the knowledge transition process, and in the individual knowledge and competencies development process, with major benefits for all the actors involved The following Figure 3 reports the main knowledge transition benefits.

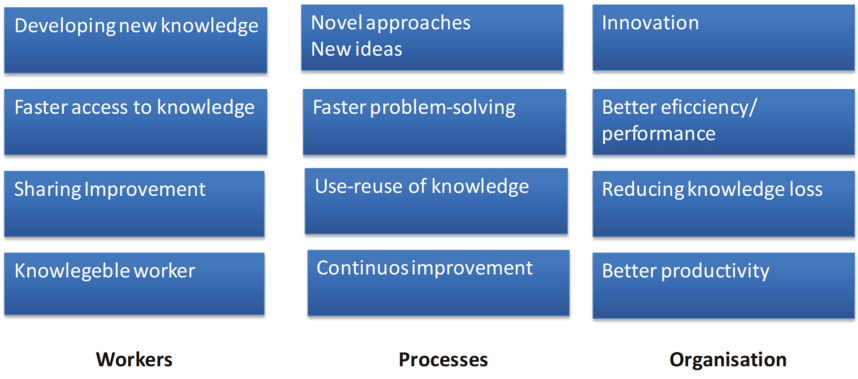

Figure 3. Knowledge transition benefits—case study.

The benefits for health workers derived from more efficient processing of information and knowledge by, for example, eliminating the duplication of efforts or saving valuable time. The benefits for processes could be translated into benefits that can be expressed in terms of efficiency or effectiveness. Databases are a common example since they help to eliminate less efficient operations by reusing knowledge. The impacts on organizations affect some of the health institution key goals, such as productivity, performance, and innovation. Moreover, knowledge in transition can also be viewed as an innovation with the potential to generate new ideas, develop workers' competencies, and create advantages for the health organizations.

6. Conclusions

Organizations are challenged to find ways to transform and translate Dynamic Knowledge into Static Knowledge, embedded in documental tools, to capture knowledge and allow the transfer and sharing of it among people and teams. However, Dynamic Knowledge, that flows and is shared in more informal ways, is relevant to enhance innovation and the creation of new knowledge.

We decided to investigate the healthcare sector, employing a case study carried on in an Emergency Room department. In the ER, healthcare professionals face different situations and emergencies every day, and they must cope with the need to make decisions quickly. The need to rely on tangible tools and instruments is balanced by the necessity to use more intangible techniques and skills, including teamwork. Tensions emerge, as our investigation highlights the need for healthcare professionals to work employing both Static as well as Dynamic Knowledge at the same time.

The call for a clear and formalized table of competencies to identify the crucial skills and tasks for each job position is balanced by the need to enhance a general culture of knowledge sharing and teamwork. Training may include not only the development of technical and hard skills, but also the enhancement of soft skills such as problem-solving.

Our study stresses how the situation can be complex and subtle. Static and Dynamic Knowledge must coexist. Only their balance can help the successful development of an organization. We investigated one healthcare organization and, in particular, one particular department (the ER).

The need to translate the Dynamic Knowledge into formal and tangible tools, and at the same, the call for creative ways to enhance informal engagement and knowledge sharing among people and teams may represent one practical implication of the study.

Further research avenues may include the investigation of specific techniques or best practices, in the healthcare sector or different business fields, including the role of new technologies in fostering and facilitating such dynamics.

Like any piece of research, this paper features some limitations. First, the case study investigates one specific sector. Thus, its replicability to other industries has yet to be proved. Moreover, the limited number of respondents may bias the results. We think that these limitations could be the basis for further developments of the research, enlarging the sample and applying the same methodology to other healthcare departments or different industries. Future research avenues may deepen such aspects, conducting the analysis in other sectors or locations.

Author Contributions: All Authors approved the final version of the manuscript. M.J.S. conceived the idea of the study. M.J.S.: data collection; M.J.S. and F.D.M.: writing of the first draft; A.G.-P. and L.C.: review and editing. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Fundação para a Ciência e Tecnologia grant number UIDB/00315/2020 and the APC was funded by MDPI.

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

Appendix A. Interview Script

Note: This interview script is part of a larger project, so some parts do not apply to this paper:

1. Which is the main organizational knowledge that is important to frame your individual knowledge?
2. How does the organization use the worker's individual knowledge to help solve emergency room problems?
3. Do you help to answer the everyday emergency room problems? Could you describe a situation where that has happened?
4. Which activities and related competencies are needed to perform your job?
    a) Activities
    b) Technical Competencies
    c) Organizational Competencies
    d) Cognitive Competencies
    e) Social Competencies
5. What are the procedures when a problem occurs? Could you describe a situation where there was a problem, and how you solved it?
6. Describe some situations to help promote the transition of knowledge?
7. Which types of knowledge are in transition?

Appendix B. Tables of Competencies

Table A1. Emergency Room Nurses.

Activities
1) Direct Care
2) Indirect Patient-Centred Care
3) Personal Development
4) Writing Services
5) Non-Nursing Duties
6) Patient Assessment
7) Patient Education
Technical Competencies
Human development stages
Anatomy
Physiology
Pharmacology
Organizational Competencies
Informed consent
Handling of evidence
Mandatory reporting of child and elder abuse
Rules, norms, and internal regulations
Organisational structure
Cognitive competencies
Problem-solving
Critical Thinking
Emotional intelligence
Social Competencies
Working habits
Communication
Leadership skills
Teamwork
Empathy

Table A2. Emergency Medical Technicians.

Activities
Cardiac First Responder
Occupational First Aider
Emergency First Responder
Intermediate Life Support
Technical Competencies
Administration of medicines
Bleeding control
Management of burns
Splinting of suspected fractures and spinal injuries
Childbirth
Cardiopulmonary resuscitation
Semi-automatic defibrillation
Oral suctioning
Insertion of oropharyngeal and nasopharyngeal airways
Pulse oximetry
Blood glucose monitoring
Auscultation of lung sounds
Administration of medications
Organizational Competencies
Handling of evidence
Mandatory reporting of child and elder abuse
Rules, norms, and internal regulations
Organisational structure
Cognitive competencies
Problem-Solving
Critical Thinking
Emotional intelligence
Conflict resolution
Social Competencies
Working habits
Communication
Leadership skills
Teamwork
Empathy

Table A3. Operation Assistants.

Activities
Setting up specialised hospital equipment
Assisting physicians with the application of casts
Transporting patients
Providing routine personal care to patients
Technical Competencies
Anatomy
Physiology
Cognitive impairments
Nutrition
Mental health issues
Infection control
Personal care skills
Record-keeping skills
Organizational Competencies
Handling of evidence
Mandatory reporting of conflict situations
Rules, norms, and internal regulations
Organisational structure
Cognitive competencies
Problem-Solving
Critical Thinking
Emotional intelligence
Conflict resolution
Social Competencies
Working habits
Communication
Teamwork
Empathy

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European Journal of
Investigation in Health, Psychology and Education

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Effectiveness of Educational Practices in University Students' Knowledge about Sun Protection and Its Relation to Sunlight Exposure: An Exploratory Study in a Portuguese Higher Education Institution

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Received: 29 April 2020; Accepted: 12 July 2020; Published: 15 July 2020

Abstract: Nowadays, there is worldwide recognition that health and educational outcomes are inextricably linked. It is also recognized that health education comprises opportunities to improve health literacy, including the improvement of knowledge and the development of life skills to promote individual health. It is also known that the behavioral practices regarding sun exposure are an important risk factor for skin cancer. Research is needed in this area to understand the contribution of the "Education for Health" curricular unit to these issues. Our exploratory research sought to collect information about the knowledge and practices regarding sun exposure of a group of Portuguese university students who have already attended this curricular unit. The results indicate that the participants show that, notwithstanding that they have already attended this curricular unit, they do not have more literacy on skin health, do not perceive that sun exposure habits are related to skin health and do not perceive that photoprotection constitutes prevention of skin cancer. The results support the need to promote the necessary reflection and debate on the way in which health education should be taught, as well as what is taught, in order to empower students to get decision-making skills associated with the adoption of healthier attitudes and practices, thus helping to prevent skin cancer.

Keywords: skin health; skin neoplasms; sunlight; knowledge; practices; students

1. Introduction

Since skin is a well-adapted barrier of the human body with important functions [1], including defending the body from aggressions induced by ultraviolet solar radiation, it is the behavior that compromises this adaptation, namely the corporal exposure to solar radiation during long periods, over time and without any type of photoprotection. Sun exposure is a well-known risk factor in the etiopathogenesis of melanoma and non-melanoma skin cancer. The way in which each individual manages their functional reserve into the homeostatic biological balance throughout their life cycle depends upon the options of the individual, i.e., it is related to behaviors. This is a main factor for health condition, taking into account that "Health is a dynamic state of wellbeing characterized by a physical, mental and social potential, which satisfies the demands of life commensurate with age, culture, and personal responsibility" [2] (p. 336). Furthermore, the Ottawa Charter [3] states that effective health promotion leads to changes in health determinants. The determinants include both those that people control (behaviors, lifestyles, use of health services), and those beyond their

control (socio-economic and environmental conditions as well as the provision of services) [4]. Higher education institutions with statutory attributions for the development of activities in the education field, which aim at the initial and postgraduate levels to cultivate professional, scientific, technical and pedagogical-didactic aspects, will certainly play an important role regarding health promotion for their students.

This educational research attempts to understand if the "Education for Health" curricular unit has contributed to improving knowledge and health practices about sun exposure of their students. Our research set out to collect the information described above with a group of Portuguese university students who have already attended the Education for Health curricular unit, included in the curricula of the educational courses.

Problem and Objectives

The research question was: does the "Education for Health" curricular unit contribute to improving knowledge on sun exposure and sunlight protection of the students? This research question intends to understand the effectiveness of the educational practices on sun protection knowledge and their relation to healthy practices on sunlight exposure. In addition, the question also aims to collect information on the knowledge and practices concerning solar exposure, and to contribute to the debate and reflection on the effectiveness of educational practices' role in improving students' skills on skin health related to sun exposure.

2. Related Work

The importance of behavior for the health of individuals is now consensual in the scientific community, with several studies on the relationships among behavior, health and several pathologies [5]. In fact, behavior is a modifiable health determinant [6]. There is a strong scientific interest regarding sun protection and risk behaviors, because of the increase in the prevalence of skin cancer. One of the most popular sun protection measures is the use of sunscreen. It has been demonstrated that deleterious effects on the skin from excessive sun exposure are cumulative [7] and it is estimated that six out of 10 cases of skin cancer are related to excessive sun exposure [8]. Non-melanoma skin cancer, and specifically basal cell carcinoma and squamous cell carcinoma, are the most common cancers in the Caucasian race and scientific literature suggests that "the incidence of this type of cancer could be prevented if individuals adopted precautionary behaviors" [9] (p. 37). In 2018, in Portugal, new cases of non-melanoma skin cancer were ranked seventh and new cases of cutaneous melanoma were ranked thirteenth when compared to other countries worldwide [10]. Exposure to ultraviolet radiation is considered a major etiological factor correlated with the increase of the incidence of these neoplasias [11,12]. Cutaneous melanoma is the most aggressive and lethal type of all skin cancer, resulting from the malignant transformation of melanocytes related to genetic defects most often caused by ultraviolet radiation. It corresponds to approximately 5% of all skin cancers, but to three-quarters of all deaths due to skin cancer. Furthermore, it has a relevant prevalence and increasing incidence, particularly over the last 50 years. In Western countries, it is strongly correlated with skin color, the presence of freckles and the number and characteristics of naevi as well as with behaviors, such as past sun exposure during childhood and adolescence, specifically when it has been intense and intermittent [12,13].

The Surgeon General and World Health Organization have presented guidelines to improve sun protection in order to address the increasing incidence of skin cancer. These guidelines reinforce the importance of behaviors in this prevention, consisting of wearing protective clothing, sunglasses and a hat, the importance of seeking shade and avoiding sun exposure during peak sunlight hours and the central relevance of sunscreen. Educational interventions can change intentional decision-making processes by increasing one's knowledge and improving socio-cognitive determinants, such as the attitudes and learning of skills needed to perform adequate behavior [14]. "All health educators,

regardless of work setting, will find the path to change by scanning for and thinking about new opportunities" [15] (p. 269).

Although existing health services in the community are efficient, disease prevention and health promotion will always be conditioned by the appropriation of healthy behavioral practices and routines, that is, the appropriation of competences for autonomous decision-making in relation to health needs (self-empowerment based on health literacy). Health literacy is a global issue [16] that has implications that are far-reaching and impact both the individual and society [17]. Furthermore, health literacy, disadvantage and risk for poorer health outcomes are correlated [18], even though it is unclear to what extent health literacy may affect health outcomes [19]. Indeed, health literacy encompasses "health knowledge, beliefs and practices, capacity and self-efficacy, community empowerment" [20] (p. 16). It seems that the development of health literacy is the way to construct adequate responses that enable individuals to control health determinants and therefore to adopt everyday practices that enhance and benefit their biological functional reserve and, thus, their health. Therefore, initiatives may focus on educational practices as a means to achieve the improvement of the knowledge and the development of life skills that are conducive to individual health. The construction of the biological functional reserve of each individual is built into early adult life. Then, health or risk behaviors in this period of the life cycle will influence, through a positive or negative manner, the next phases of this cycle. Thus, health-promoting interventions in this age group will have medium- and long-term consequences [21–23].

It seems necessary for individuals to "understand their health potential, their own health determinants and specificities associated with their life cycle and context stage, and develop knowledge, attitudes, competencies and accountability that promote health and prevent disease concerning themselves, their families, communities and their environments" [24] (p. 64). There is increasing recognition that health and educational outcomes are inextricably linked [25]. Health promotion is the "empowerment of people and communities to change the determinants of health for one's own quality of life" [3]. Therefore, there is a need to understand the role of higher education in promoting youth health, particularly regarding the knowledge about sun protection and its relation to sunlight exposure.

3. Research Methodology

This exploratory research was framed within the Education for Health curricular unit, involving a total of 94 participants. The selection criteria applied to participants were: a group of the students (n = 47) who had already attended the "Education for Health" curricular unit (study group) and another group of the students (n = 47) that had not attended the curricular unit (control group).

The "Education for Health" is a curricular unit included in the curricula of educational courses (degree in Basic Education, an undergraduate degree in monitoring of children and youths) of a public Higher Education Institution with more than 40 years of work in the formation of educators and teachers in the field of education. The students of the Masters in Pre-School and Primary School Teaching are former students of the course on Basic Education, so they had already attended that curricular unit. These students participated on a voluntary basis. The learning survey was filled out right after the end of the classes of the curricular unit.

Reading the program description of the "Education for Health" curricular unit of the educational courses of this public Portuguese higher education institution, we note that the general objectives are: to understand that health is a result of a biological balance and that prevention is the best way to keep it; to learn about health risk factors; to raise awareness of health promotion; to explore pedagogical tools for the design and implementation of health education projects and actions in educational contexts; to discuss health education interventions in scientific and interdisciplinary contexts; to develop research skills in the field; to promote reflection and self-analysis potentially oriented towards problem-solving and decision making; and to evaluate different educational methods and techniques to promote healthy practices.

The plan of the teaching and learning process of the "Skin and sun exposure (sun protection: benefits, risks and healthy practices)" content of the curricular unit is presented in Table 1. This content was taught in two lessons (one week). An integrated method that comprises a lecture (1 h) followed by a discussion section was applied. In the discursive interaction, the professor is a mediator and instigator.

Table 1. Plan of the teaching and learning process.

Learning Objectives	Teaching Strategies
Understand health as a result of a biological balance and that prevention behaviors are the best way to preserve it.	1st Lesson (2 h) and 2nd Lesson (3 h): Integrated method (Lecture–Discussion)
Explain the benefits (vitamin D) and risks (skin cancer, sunburn or aging) of sun exposure.	
Know healthy practices concerning sun exposure.	
Identify and provide examples of precautions regarding sun exposure.	
Understand the importance of sunscreen and how and when to apply it.	

A learning survey was developed to collect data. The questions were formulated considering the construction of questionnaires of the same type with special attention to the structure and order of the questions [26–30] and it was based on the learning contents of "Skin and sun exposure (sun protection: benefits, risks and healthy practices)" that are taught in the curricular unit "Education for Health". The questions of the learning survey were specifically designed for this study by a dermatologist doctor, based on their clinical background and on a literature review including scholarly articles, reviews and original research related to the affects of individual behaviors regarding sun exposure [28–30]. It is an anonymous self-reported learning survey [8,9,12,14,15] to collect information about knowledge and practices concerning solar exposure from the students who have already attended the "Education for Health" curricular unit. The learning survey was distributed to twenty students from the same institution (not included in the study). No difficulties of interpretation were recorded, and the experts considered the final version suitable to apply in the study group and in the control group. Thus, the questions were agreed upon by a consensus process of the research team. More precisely, the final version included 25 questions, including multiple-choice, closed-ended and open-ended questions, addressing the knowledge about benefits and risks of sun exposure: practices of photoprotection and knowledge about the relevance of photoprotection. An example of the multiple-choice and the closed-ended questions that were used is: "Do you like sunlight exposure during the warmer summer months?" (Answer: yes or no) If "yes", "In what period of the day?" (Answers: (a) before 10 AM; (b) between 10 AM and 4 PM; (c) after 4 PM; (d) before 10 AM and after 4 PM). An additional example of a closed-ended question and of an open-ended question that were used: "Do you know the harmful effects of the sun exposure on the skin?"; "If you have answered "yes" in the previous question, please mention some examples of the harmful effects of the sun exposure on the skin". Another example of the open-ended questions is: "Please mention some example of the benefits of sunscreens".

Information about the age, sex and skin phototype of the participant was also included in the analysis of the results. The skin phototype was obtained through the identification of the participants of one of six possibilities concerning their skin color and the response to sun exposure, taking into account a simplified version of the traditional Fitzpatrick phototype. For example, for phototype II: color of the skin—white; skin characteristics—always burns, tans slightly or sensitive to the sun. No difficulties in the interpretation were noted by the students who were not included in the study and who answered to the questions before the study group. The work meets the standards of ethics established for this type of study at the authors' institution. It follows the ethical guidelines of the current Declaration of Helsinki.

The data were entered into IBM Statistical Package for the Social Sciences (SPSS) Statistics Version 20 (IB). The X2 test was used to analyze proportions between groups and comparison of

continuous variables between groups was performed with the Student's t-test. Statistical significance was set at 0.05.

4. Results and Discussion

The participation rate on this learning survey was 71.4%. No difficulties in the interpretation of the questions were reported by the participants.

The study groups had a mean age of 20.9 ± 2.2 years, including two male and 45 female participants (Table 2).

Table 2. Sample characteristics.

Characteristics (Age, Gender and Phototype)	Study Group (n = 47)	Control Group (n = 47)	*p*-Value
Age (mean ± standard deviation, years)	20.9 ± 2.2	20.6 ± 2.6	0.543
Gender (n, number of students			
Female	45	45	1
Male	2	2	
Phototype (n, number of students)			
I	3	2	
II	11	17	
III	16	15	
IV	12	10	0.370
V	1	0	
VI	0	2	
?*	4	1	

* Unknown phototype (not indicated by the student).

The control group consisted of individuals with a mean age of 20.6 ± 2.6 years, with two male and 45 female participants ($p > 0.05$).

In the descriptive analysis of the learning survey, it was verified that the predominant Fitzpatrick phototypes (Table 1) were II and III, and there was no statistical significance between the two groups ($p > 0.05$). The Fitzpatrick scale is based on a person's skin color and sun sensitivity (burning and tanning). Fitzpatrick skin typing helps predict the risk of photodamage and skin cancer [31]. The skin types I–III are at an increased risk of sun damage and skin cancer, particularly cutaneous manifestations of photoaging, melanoma and non-melanoma skin cancer [32].

A simultaneous analysis was made about the data collected in this study, and Figures 1–6 illustrate some of the questions that were used in this learning survey and the statistical analysis of the responses that were given by the participants.

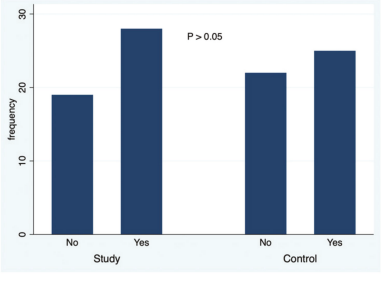


Figure 1. The responses to the question: Do you know the beneficial effects of sun exposure?

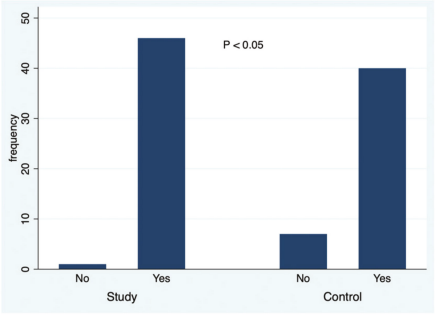
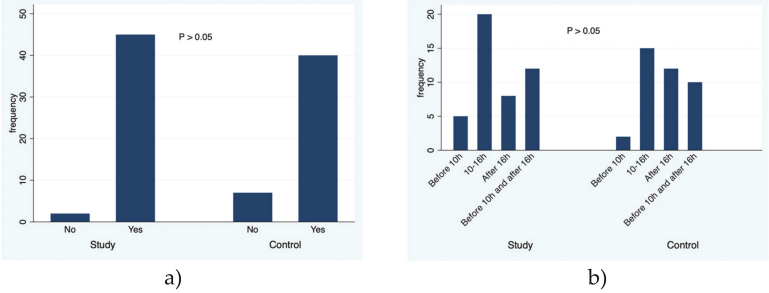
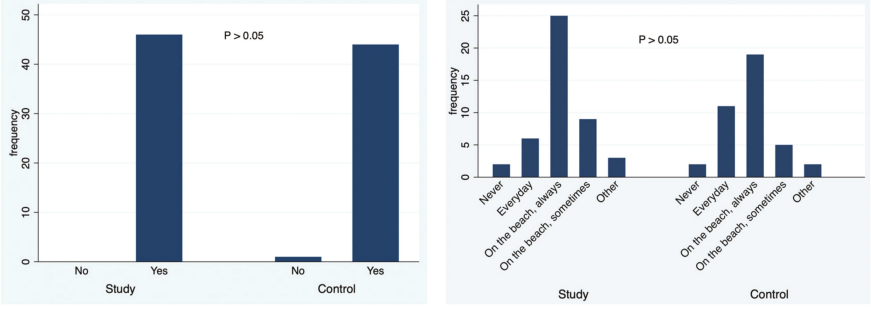


Figure 2. The responses to the question: Do you know the damages (harmful effects) on our skin due to sun exposure?



a) b)

Figure 3. The responses to the questions: (**a**) Do you like to expose yourself to the sun on the beach during the summertime? (**b**) If your answer is "yes", please state when do you expose yourself to the sun during the summertime?



a) b)

Figure 4. The responses to the questions: (**a**) Do you consider the use of sunscreen important? (**b**) When should one apply the sunscreen?

Globally, the analysis of the responses (Figure 1) and their comparison between groups (study and control groups) showed that there was no significant association between being a student of courses in the area of education and the knowledge of the beneficial effects of sun exposure ($p = 0.533$). The total number of respondents who knew about the beneficial effects of sun exposure was higher (28 students); however, there was no statistical significance in relation to students who reported that they did not know the beneficial effects (19 students).

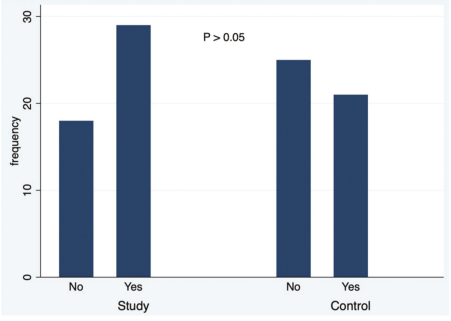


Figure 5. The responses to the question: Were you already informed about photoprotection (measures to reduce exposure to the sun)?

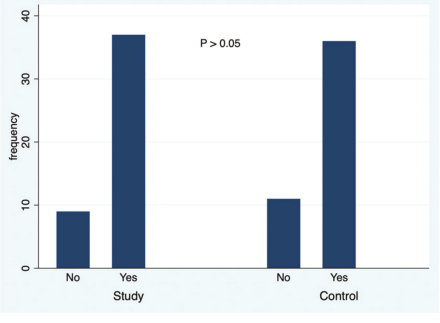


Figure 6. The responses to the question: Have you ever had a sunburn?

For the open-ended question "If you answered yes in the previous question, cite examples of the beneficial effects of sun exposure", the predominant response was the production of vitamin D due to sun exposure, with statistical significance. Indeed, the body obtains vitamin D by cutaneous synthesis upon skin sunlight exposure and vitamin D has been implicated in several health benefits [33]. However, although the exposure to ultraviolet radiation in sunlight is related to the obtaining of vitamin D, this radiation is known to be related to a higher risk of skin cancer in later life [34,35]. At any rate, this was the only correct answer that was given, and all other responses were incorrect examples of the beneficial effects of sun exposure. There was no statistically significant difference between the responses of the study and the control groups ($p = 0.805$).

However, the analysis of the question "Do you know the damages (harmful effects) on our skin due to sun exposure?" (Figure 2) showed that there was a statistically significant association between being a student of education and having noticed the harmful effects of excessive sun exposure ($p = 0.027$).

However, there was no statistically significant difference between the two groups with respect to the examples given for the harmful effects of excessive sun exposure ($p = 0.384$) and there was no significant difference between the study and control groups (Figure 3) regarding the pleasure associated with sun exposure, during the summertime, at the beach ($p = 0.08$). Moreover, when the participants were asked to say when they expose themselves to the sun, both groups answered between 10 AM and 4 PM (Figure 3b, $p = 0.463$).

Regarding the relation between skin cancer and sunburn, 19 participants agreed with it and 11 students denied it in the study group, while 20 agreed with it and 4 students denied it in the control group. In the past several decades, there has been concern about sun exposure and sun protective measures because of the increasing incidence of skin cancer [23]. Although the responses provided were correct (skin cancer, sunburn or aging), the students belonging to the study group did not remember

more than one example and there was no tendency with statistical significance among the responses that were given ($p = 0.08$). Some studies have noted that it is not always the best knowledge levels that entail higher sun protection practices and lower sunburn incidence rates [36,37]. Regarding examples of beneficial effects from the use of sunscreen, there was no association between more knowledge about the subject and belonging to one of the groups ($p = 0.122$).

The majority of students incorrectly pointed out "skin hydration" as a beneficial effect of sunscreen (22 students from the study group and 24 from the control group); 11 students from the study group and 6 from the control group reported the prevention of burns, and only six students from the study group and four from the control group mentioned the prevention of cutaneous cancer. It should be noted that most skin cancers could have been prevented with protection from exposure to sunlight [38].

Regarding the knowledge about the relevance of the use of sunscreens (Figure 4a), most of the students from both the study and control groups perceived the use of sunscreen to be important, with no statistically significant difference between them ($p = 0.309$). Regarding how much time should the sunscreen be applied before sun exposure, the study group selected the answer "15 min before sun exposure", which is the correct response, with statistical significance in relation to the control group ($p = 0.006$); 26 students from the study group chose the "15 min earlier" answer and in the control group 18 students chose the "15 min earlier" answer. Concerning the question about when sun exposure should be avoided, there was no statistical significance between groups and between the different responses ($p = 0.0787$). Students in both groups tended to correctly answer, "sun exposure should be avoided between 10 AM and 4 PM regardless of whether we use sunscreen". Thus, there is no concordance between what they consider as correct (avoid sun exposure between 10 AM and 4 PM) and what they usually do (Figure 3b, they expose themselves to the sun between 10 AM and 4 PM). In addition, both groups answered that sunscreen application should be done every day (Figure 4b) during the summertime at the beach (with statistical significance in relation to other responses), and there was no statistical significance compared to the control group even though the correct answer would be every day when one is outside ($p = 0.123$).

Regarding the source of information used to choose the sunscreen (Figure 5), the majority of participants did not seek information, although there was no statistically significant difference between the groups ($p = 0.0079$) and between the different responses. Statistical significance was not found in relation to the control group ($p = 0.0121$) regarding the question of having already received information on photoprotection. Although the number of students in the study group reporting to have received information on this was higher (29 students) than those who said they did not receive information (18), the difference was not statistically significant. There was no statistically significant association between the phototype of each student and the tendency to obtain more information about photoprotection ($p = 0.365$).

The practice of solar exposure showed that there was no association between the study group and the control group. Moreover, regarding the practice of sun exposure at the beach ($p = 0.080$), 45 students of the study group and 40 of the control group reported they like sun exposure in the hot months; however, there was no statistically significant difference between them. Regarding the usual time of sun exposure on the beach, there was no statistically significant difference between the different responses and between the groups ($p = 0.463$).

Regarding the sun protection factor (SPF), there was no statistically significant difference among the different responses and between the groups ($p = 0.729$) and the answer was correct: SPF $\geq$ 30. Concerning the question about who should use sunscreen daily, there was also no statistically significant difference between the groups ($p = 0.330$) and between the responses. A statistically significant higher number of students answered that all people (infants, children and adults) should use sunscreen daily. The correct answer was "all the people from 6 months of age". In the last SPF item, most respondents correctly answered that "sunscreen application should be renewed every 2 h", but there was no statistically significant difference between the type of responses and each group ($p = 0.593$). The SPF provides strong protection against the development of skin cancer [39] and sunscreen application

should be renewed every 2 h [40]. In response to the question "Have you ever had a sunburn?" (Figure 6) 37 students from the study group and 36 from the control group reported to have already had a sunburn; thus, there is no evidence of health behaviors in the study group ($p = 0.652$), which is surprising as both groups answered that sunscreen was important, without differences ($p = 0.309$).

The analysis of this question showed a higher tendency, with statistical significance for phototypes II, III and IV, to have a history of sunburn ($p = 0.002$). Although people know the sun-related risks and protection measures, they still do not have healthier practices regarding sun exposure and the rates of the sunburn incidence are high [37].

Interestingly, regarding behavioral practices in relation to sun exposure, no statistical significance was found between the study group and the control group, although the former answered that they were aware of the harmful effects of sun exposure, with a different statistical significance. However, the results showed that the low level of this knowledge has no significant difference between the groups. The results demonstrate that there is an overall tendency of no statistical significance of being a student of higher education courses and having deep knowledge on the relation between sun exposure behavioral practices and the promotion of skin health and prevention of skin cancer. Students in both groups did not demonstrate to have lack of knowledge about the beneficial effects of sun exposure and the use of sunscreen on the skin. Most students, regardless of whether or not they belong to an education course, did not seek information about photoprotection. However, research has shown that deeper knowledge does not necessarily associate with adopting healthier attitudes and behaviors. There is a strong tendency to reject concepts that do not correspond to our prior conceptions [41,42]. Education is needed to empower pupils to carry out sun protection in real life. An educational process is needed, using methods in order to empower students for decision-making skills associated with adopting healthier attitudes and behaviors [35].

These results have shown gaps in the students' knowledge and their relation to healthy practices on sun exposure. The teaching–learning process of the "Skin and sun exposure (sun protection: benefits, risks and healthy practices)" content of the program of the curricular unit requires reflection, discussion and debate. Assessing coherence between the learning objectives, teaching methodologies and the learning outcomes is, perhaps, the path to follow. Thus, it is necessary to point out that "the educational process is a challenge. It needs to be renewed permanently. Therefore, it is necessary to constantly debate that subject" [43] (p. 1). The results clearly show that there is no association between being a student attending the "Education for Health" curricular unit and: having more literacy on skin health; deeply understanding that sun exposure behavioral practices are related to skin health; having the awareness that photoprotection is a skin cancer prevention practice; and having better behaviors regarding sun exposure. Research that analyzes students' knowledge about sunlight protection and risks can help identify education problems linked to the teaching–learning process [44]. Studies have drawn attention to the need for the promotion of photoprotective habits and the need for engaging physicians and teachers with this subject [45]. Through targeted educational interventions, higher awareness and knowledge levels could be achieved, as well as the adoption of healthier attitudes and behaviors regarding sun exposure, which would take us to a lower risk for the development of skin cancer [25].

The results of this study highlight the complex interrelationship between knowledge and behavioral health practices. However, if the behavior change process is "any activity that you initiate to help modify your thinking, feeling, or behavior" [46] (p. 25), the "Education for Health" curricular unit will and should play an important role. People acquire a coherent set of experiences, with associations, concepts, values, feelings and conditioned responses that influence their lifestyle. There is a strong tendency to reject concepts that do not correspond to our prior conceptions [29,30]. However, teachers and educators are expected to know and confront epistemological, social and psychological conceptions of beliefs, feelings and behaviors, as well as to evaluate the consequences of these conceptions in the construction and maximization of functional reserves that determine health. Thus, it is a challenge for

the teaching–learning process to provide students with life skills about determinants of health in order to improve behavioral health practices.

5. Conclusions, Limitations and Recommendations

We may conclude that the study group had gaps concerning the knowledge and the appropriation of skills in relation to behavioral practices regarding sun exposure, highlighting the need for more training regarding behavioral practices and the knowledge of risk in relation to solar exposure. The results of this research provide valuable information to improve knowledge and develop life skills that are conducive to the skin health of the students attending the "Education for Health" curricular unit. The "Education for Health" subject has an important role to play in the development of health literacy. Reflection on teaching methodology to address this issue should be considered, which should also involve epistemological decisions. This study can be taken as an example of the need to develop research on the outcomes regarding the lectures provided by professors who teach these topics. Teaching is not just sharing and transferring knowledge, but it requires reflection to promote intervention and research about educative practices in order to promote healthier behavioral practices. There is increasing recognition that health and educational outcomes are inextricably linked. Promoting health is also the task of higher education schools.

The results of this survey demonstrate the potential of this type of research as an instrument to understand the need to improve knowledge and healthy practices. Moreover, the research shows the need to rethink the curricular unit, namely the methods applied and identifying expectations of the students. This educational research demonstrates the importance of looking into the effects of educational practices through a "learning survey". Further research is needed to reinforce these results. Nevertheless, this study has some limitations. The questions were not used before, which limits their application and interpretation in other comparable groups. This work might be followed by a project of validation on a larger group of participants. We will have to question the value that these students are attributing to the knowledge of this determinant of health (sun exposure) and the elaboration of a similar study for each one of the determinants of health would be relevant. We believe that research in this field should be based on the intersection of knowledge among specialists in the areas of education and health, and this is the reason why we have decided to conduct a study in the field of education with a multidisciplinary team, including a dermatologist.

The most important insight gained through the present study was that curriculum and educational issues related to empowerment in the health of students need analysis, reflection and discussion. Globally, the results have shown that a deeper knowledge of skin health promotion and skin cancer prevention does not necessarily associate with adopting healthier attitudes and behaviors. This highlights the conclusions of previous studies, that although educational interventions may have positive effects, it is important to remember that the behavior can also be automatically triggered by and deeply linked with environmental characteristics (the family and the social environment), that should be considered in the educational interventions [14]. Therefore, the results support the need to promote the necessary reflection and debate on the way in which health education should be taught and analyzed, taking into account its central role and relevance to improve behaviors and the impact this may have on health promotion and on the prevention of disease. Education may help contribute to improving skin health as affected by sun exposure, helping to encourage the adoption of the correct practices to contribute to preventing the most common (basal cell carcinoma and squamous cell carcinoma) and the most lethal (melanoma) types of skin cancer [12,14]. Therefore, this study provides information for clinicians and educators on the scale of the problem.

Author Contributions: Conceptualization, B.R.F. and M.E.F.; methodology, B.R.F., J.S., and M.E.F.; investigation, B.R.F., J.S., and M.E.F.; performed the analysis and wrote the manuscript., B.R.F., J.S., and M.E.F. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: This work is funded by National Funds through the FCT—Foundation for Science and Technology, I.P., within the scope of the project Ref[a] UIDB/05507/2020. Furthermore, we would like to thank the Centre for Studies in Education and Innovation (CI&DEI) and the Polytechnic of Guarda for their support.

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

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European Journal of
Investigation in Health, Psychology and Education

MDPI

Article

Traversing the Funambulist's Fine Line between Nursing and Male Identity: A Systematic Review of the Factors that Influence Men as They Seek to Navigate the Nursing Profession

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Received: 19 June 2020; Accepted: 4 July 2020; Published: 5 July 2020

Abstract: Nursing has seen a dominance of women within the profession, and today, the presence of men in the role remains less understood and appreciated. Males considering or entering nursing face challenges concerning role misconception, marginalization, and gender bias. With a looming shortage of nurses on the horizon, it is more important now than ever before to find better ways of engaging males into nursing. The aim of the study was to examine the psychological constructs that influence male perceptions of nursing as they seek to navigate the profession, and what aspects influence men to consider nursing as a career. To achieve this, a systematic review and mixed research synthesis (integrated design) was conducted. English language research published between 1999 and 2019 was eligible. The methodological rigor of qualitative articles followed the Critical Appraisal Skills Program, while the Best Evidence Medical Education guided the quantitative review. Among the 24 publications identified, three sub-themes emerged from the overarching theme of the funambulist or tightrope walker. Sub-themes included societal, inner and collective voices that inform men's place in nursing or their decision making about entering the profession. There is a need to re-visit what it means to be a nurse in order to address the gendered stereotypes that impact men entering the nursing profession.

Keywords: nurses; men; male; stereotype; workforce; recruitment; retention

1. Introduction

While nursing is plagued with workforce shortages across the globe [1], nurses still represent the single largest category of healthcare worker across the globe [2]. A key strategy to address this impending workforce shortage is to improve the recruitment of males into nursing [3,4]. It is however questionable whether this strategy will yield success given the longstanding historical and socio-cultural evidence in support of fewer men enrolling in programs of nursing study [5].

It is now a widely held view in contemporary thought that gender alone is not grounds for acceptance or preference into a professional body of knowledge and subsequent role. Successful examples of societies efforts to improve gender diversity can be seen in areas such as the sciences, engineering, medicine, and corporate roles, which have traditionally been over-represented by males [6]. Despite this, there remains a marked gender imbalance in nursing [7]. In Australia males make up a mere 11% of the nursing workforce [8], a picture seen time and again in other parts of the word: 9% in New Zealand, 9.6% in the United States, and 11% in the United Kingdom [5]. Scholars suggest a number of reasons to explain these low global rates of males entering nursing that tend to focus on the

role of negative stereotypes [5,9,10], and a pervasive societal construction of nursing being squarely aligned with women's work [5,7,11].

A common thread across much of the research in the area of men in nursing is the role and influence of Florence Nightingale. Considered a pioneer of modern nursing, she worked to develop training institutions that were exclusively for women [7,12]. Nightingale believed that nursing was an unsuitable role for men—a belief that has arguably played a significant role in the invisibility of men in nursing and contributed to the socio-cultural norms that influence modern culture [5,12].

What is evident is that the forces that shape the role and scope of males in the profession of nursing are most likely multi-factorial in nature [5]. There can be little argument therefore that an interplay of some deep-seated sociocultural factors that influence males' decisions to come into nursing as a career exists and needs to be explored if we are to better target or open up nursing to men in our societies. This review of the literature therefore seeks to distil the findings from previous studies that also seek to shed light on male constructions of nursing. Importantly, we seek to understand both the perspective of those males engaged in the nursing profession to better understand the insider perspective and the perspective of those males not engaged with nursing, so as to understand better the sociocultural perceptions of nursing that pervade our societies and influence our men.

Research Aim

The aim of the systematic mixed research synthesis is to (i) systematically examine the psychological constructs that influence male perceptions of nursing as they seek to work in and navigate the profession, and (ii) to identify aspects such as attraction and barriers that determine a male considering nursing as a career.

2. Materials and Methods

A systematic review and mixed research synthesis—an integrated design informed by the work of Sandelowski et al. [13]—was utilized as a framework to navigate the integration of results from both qualitative and quantitative studies within this review. Mixed research synthesis recognizes the contribution that diverse forms of evidence have in evidence-based practice and that informs many disciplines [13]. The underutilization of qualitative studies has been amplified by the requirement of applied evidence-based practice modalities to be informed by empirical evidence in the traditional sense, situating qualitative studies as unscientific and unworthy in the hierarchy of evidence in which randomized clinical trials and quantitative meta-analyses are highest. Within this debate there are those who tolerate the contribution of qualitative research to evidence-based practice by default rather than by design, on the one hand, and those who argue that qualitative research is a necessity in achieving the goals of evidence-based practice [14]. There are facets of human experience that are not reached by the gold-standard of randomized controlled trials and yet at the same time are central in developing participant-centred practical significance.

Recognizing that for each researcher the inherent differences between qualitative and quantitative research have an influence upon the research design, Sandelowski et al. [15] proposed three designs—segregated, integrated, and contingent—that accommodate different perspectives on the relationship between qualitative and quantitative research. For the purpose of the present study, an integrated approach was used.

An integrated approach is based upon a series of assumptions that culminate in a view that the theoretical differences between qualitative and quantitative are not insurmountable. Here researchers grouped together targeted areas of interest not on the basis of their methodological approach, but rather by the findings that are viewed as answering the very same question and are therefore convertible [14]. Unlike a segregated approach that requires the researcher to adhere to the quantitative and qualitative binary and, therefore, to group findings on the basis of methodology, in an integrated perspective findings are grouped on the basis of thematic similarities in the findings [13].

The systematic review and integrated mixed research synthesis as guided by Sandelowski, Voils, and Barroso [15] was used to identify, evaluate, and synthesize quantitative and qualitative research-based evidence in order to answer the research questions. The objectives, analysis methods and inclusion and exclusion criteria were developed and documented to ensure accurate and complete reporting of findings [13,14], following the guidelines outlined by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [16] to ensure accurate and complete reporting of findings.

2.1. Search Strategy

A search of the literature was run on ProQuest Central, Web of Science Core Collection, Scopus, Medline, and Cumulative Index of Nursing and Allied Health Literature (CINAHL) was completed on November 10, 2019 for studies related to men in nursing. The search examined title, keyword, and abstract, adapted to each database's specific requirements, with a search strings that included: "nurs*" AND "male" OR "man" OR "men" OR "masc*" AND "stereotypes" OR "representation" OR "perceptions" OR "attitudes" OR "deci*" AND "career" OR "higher education" OR "tertiary education" OR "workforce". An additional hand search of reference lists was conducted to identify any extra studies.

2.2. Inclusion and Exclusion Criteria

Studies included were those between 1999 and 2019 that were original research, including literature reviews, regardless of nursing specialty, clinical context, or level of nursing or health education. After duplicates were removed, studies were excluded if they were review articles or peer and non-peer reviewed commentaries regarding men in nursing. It must be noted that publications prior to 1999 were initially considered; however, it was agreed that the systematic review should encompass a contemporary (21st century) political and social view and lens of men in nursing, and therefore any potential publications prior to 1999 (n = 29) were also excluded. Full-text articles published in languages other than English were excluded due to issues associated with translation quality.

2.3. Study Screening

Articles retrieved from the search were uploaded to Rayyan, a free application used for systematic reviews [17], and two of the authors (CC and DT) undertook a blinded review of the title, keyword, and abstract of the downloaded items after duplicates and exclusions were removed. A second round review of full text articles were then assessed independently and judged against the inclusion and exclusion criteria by two reviewers (CC and DT) with each article reviewed being classified as "include", "exclude", or "not sure". Any discrepancies between reviewers were resolved by discussion with a third reviewer (BP) until consensus was achieved.

2.4. Methodological Quality Assessment Procedure

The methodological quality of the included studies was assessed independently by two reviewers (CC and DT). The scoring of the each qualitative study occurred using the Critical Appraisal Skills Program (CASP) tool for qualitative research [18]. The quality of the qualitative papers were scored as "met" (1), "partially met" (0.5), and "not met" (0) with scores added to gain a final score of 9.0–10.0 (high quality), 7.5–9.0 (moderate quality), 6.0–7.5 (low quality), or 0.0–6.0 (exclude) [18]. Eight (72.7%) out of eleven qualitative publications had a score of more than 6.0 and were considered to be of high methodological quality and included in the review, as presented in Table 1. It must be noted that all authors involved with the review and methodological assessment (BP, CC, and DT) have completed Doctor of Philosophy (PhD) research studies and post-doctoral research training, in addition to having extensive experience in and being fully conversant with undertaking systematic reviews.

Table 1. Methodological quality assessment of qualitative articles using the Critical Appraisal Skills Program (CASP) checklist.

Author	A	B	C	D	E	F	G	H	I	J	Total	Quality
Abushaikha et al. [19]	1	1	0.5	0.5	0.5	1	1	0.5	1	1	8.0	Moderate
Christensen et al. [20]	1	1	1	1	1	0	1	1	1	1	9.0	High
Ellis et al. [21]	1	0.5	0.5	0.5	0.5	0	0.5	0.5	1	1	5.5	Exclude
Evans and Frank [22]	0.5	0.5	0.5	0	0.5	0	0	0	0	0.5	2.5	Exclude
Harding [23]	1	1	0.5	1	1	0.5	1	1	0.5	1	8.5	Moderate
Ierardi et al. [24]	1	0.5	0.5	1	1	0	1	0	1	1	7.0	Low
Jamieson et al. [25]	1	0.5	1	0.5	1	1	1	1	1	1	9.0	High
Juliff et al. [26]	1	1	1	0.5	0	1	1	1	1	1	8.5	Moderate
Ndou and Moloko-Phiri [27]	0.5	0.5	0.5	0.5	1	0	1	0.5	0.5	0.5	5.5	Exclude
Meadus and Twomey [4]	0.5	1	1	1	1	1	1	1	1	1	9.5	High
Weaver et al. [28]	1	0.5	1	1	1	0.5	1	1	0.5	1	8.5	Moderate
Whittock and Leonard [29]	1	1	0.5	1	1	0	0	0	0.5	1	6.0	Low

Quality criteria: A: Was there a clear statement of the aims of the research?; B: Is a qualitative methodology appropriate?; C: Was the research design appropriate to address the aims of the research?; D: Was the recruitment strategy appropriate to the aims of the research?; E: Were the data collected in a way that addressed the research issue?; F: Has the relationship between researcher and participants been adequately considered?; G: Have ethical issues been taken into consideration?; H: Was the data analysis sufficiently rigorous? I: Is there a clear statement of findings?; J: How valuable is the research?. Recommendations; 1: yes, 0.5: unsure, 0: no. High-quality paper: scores 9–10; moderate-quality paper: scores 7.5–9; low-quality paper: less than 7.5; exclude: less than 6.

In addition, the methodological assessment for quantitative studies was initially undertaken against Cochrane quality criteria as outlined by Higgin and Green [30]. However, all studies would have been excluded due to failing to meet the criteria of randomisation, assessors being blinded to outcome, or blinding of participants. Therefore, the Cochrane quality criteria were inappropriate for the studies highlighted. Although there is no one specific methodological assessment tool developed for observational studies, Sanderson et al. [31], indicated that there are a plethora of instruments with various methods of examining risk of bias. In addition, it remains inappropriate to use the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement, as it was not developed to be used as a tool for assessing the quality of observational research [32]. Therefore, the quality of the quantitative papers was rated against the 11 Best Evidence Medical Education (BEME) quality indicators developed by Buckley et al. [33]. These indicators were developed to ascertain the appropriateness and quality of studies, including study design, its conduct, analysis of results, and conclusions made, where higher-quality studies are those that meet the minimum of seven of the eleven indicators [33]. Using the BEME indicators and within this context, criteria are examined as either criteria being "met" (+), "not met" (−), or "not applicable" (n/a). Overall, this led to a 95% agreement between the reviewers, with any disagreements being discussed and a third reviewer (BP) being consulted to reach consensus. The quality score of the quantitative publications ranged from 5 to 9, while 13 publications of the total 14 (93%) publications had a score of more than seven and were considered to be of high methodological quality and thus included in the review presented in Table 2. Lastly, the methodological quality of literature reviews was not examined, but remained included within the accepted studies.

Table 2. Methodological quality assessment of quantitative articles using Best Evidence Medical Education (BEME) indicators.

Author	A	B	C	D	E	F	G	H	I	J	K	Total	Quality
Ashkenazi et al. [34]	+	+	+	+	u	+	+	+	+	u	+	9	High
Bartfay et al. [35]	+	+	+	u	u	+	+	+	+	-	+	8	High
Clow et al. [36]	+	+	+	-	-	-	+	+	+	-	+	7	High
Clow et al. [37]	+	+	+	u	-	u	+	+	+	-	+	7	High
Hoffart et al. [38]	-	+	+	-	+	+	+	+	+	u	+	8	High
Loughrey [39]	-	+	+	-	+	+	+	+	+	+	+	9	High
McKenna et al. [40]	-	+	u	+	u	u	+	u	+	u	+	5	Exclude
McLaughlin et al. [41]	u	+	+	+	+	-	+	+	+	+	+	9	High
Meadus and Twomey [42]	-	+	+	+	+	-	u	+	+	u	+	7	High
Rajapaksa and Rothstein [43]	+	+	+	+	u	+	+	+	-	-	+	8	High
Rochlen et al. [44]	+	+	+	u	+	+	+	+	+	u	+	9	High
Stanley et al. [45]	+	+	+	-	+	+	+	+	+	-	+	9	High
Thompson et al. [46]	+	+	+	u	u	u	+	+	+	+	+	8	High
Twomey and Meadus [47]	u	+	+	-	+	u	+	u	+	+	+	7	High

Quality criteria: A: Is the research question(s) or hypothesis clearly stated?; B: Is the subject group appropriate for the study being carried out (number, characteristics, selection, and homogeneity)?; C: Are the methods used (qualitative or quantitative) reliable and valid for the research question and context?; D: Have subjects dropped out? Is the attrition rate less than 50%? For questionnaire-based studies, is the response rate acceptable (60% or above)?; E: Have multiple factors/variables been removed or accounted for where possible?; F: Are the statistical or other methods of results analysis used appropriate?; G: Is it clear that the data justify the conclusions drawn?; H: Could the study be repeated by other researchers?; I: Does the study look forward in time (prospective) rather than backwards (retrospective)?; J: Were all relevant ethical issues addressed?; K: Were results supported by data from more than one source? +: Criterion met; −: Criterion not met; n/a: not applicable [31].

2.5. Data Extraction and Analysis

Informed by the approach to qualitative systematic review outlined by Sandelowski, Voils, and Barroso [15], the data extraction was undertaken by reviewers (CC and DT) who extracted all data using Microsoft Word. Following a modified version of the process outlined by Colaizzi [48], each reviewer (CC, DT, and BP) independently read and re-read each article identified in order to formulate significant statements and meaning, as well as the interpretation, ideas, accounts, and assumptions of what the findings presented by the authors of each of the identified papers represented. Reviewers then shared their interpretation of the articles resulting from the independent review. Here common or recurring patterns in the significant statements and meanings amongst the significant statements and understandings identified from the independent review process were aggregated and formulated into thematic representations to describe the phenomena.

The quantitative approach for mixed research synthesis was informed by Voils et al. [49] and Crandell et al. [50]; however, the vast heterogeneity of research articles' hypotheses, research questions, and findings of each individual study precluded undertaking in-depth meta-analysis. Data included continuous data, categorical data, or themes, and in some cases data were not accurately reported, leaving gaps within elements of the data. For example, articles would report a significant finding; however, they would leave out key statistical information [34]. Therefore, the quantitative data analysis was modified to address these deficits, while it remained informed by Sandelowski, Voils, Crandell, and Leeman [13], and Sandelowski, Voils, and Barroso [15].

To address this, when data were extracted from the quantitative studies, results, outcomes, and findings were grouped into ten topics or domains, which were then truncated with other similar topics due to their parallelism or relevance to other overlapping topics or domains leaving three overarching domains to undertake data analysis. Due the diversity and quality of the data extracted, only descriptive statistics of the data and key findings from each study were analysed. Again, each reviewer (DT and BP) independently examined each article in order to identify and articulate significant findings and meaning from the qualitative data, while developing an interpretation of what the collective quantitative data were presenting from the identified papers.

Remaining consistent with the application of the mixed research synthesis integrated design, each reviewer (CC, DT, and BP) employed the process of aggregation, where findings that had been identified as communicating the same understanding of the phenomena of interest were grouped together as a confirmation of the finding. On the other hand, the reviewers also used the process of configuration whereby findings that are thematically diverse and therefore not amendable to pooling were brought together to contradict, extend, explain, or otherwise modify each other [13]. In culmination, the findings from this process are presented below in the form of a traditional thematic analysis with areas of aggregation and of configuration identified.

3. Results

The systematic search yielded 1083 potentially relevant publications and after removing duplicates (n = 383) and those that did not meet the inclusion criteria (n = 658), a total of 42 were agreed upon. A further six were excluded, as full-texts could not be obtained, leaving 36 items to be included in the full-text review. After the review of each article identified, using CASP and BEME to ensure the research quality, twelve additional articles were excluded. For example, four of these articles were brief review pieces, four had poor methodological quality, and five were poorly translated into English and could not be deemed appropriate for inclusion by the authors, as outlined in Figure 1. Overall, 24 publications were included in the final group of publications, which included nine qualitative studies, 13 quantitative studies, one literature review [51], and a concept analysis [52].

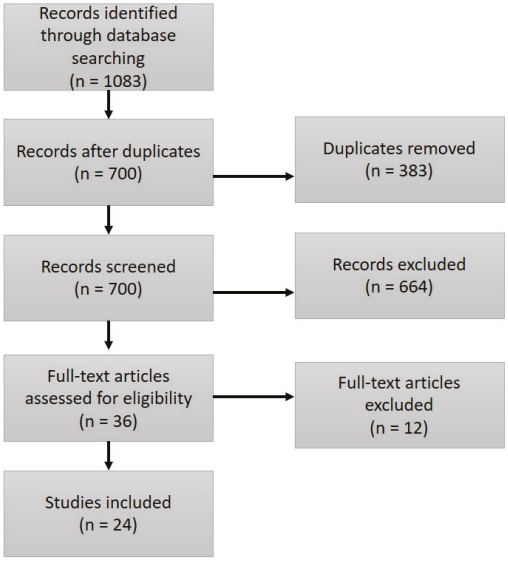

Figure 1. Systematic review flow chart.

Two of the articles did not have a clear country of focus, as these were a concept analysis [52] and a literature review [51]. Of the remaining articles, the most common countries of focus were Canada (n = 6), the United States (n = 5), and Australia (n = 5), with other countries, such as Ireland, New Zealand, Israel, and Jordan also represented in separate studies. Overall, just over half (n = 13) of the studies focused on undergraduate students, while two (n = 2) additional studies focused on or included postgraduate students. In addition, half (n = 12) of the studies focused solely on male nurses, while another five (n = 5) studied both male and female nurses. Lastly, just over one third of the articles (n = 12) relied on questionnaires, while eight articles used interviews or focus groups as the data collection method, as outlined in Table 3.

Table 3. Features of reviewed studies.

Author	Country	Design	Sample (n)	Population	Data Collection	Data Analysis
Abushaikha et al. [19]	Jordan	Qualitative exploratory	20	Undergraduate nursing, males	Interviews	Inductive content analysis
Ashkenazi et al. [34]	Israel	Not explicit	290	Undergraduate nursing, both sex	Questionnaires	Inferential statistics
Bartfay et al. [35]	Canada	Comparative study	149	Undergraduate nursing and non-nursing, both sex	Questionnaire	Descriptive statistical analysis
Christensen et al. [20]	Australia	Qualitative exploratory	8	Undergraduate nursing, males	Interviews	Descriptive Phenomenological approach
Clow et al. [35]	Canada	Not explicit	145	Undergraduate nursing and non-nursing, both sex	Questionnaires	Inferential statistical analysis
Clow et al. [36]	Canada	Not explicit	164	Undergraduate Psychology, both sex	Questionnaires	Inferential statistical analysis
Harding [23]	Australia	Qualitative exploratory	18	Undergraduate, Postgraduate nursing, males	Interviews	Thematic analysis
Hoffart et al. [38]	USA	Not explicit	3506	Undergraduate nursing, both sex	Questionnaires	Inferential statistical analysis
Ierardi et al. [24]	USA	Qualitative exploratory	7	Associate degree, nursing, males	Interviews	Unclear
Jamieson et al. [25]	New Zealand	Qualitative exploratory	8	Postgraduate nursing, males	Interviews	Thematic analysis
Juliff et al. [26]	Australia	Qualitative exploratory	9	New graduated Registered Nurses, males	Interviews	Interpretative phenomenological analysis
Loughrey [39]	Ireland	Non-experimental descriptive	104	Registered Nurses, males	Questionnaires	Inferential statistical analysis
McLaughlin et al. [41]	Ireland	Longitudinal study, not explicit	384	Undergraduate nursing and non-nursing, both sex	Questionnaires	Inferential statistical analysis
Meadus and Twomey [42]	Canada	Descriptive design	62	Registered Nurses, males	Questionnaires	Descriptive statistical analysis
Meadus and Twomey [3]	Canada	Qualitative exploratory	27	Undergraduate nursing, males	Focus groups	Descriptive Phenomenological approach
Rajapaksa and Rothstein [43]	USA	Not explicit	1589	Former Registered Nurses, both sexes	Secondary Analysis	Inferential statistical analysis
Rochlen et al. [44]	USA	Not explicit	174	Registered Nurses, males	Questionnaires	Inferential statistical analysis
Roth and Coleman [51]	USA	Literature Review	n/a	n/a	Literature Review	Not explicit
Sasa [52]	USA	Concept analysis	n/a	n/a	Concept analysis	Not explicit
Stanley et al. [45]	Australia	Non-experimental descriptive	1055	Registered nurses, enrolled nurses and midwives, both sexes	Questionnaires	Descriptive and inferential statistical analysis
Thompson et al. [46]	USA	Not explicit	109	Nursing students, both sexes	Questionnaires	Inferential statistical analysis
Twomey and Meadus [47]	Canada	Descriptive design	239	Registered Nurses, males	Questionnaires	Descriptive and inferential statistical analysis
Weaver et al. [28]	Australia	Qualitative	n/a	n/a	Not explicit	Not explicit
Whittock and Leonard [29]	UK	Qualitative exploratory	42	Pre and Post Registration, males	Interviews	Thematic analysis, but not explicit

Three key sub-themes from the qualitative literature and the quantitative data were identified and emerged from the overarching theme of the funambulist or tightrope walker. The central theme highlights the competing worldviews, societal voices, and collective agendas that men must precariously comprehend, negotiate, and traverse as they seek to learn, work in, and navigate the nursing profession. The first sub-theme from the literature findings is the scrutinizing voice that questions "why are you participating?" and encompasses societal stereotypes, perceptions, and gender norms. The second sub-theme is the inner voice or monologue that questions "why am I participating?", incorporating the rewards of nursing as career. Lastly, the third and final sub-theme is centred on the collective voice that indicates "why you should be participating", focusing on male role models, family, and familiarity with the profession. Each of these sub-themes or voices that encompass the challenges and strategies to improve men entering nursing are discussed in detail below.

3.1. Why are You Participating—Societal Stereotypes, Perceptions, and Gender Norms

One of the key challenges for males entering or being an active member of the nursing profession is the perception that nursing as a profession is observed as an inferior career choice relative to other health-related professions, such as Medicine [51]. In addition, other key difficulties experienced included the stereotype that male nurses are homosexual, that it was not a "macho" type of career as nursing is feminine role, and men participating in the profession are effeminate or are undertaking female-oriented occupation, or what some might consider as "women's work" [25,35,36,42,51]. Within the literature elsewhere, this was also observed to be a barrier, particularly among male nursing students and those seeking to enter post-secondary or higher education [19,34,41].

Among a number of students, these stereotypes of what constitutes a "nurse" were shown to make the feminization of the nursing curriculum and nurse education uncomfortable or less conducive for some men, and has led to a decrease in retention of male nursing students within post-secondary or higher education [35,41,51]. For example, male nursing students in a Canadian study conducted by Twomey and Meadus [47] indicated they felt that they "stood out" and this was a contributing factor that impacted their experience in both education and practical settings.

These stereotypes were further evident due to a perceived incongruence between masculinity and the nursing profession, which was a source of tension and difficulty for male nurses to navigate [25,37]. Nevertheless, a study conducted by Loughrey [39] in Ireland had found that many male nurses were able to or had the capacity to identify more with female than male gender norms. In addition, Loughrey [39] and Thompson, Glenn, and Vertein [46] demonstrated that nurses who were men had significantly lower masculinity levels, while their femininity levels were commensurate with their male non-nursing counterparts. Overall, it was indicated that both male and female nurses were significantly more androgynous than their non-nursing counterparts [46]. Although this group of males demonstrated male gender norms, it was suggested that as a group male nurses exhibited "soft" masculinity, where they maintain certain socially accepted or stereotypical male qualities, while "regarding themselves as affectionate, sympathetic and understanding" [39]. Despite this finding, men and students within the nursing profession felt there was a level of discrimination toward them, in that they were seen and relied on as the "muscle" or those who could or should handle more aggressive, violent, or difficult patients [4,39,45,47].

The soft masculinity reported amongst men in Ireland [39] can be considered to be in contrast to more negative stereotypes represented in studies from Jordan and Israel [19,34]. It is suggested that geographical areas with typically stronger religio-cultural norms tend to also have more traditional gender roles. Conversely, in a United States study it was indicated that nursing students had reported higher levels of masculinity and femininity than reported in previous USA studies, which suggests a change may be occurring within nursing regarding the relationship between gender norms and the profession [46]. Despite this, Sasa [52], has argued that the very idea of the term "male nurse", so ubiquitously used within the profession, within the healthcare workforce, and society, including

the media, continues to perpetuate gendered stereotypes about who should participate and what nursing should resemble [47].

3.2. Why am I Participating—The Rewards of Nursing as A Career

Beyond the stereotypes, perceptions, and gender norms that appear to permeate the nursing profession for and amongst men, another theme was identified that centred on the reward that males were able to glean from being a member of the nursing profession. The key rewards that were important to males to enter or be a nurse were focused on the financial remuneration, including stable employment, job security, the level of pay, leave entitlements, and extra benefits, and were identified within several studies [4,24,34,38,45,47]. In addition to financial reward, the perceived career stability as a nurse was demonstrated as a motivating factor for men to enter the nursing profession [20,47]. However, financial factors were also found to be a major motivator for men leaving the nursing profession [45,47], with one study conducted by Rajapaksa and Rothstein [43] in the USA demonstrating that men were 2.5 times more likely to leave nursing for financial reasons than women.

Other aspects that men found rewarding beyond the financial elements of the career were shown to be the caring aspect of nursing, which encompassed altruism and the capacity to make a difference [4,45]. However, it was suggested that men in nursing felt they needed to precariously traverse their caring roles, leaving themselves in vulnerable positions, as they often felt as though they were perceived as having deviant or sexualized motives behind their desires to provide care [4,24,51]. By contrast, it has also been identified by male nurses that they are perceived as less caring than their female nursing counterparts, and therefore not well suited to the profession, leaving males perplexed, disconcerted, and dissatisfied [4,44,45].

Regardless of the perceptions of others, caring among men was deemed personally rewarding and essential for them to be part of and stay in the nursing profession [23,26,29,47]. Among males already engaged as nurses there was a sense of meaning, purpose, fulfilment, and satisfaction from key elements of the work, such as making a difference in other people's lives and the work itself being both challenging and rewarding, especially among men who had previously worked in other professions [23,35,45,47]. Overall, the study conducted by Rochlen, Good, and Carver [44] indicated that despite the challenges males within the nursing profession encountered, they were more satisfied, on average, than men in other professions.

3.3. Why You Should be Participating—Male Role Models, Family, and Familiarity

The last theme had identified that men were greatly influenced to consider, commence, and remain in the nursing profession by way of other male role models who are present in the profession [4,25,26]. Further, often men in nursing became familiar with the nursing profession and what nurses actually do through others or even their own previous employment around nurses and nursing, which often means males enter the profession later in life than their female counterparts [4,25,26,45].

Familiarity with the role of nursing is generally less well understood by the public, and therefore, males indicated their understanding and desire to enter the profession was achieved through others. For example, supportive family members, including parents, siblings, extended family, and close associates who were either nurses or working in health were vital in the decision making process [4,25,26,45,51]. In addition, familiarity with nursing was also achieved through a natural progression or an advancement among men who had worked in other health-related employment, due to their own helping experiences, or because of their interactions with nurses [24–26,51]. However, it was also indicated that less supportive family members, including female nursing students, can also have an impact on, or not be supportive of, male family members who seek to pursue a nursing career [35,42].

Further, familiarity with nurses and what they do is also shown to be an important factor in mitigating the impact of negative stereotypes toward nursing as a profession for men [23]. For example, in a Canadian study conducted by Clow, Ricciardelli, and Bartfay [34], it was demonstrated that greater exposure to men in nursing was associated with increased positive attitudes and stereotypes of men in

this profession. However, television representations of male nurses have been shown to be implicitly or unintentionally stereotypical even when they explicitly seek to challenge negative stereotypes [28]. Therefore, despite positive role models that men may have contact with, the media may further perpetuate and reinforce certain effeminate or homosexual stereotypes, portray hyper-masculine personas as a counterpoint, give male nurses minimal screen time, or leave them absent altogether [28, 35,42,51]. Unfortunately, such endeavours ultimately problematize men in the nursing profession and further impair the capacity of the profession to recruit and retain men [28,42].

4. Discussion

The purpose of this systematic mixed studies review was to (i) systematically examine the psychological constructs that influence male perceptions of nursing and (ii) to identify those aspects that determine a male considering nursing as a career. The nature of these research objectives required a clear search strategy inclusive of strict eligibility criteria inclusive of an extensive and explorative search strategy. A mixed-research synthesis, and more specifically an integrated design informed by the work of Sandelowski, Voils, and Barroso [15] and Sandelowski, Voils, Crandell, and Leeman [13] led to nine qualitative studies and 13 quantitative studies being included. The results of the review yielded three areas of commonality that centred on the overarching theme of the funambulist, which highlights the competing world views, societal voices, and collective agendas that men must precariously traverse prior to and when in the nursing profession. The sub-themes are societal, inner, and collective voices that ask "why are you participating", "why am I participating", and "why you should be participating". It is these voices that encompass the stereotypes, perceptions, gender norms, the rewards of nursing for men, and men coming to nursing through others, that inform men's place in nursing and their decision making concerning entering the profession, which are explored further here.

Qualitative and quantitative data corroborate that men identify a central limitation in considering nursing as a profession revolved around questions of what constitutes a nurse. The feminization of the role, in both professional clinical practice and education domains of nursing, posed a perceived barrier to male participation in nursing [25,35,51]. The pervasive stereotype that male nurses are in some way effeminate and therefore less masculine was a consistent burden to the consideration of nursing as a profession [35,41,51]. While for males already engaged in nursing, they reported feeling a tension between masculinity and the expectations of nursing that required them to adopt a soft masculinity to prevent them from standing out [47], or as something different within clinical practice environments [25,37].

While the literature was replete with examples of normalized cultural practices that operate to keep from engaging with nursing as a career, there was also a body of literature that outlines aspects of a career in nursing that was attractive to males [4,23,34,38,45,47]. Employment security was the most often cited justification for males choosing nursing as a career [20,47], while financial remuneration was both attractive and a central reason for males leaving the profession. While intrinsic reward was identified as a reason for choosing nursing as a career, it appeared to come with a caveat. Males recognized that while nursing provided avenues for capitalizing on traits of altruism and caregiving, there was an on-going need to carefully traverse what they perceived to be the precarious line between being a male nurse and the broader societal feminization of caring. The influence of stereotypical ideals that permeate society's perception of what constitutes a nurse is, again, palpable in the voices of men and their decisions about nursing.

Interestingly, males in the studies reviewed appeared to find nursing a more appealing career option when they were able to identify a role-model who could provide some understanding of what it is that nurses actually do [4,25,26,45,51] and in so doing help to breakdown the stereotypes that surround males in nursing [23]. The time required for males to "arrive" at nursing as a career possibility—often by way of a third party—means that that men are often older when they commence in the profession. Here again one could suggest that the influence of nursing stereotypes operates to

keep males at arm's length without entrée provided by a close insider who can help navigate the fine line between nursing and male identity.

5. Conclusions

While males make up close to 50% of the global population, they represent only 10% of the nursing workforce globally. Nursing is predicted to experience a global shortage in 2025 and finding ever better ways of engaging males in a career in nursing would seem more important now than ever before. Even though there is research suggesting that males who engage in nursing are satisfied with their roles, with a ratio of only 1 in every 10 men contemplating nursing, we have some work to do. This systematic review mixed research synthesis examined the psychological constructs that influence males' perceptions of nursing, in order to identify those aspects that determine a male's consideration of nursing as a career.

Arguably, at the core of the issues raised through the previous research reviewed here is a pressing need to re-write what it means to be a nurse, in an effort to dissolve the gendered stereotypes that permeate societies the world over. If nothing else, this review has highlighted that the issues that confound the story of males in nursing are complex and, much like the funambulist's tightrope walking, they are much more complex that first appreciated. We certainly have an issue as a civilized society when a male is discouraged from showing caring traits out of fear for loosing aspects of one's masculinity. While we recognize that some of these issues do not encompass nursing alone, but embody contemporary ideas of masculinity, this review has shown us that the long term feminization of nursing means that men in nursing are at all times "different". They remain "different", which can be best symbolized through language that is ubiquitous in society. A female nurse is always referred to as "a nurse", while a male engaged in nursing is always referred to as a "male nurse". Here the powerful gendered stereotypes in our everyday nomenclature operate to situate one nurse as being somehow different or abnormal in relation to another on the basis of nothing more than gender, and does little to be inclusive of males in nursing.

Author Contributions: D.T., B.P., and A.S. conceived and designed the study; C.C, D.T., and B.P. analysed the data; A.S. and A.J.P. contributed to the analysis and interpretation of the results; D.T., B.P., and C.C. prepared the original draft; D.T., B.P., C.C., and A.S. undertook subsequent draft preparations, reviews and editing. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: The authors acknowledge the facilities and the scientific and technical assistance of the School of Health at Federation University Australia, including the Griffith Centre for Social Cultural Research, Griffith University.

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

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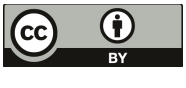

European Journal of
Investigation in Health, Psychology and Education

MDPI

Article

Concrete Messages Increase Healthy Eating Preferences

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Received: 13 May 2020; Accepted: 10 June 2020; Published: 18 June 2020

Abstract: Public health campaigns utilize messaging to encourage healthy eating. The present experimental study investigated the impact of three components of health messages on preferences for healthy foods. We exposed 1676 online, American study participants to messages that described the gains associated with eating healthy foods or the costs associated with not eating healthy foods. Messages also manipulated the degree to which they included abstract and concrete language and the temporal distance to foreshadowed outcomes. Analysis of variance statistical tests indicated that concrete rather than abstract language increased the frequency of choosing healthy over unhealthy foods when indicating food preferences. However, manipulations of proximity to outcomes and gain rather than loss frame did not affect food preferences. We discuss implications for effective public health campaigns, and economic and social cognitive theories of persuasion, and our data suggest that describing health outcomes in concrete rather than abstract terms may motivate healthier choices.

Keywords: abstraction; construal level; junk food; temporal distance

1. Introduction

The increased prevalence of non-communicable diseases such as cardiovascular disease, diabetes, stroke, and various types of cancers has mobilized a multidisciplinary approach to manage the current health crises [1]. Many of these approaches attempt to modify an individual's behavior and lifestyle using cognitive-behavioral and social learning theories [2,3], and implement these theories with messages delivered to the public at large urging the adoption of healthy behaviors [4]. The messages are framed in varied ways. Various public health organizations have generated hundreds of thousands of such messages, the specific content and focus of which has varied substantially. For instance, one New York City anti-soda campaign used shame to promote behavior change, presenting glasses overflowing with gelatinous, orange-tinged substances accompanied by the tag line "Don't drink yourself fat." A poster in Atlanta attempted to motivate by using fear, depicting an overweight child who could not fit inside the visual frame along with the text, "Warning: Chubby kids may not outlive their parents." We join the researchers, public health advocates, and community agencies to continue to investigate what forms of messaging—the features of the message frame—promote intentions towards better health. Additionally, we probed the social-cognitive factors that target individuals' preferences in choosing foods to eat.

1.1. Gain- and Loss-Framed Messages

One aspect of public health messages that fundamentally distinguishes one health campaign from another is whether the message focuses on or is framed around gains or losses. The American Cancer Society [5], for instance, recently advocated for gain framing. It highlighted the health improvements that arise after quitting smoking, both immediately such as improved circulation and lung function,

and later on such as a reduction in the risk of developing coronary artery disease. In contrast, the Centers for Disease Control [6], has rolled out several ad campaigns that rely on loss framing. Its messages use testimonials from past smokers to encourage current smokers to quit by highlighting what can be lost if a smoker continues, including jaw bones, the ability to speak, and the freedom to move unencumbered by oxygen tanks.

Researchers have examined whether gain or loss message frames are more effective at motivating individuals to engage in healthy behaviors. One meta-analytic review examined the effect size of gain and loss framing aggregating across 94 published studies. They concluded that gain-frames were more effective than loss-frames at motivating healthy behaviors including exercise, smoking cessation, and skin cancer prevention [7]. However, whether gains or losses consistently motivated behavior change is open to discussion. Closer inspection finds that the effect size of the difference in that meta-analysis though significant, was small by all standards (r = 0.083; [7]).

Moreover, the results of another meta-analysis of 53 studies found a small though statistically significant advantage for loss-framed over gain-framed messages, an effect that was similarly small (r = 0.039) but opposite in its prescriptive implications [8]. Likewise, another meta-analytic review found that fear appeals, which encourage people to avoid the negative consequences that failing to exercise might induce [9,10], increased individuals' adherence to doctor recommendations when compared to exposure to no messages, to a message that was not designed to induce fear, or to messages designed to induce relatively less fear than the experimental group [11].

The efficacy of gain or loss frames may depend on not only the gain or loss frame of the message but other features of its content as well. Both gain-frames and loss-frames can induce compliance with messages advocating for behavior change, however, whether gain or loss-frames are stronger motivators of healthy behavior may depend on additional characteristics of the language the messages contain. With this work, we draw from two theoretical fields—economic models and social cognitive theories—to test the efficacy of gain and loss frames, in addition to their interaction with multiple other message features.

1.2. From the Economics of Message Framing

Economic models posit that temporality could interact with the gain and loss frame of a message. Messages intended to change behavior could include descriptions of distant, long-term or proximal, short-term outcomes, and could vary the content of messages through differences in the time units specified (e.g., infection rate per day vs. per year; [12]) or the immediate or delayed nature of the consequences [13]. Evidence suggests that immediate rather than delayed outcomes motivate behavior change. For instance, when researchers stated that drinking holds immediate negative consequences to college students, alcohol use and frequency of binge drinking were lower, compared to when researchers stated that drinking holds long-term negative consequences [13]. Future outcomes may carry less weight and exert less impact than immediate outcomes (e.g., [14,15]), which suggests that messages describing proximal rather than distal consequences could impact health decisions to a greater degree.

However, it is possible that the degree to which proximal or distal frames shape the efficacy of gain or loss frames varies. The hyperbolic discounting function and temporal discounting function, in fact, propose that individuals value gains less as they become more distant in time (e.g., [16,17]). As a result, the healthiness of behaviors should grow stronger when messages focus on the positive outcomes that will be experienced relatively sooner rather than later. Indeed, gain frames were better than loss frames at motivating individuals to quit smoking and consume less alcohol, and this effect was most pronounced when the gain frame featured immediate benefits over distant future ones [13,18].

The economic principle of loss aversion, however, predicts a larger impact of short-term losses than short-term gains. When researchers incentivized smokers to quit, participants were more likely to achieve at least one day of abstinence after exposure to loss rather than gain frames [19]. When focusing on the immediate, proximal, daily outcomes, loss-framed messages induced stronger and healthier

behavior change than gain-framed messages. Together, economic principles specify that temporally near outcomes, whether described as gains or losses, should motivate behavior change more strongly than messages that focus on distal outcomes.

1.3. From Social Cognitive Theories of Message Framing

We also draw from social cognitive theories, including Construal Level Theory [20], to generate hypotheses regarding the impact of message frames on health outcomes. Construal Level Theory states that events, including high-stakes decisions and personal experiences involving individuals' health, can be represented in either high-level or low-level ways [21]. There are multiple ways to induce high and low level construals in message frames, which might impact health behaviors.

1.3.1. Temporal Distance

High and low-level mindsets can be induced by temporality [20,22,23]. High-level mindsets arise when considering long-term implications, while low-level mindsets arise when considering proximal implications. When the psychological distance matches the gain and loss frame, persuasive ability increases. For instance, Canadian residents who viewed advertisements that saw the headline, "Recycle for a better Calgary Tomorrow," and considered what would be gained by recycling showed stronger pro-environmental intentions than those who read about what would be lost. Similarly, Canadian residents who read the headline, "Recycle for a better Calgary Today," and considered what would be lost by not recycling strengthened intentions compared to those who considered what could be gained [24]. In other words, when the message paired a distal frame with gains or proximal frame with losses, behavioral intentions grew stronger than when the pairings were mismatched.

1.3.2. Abstraction

High and low-level mindsets can also be induced with abstract and concrete language [20,22,23]. High-level mindsets arise with abstract language, while low-level mindsets arise with concrete language. Evidence suggests that concreteness, associated with low-level construals, rather than abstraction, is associated with persuasive appeal. Nisbett and Ross [25] (p. 44), in fact, theorized that concrete rather than abstract messages make information more available in memory, increases attention to and elaboration and rehearsal of the message, and increases the effectiveness of persuasive appeals, arguing that "people's inferences and behavior are more influenced by vivid, concrete information than by pallid and abstract propositions." Indeed, messages describing the risks of sexually transmitted disease and skin cancer is more persuasive when they contain concrete vivid descriptions, like personal stories, specific details, and photographs of consequences, rather than non-vivid descriptions, like general statistics or text [26]. Graphic images of oral disease associated with smoking elicited greater intentions to quit smoking than non-pictorial warnings or less graphic images [27]. And when the consequences of drinking alcohol on reaction time were described in more concrete terms (as resulting in bloody, bone-crushing accidents) rather than abstract terms (as resulting in delays that slow reaction time to a snail's pace), participants remembered more of the message content [28]. In other words, when people believe they can make necessary changes to reduce risk in their daily life, concrete rather than abstract information produces cognitive and behavioral intention changes that promote good health (see [29], for a review of nuances in how to establish concreteness without confounding variables).

Though there is evidence of an overall motivating effect of concrete rather than abstract language, Construal Level Theory offers that gain and loss frames might be differentially persuasive when described in concrete or abstract terms, as gains align with high-level construals, while losses align with low-level construals [30]. When individuals considered, for instance, what could be lost by a behavior, they engaged a more concrete mindset, while consideration of what could be gained engaged a more abstract mindset, and when messages matched the gain frame with abstraction and the loss frame with concreteness, persuasion increased [24]. These data suggested that matched alignment

between construal level and gain or loss frame can increase the fluency of message processing and as a result increase the persuasive appeal of the message content.

1.4. Unpacking the Covariation

There are challenges to interpreting existing evidence of the impact of abstraction, temporality, and gain and loss frames in health message frames given covariation in variables of interest. For instance, manipulations of temporal distance and gains and losses naturally give rise to differences in the abstract nature of cognition. Indeed, Chandran and Menon ([12]; Study 3) found that individuals perceived risks more vividly and clearly when messages described the deleterious consequences of failing to exercise when they were ones described as having an impact in one day rather than one year. That is, proximal loss consideration primed a concrete, low-level mindset.

Moreover, some messages that highlight the temporal nature of outcomes simultaneously varied the abstract nature of the language used within them. For example, one investigation varied the temporal context of the message by emphasizing either the immediate or the long-term effects of consuming fruits, but in doing so, simultaneously varied the certainty of experiencing the stated effects [31]. Certainty is a form of abstraction [32]; thus, temporality covaried with abstraction. Such covariation pose challenges to understanding the cognitive processes by which message frames impact behavioral intentions. Given the relationships among time and abstraction, isolating the unique impact of temporal distance, abstract language, and gain or loss frames has flummoxed empirical investigations thus far.

1.5. Aims

The current research sought to clarify the nature of message frames that are most persuasive at motivating healthy food preferences, as healthy eating has been shown to have myriad preventative and protective benefits against chronic, preventable disease including heart disease, stroke, and diabetes [33]. The present research used an experimental social-cognitive approach to test the effectiveness of gain and loss-frames under conditions that varied either the abstract nature of the language used to describe them or the temporal distance to described consequences.

We designed a high-powered study in which we manipulated gain and loss frame. We crossed this manipulation with two additional constructs: construal type and level. Construals can be manipulated via changes in abstraction or in temporality. Each of these types of construal can assume low or high levels. When manipulating abstraction, concrete messages reflect low level framing while abstract messages reflect high level framing. When manipulating temporality, proximal consequences reflect low level framing while distal consequences reflect high level framing. Probing the facets of health message framings that are most effective at motivating behavior change will aid the public health community in formulating compelling campaigns aimed at prevention of chronic, non-communicable diseases.

1.6. Hypotheses

Given the covariation in manipulated constructs in published research, we posit as an exploratory prediction whether either low or high levels of framing when applied to the dimension of temporality or the dimension of abstraction will predict divergent effects of gain and loss frames on healthy eating intentions.

2. Materials and Methods

2.1. Ethics

The procedures were reviewed and approved by the New York University, University Committee on Activities Involving Human Subjects, #2016-1090 date: 2-11-2019.

2.2. Participants

We recruited 1676 participants from Amazon Mechanical Turk. Participants were eligible to complete the study if they lived in the United States. Respondents were paid $1.00 for completing the survey. We conducted a power analysis using G* Power [34,35] to compute the sample size needed to detect the smallest effect size we were probing, using a priori planned two-way analyses that would deconstruct a 3-way interaction. Because there is no published research we could draw from for the model we designed, we aimed to achieve 80% power to detect a small to medium effect size Cohen's *f* of 0.175, with an alpha error probability of 0.05, in an interaction with a numerator *df* of 1 and 4 groups, the analysis required 259 participants for any decomposed two-way interactions. Because we designed a study in which there were six possible two-way interactions, we set as our recruitment goal a minimum of 1500 participants. We oversampled in anticipation of attrition and to ensure adequate power; 31 responses were excluded from analysis for failing attention checks and supplying nonsensical answers to open-ended questions that suggested they were bots, leaving data from 1644 respondents for analysis (See Table 1 for participant demographics; data file indicates in "exclude_from analyses" column which participants were removed).

Table 1. Participant demographics.

M_{BMI} (SD)	**27.7 (7.6)**
M_{age} (SD)	38.3 (12.5)
n White	1268
n Black	149
n Latinx	76
n Asian	68
n Native American, Alaskan, Pacific Islander	13
n other or multiracial	65
n undisclosed race	5

2.3. Message Frames

All participants read one of 16 different messages that framed the United States' growing public health concern with the obesity epidemic using different language. Every message began by stating that countless longitudinal studies have found a strong link between obesity and the development of chronic, non-communicable diseases such as heart disease, stroke, diabetes, and cancer, which are the biggest killers in developed nations.

The message went on to describe recommendations by one of two sets of government agencies, as a manipulation of Government Agency. In one, the message described the United States Department of Agriculture and Health and Human Services daily minimum number of serving of fruits, vegetables, lean meat, and whole grains. In another, the message described The Centers for Disease Control recommendation for adults to eat a variety of healthy, nutrient-dense foods across all food groups and set a calorie level that will help each individual achieve and maintain a healthy body. We selected these two federal agencies that offer compatible recommendations but that vary in the manner in which they describe these recommendations.

The next paragraphs varied the gain or loss frame. Messages were framed as either gains or losses. Among those receiving gain-framed messages, participants learned that engaging in healthy eating would provide health benefits. Among those receiving loss-framed messages, participants learned that not engaging in healthy eating would lead to health risks (See Supplement for exact wording of all messages).

These gain or loss frames simultaneously varied with the type of construal. Some messages held abstraction constant, and varied the temporal distance to the expected consequences. Those assigned to the proximal frame read that the consequences of [not] eating healthy would impact them within

weeks (gain/weeks n = 202, loss/weeks n = 202). Others assigned to the distal frame read that the consequences would impact them in years (gain/years n = 211, loss/years n = 201).

While half of the participants were exposed to variation in temporal distance, the other half of participants were exposed to variations in the abstract nature of the language used in the message, holding temporal distance constant. Some read messages that described the health consequences in concrete terms (gain/concrete n = 212, loss/concrete n = 213). For example, the concrete gain frame contended that adopting and maintaining a regular healthy eating plan will improve the heart's functioning, allowing it to effectively pump blood throughout the body. The concrete loss frame stated that failing to adopt and maintain a regular healthy eating plan will diminish the heart's functioning, preventing it from effectively pumping blood throughout the body. Others read messages that described the consequences described in abstract terms (gain/abstract n = 196, loss/abstract n = 207). The abstract gain frame stated that adopting and maintaining a regular healthy eating plan will improve cardiovascular health. The abstract loss frame stated that not adopting and maintaining a regular healthy eating plan will diminish cardiovascular health. In these manipulations, the only mention of time was that the consequences would occur sometime in the future.

To check the manipulation of language abstractions, we submitted our messages to a Coh-Metrix analysis. Coh-Metrix evaluates texts based on input from multiple lexicons including Celex [36], WordNet [37], the MRC Psycholinguistic Database [38], and others. It computes over 700 indices [39]; we focused our analysis on the percentile estimate of the concreteness dimension of the "text easability" principal component scores. Higher scores indicate more concrete words used in the text. Table 2 provides evidence that the text we used in the concrete messages included more concrete language than the text we used in the abstract messages. Within manipulations of temporal distance, the language we used included relatively equal numbers of concrete words regardless of gain or loss framing or distal rather than proximal consequences.

Table 2. Percentile estimates of the concrete nature of the language included in each health message when using consequences stated by the United States Department of Agriculture (USDA) and Health and Human Services (HHS) in addition to the Centers for Disease Control (CDC), gathered from Coh-Metrix analysis, as a function of each Abstraction or Temporal Distance manipulation and Gain or Loss frame. Values in parentheses reflect the concrete nature of the unique portion of the text within each government agency manipulation.

	Abstraction		Temporal Distance	
	Abstract	**Concrete**	**Distal**	**Proximal**
USDA/HHS				
Gain	91.47 (85.77)	95.15 (98.84)	86.21 (70.54)	86.21 (70.88)
Loss	92.65 (88.88)	95.54 (96.99)	88.49 (77.34)	88.49 (77.04)
Average	92.06 (87.33)	95.35 (97.92)	87.35 (73.94)	87.35 (73.96)
CDC				
Gain	79.95 (85.77)	90.99 (98.84)	73.24 (70.54)	73.24 (70.88)
Loss	80.78 (86.21)	91.31 (98.96)	78.23 (78.23)	78.23 (77.94)
Average	80.37 (85.99)	91.15 (98.90)	75.74 (79.39)	75.74 (75.41)

2.4. Procedures

After consenting to participate, participants randomly received one of 16 health messages in the 2(Gain, Loss) × 2(Construal Type: Abstraction, Temporality) × 2(Level: High, Low) × 2(Government

Agency: USDA + HHS, CDC) between subject design. We set a restriction that participants could not advance the message before 18-s expired. We also set the survey such that the back button was disabled, ensuring participants could only view the message once before answering our primary questions of interest and could not retake the survey as the IP address was recorded and repeat completions were prohibited. We also recorded the amount of time participants spent reading the message.

As manipulation checks, participants used a 5-point Likert scale (1 = strongly agree, 5 = strongly disagree) to respond to statements that assessed whether the message was gain or loss-framed: this message makes me focus on the benefits I would gain by eating healthy; this message makes me focus on what I would lose by not exercising. We subtracted responses to the gain statement from the loss statement to create one gain focus index. A positive score indicated a stronger gain than loss focus, while a negative score indicated a stronger loss than gain focus. To assess temporality, participants read that some points in time feel quite close or quite far away, and then indicated when they expected they would experience the effects of (not) engaging in healthy eating (1 = Very soon from now to 5 = Very far from now).

Following the manipulation check questions, we assessed our primary outcomes of interest. We measured intentions to eat healthy foods. We presented participants with 11 pairs of food items and asked which one they would choose as a snack after having read the message. The pairs included one healthy snack and one unhealthy snack. The pairs were selected to be equivalent in terms of visual features. For instance, an orange bag of chips was juxtaposed against an orange bag of baby carrots. A red bag of chips was juxtaposed against a red apple. A long, brown candy bar was juxtaposed against long, brown pretzel sticks. We computed the percent of healthy foods chosen as our primary outcome of interest. Participants ended by reporting demographics including gender, race, age, and height and weight from which we computed BMI. Data and food pair images are available on OSF: https://osf.io/wv9rf/.

3. Results

3.1. Time Spent Reading

Because some people spent quite a long time reading the health message (n = 9), durations that exceeded 3SDs from the grand mean were replaced with the next highest duration. We conducted an ANOVA predicting time spent reading, with outliers replaced, from Construal Type, Level, and Gain-Loss Frame. The only effect that emerged was a main effect of Construal Type, F(1, 1636) = 5.26, p = 0.022, η_p^2 = 0.003. People spent 47.5 s (SD = 41.1) reading the message when abstraction was held constant but temporality was manipulated. People spent 52.9 s reading (SD = 51.6) when temporality was held constant but the abstract nature of the language was manipulated.

3.2. Manipulation Checks

We ran an ANOVA with Gain-Loss Frame, Construal Type, Level, and Government Agency as predictors of the gain focus index manipulation check. We found a main effect of Gain-Loss Frame, F(1, 1627) = 754.92, $p < 0.001$, η_p^2 = 0.317. The gain framed message elicited stronger gain than loss focus (M = 1.19, SD = 1.62) compared to the loss framed message (M = −1.23, SD = 1.94). We also found that Gain-Loss Frame interacted with Level, F(1, 1627) = 7.74, p = 0.005, η_p^2 = 0.005, such that high level (abstract and distant) gain messages elicited a weaker gain focus index (M = 1.02, SD = 1.64) than low level (concrete and proximal) gain messages (M = 1.36, SD = 1.58), t(1627) = 2.74, p = 0.006, d = 0.211. Likewise, high level loss messages elicited relatively weaker loss focus (M = -1.15, SD = 1.92) than low level loss messages (M = −1.30, SD = 1.96), t(1627) = 1.21, p = 0.226, d = 0.077, though this simple effect did not reach significance. There was also a weak interaction between Construal Type and Level that we consider spurious and inconsequential for this manipulation check, given that there was no interaction with gain or loss frame, F(1, 1628) = 3.83, p = 0.05, η_p^2 = 0.002.

We ran an ANOVA predicting the time at which they expected to feel the consequences of eating or not eating healthy from Construal Type, Level, Gain-Loss Frame, and Government Agency. We found a main effect of Construal Type, $F(1, 1628) = 8.95$, $p = 0.003$, $\eta_p^2 = 0.005$, a main effect of Level, $F(1, 1628) = 35.65$, $p < 0.001$, $\eta_p^2 = 0.021$, a main effect of Gain-Loss Frame, $F(1, 1628) = 5.40$, $p = 0.020$, $\eta_p^2 = 0.003$, and as expected, an interaction between Construal Type and Level, $F(1, 1628) = 24.20$, $p < 0.001$, $\eta_p^2 = 0.015$. When manipulating the abstract nature of the message's language, we held the timing of when participants might experience consequences constant; as such participants in the high-level, abstract language condition did not differ in their expectations of when they would experience health consequences ($M = 2.84$, SD = 0.90) from participants in the low-level concrete language condition ($M = 2.79$, SD = 0.99), $t(1628) = 0.75$, $p = 0.453$, $d = 0.053$. However, participants assigned to the high-level distal, years condition expected they would experience health consequences farther into the future ($M = 2.93$, SD = 0.99) than did participants in the low-level, proximal, weeks condition ($M = 2.41$, SD = 0.95), $t(1628) = 7.77$, $p < 0.001$, $d = 0.536$.

There was also an interaction among Construal Type, Level, and Gain-Loss Frame, $F(1, 1628) = 4.14$, $p = 0.042$, $\eta_p^2 = 0.003$, suggesting that the gain and loss frame affected the nature of this interaction, but given the weak size of the interaction we do not interpret it here; we report means in the Supplement (see Table S1).

3.3. Primary Analysis

We ran an ANOVA predicting the percent of healthy foods chosen from Construal Type, Level, Gain-Loss Frame, and Government Agency. We found an interaction between Construal Type and Level, $F(1,1628)= 7.15$, $p = 0.008$, $\eta_p^2 = 0.004$. This interaction remained significant even when BMI, age, and gender were included as covariates, $F(1,1602)= 6.88$, $p = 0.009$, $\eta_p^2 = 0.004$ (Tables S1 and S2). To unpack this interaction, we first looked at preferences among people assigned to the abstraction construal type. Here, temporal distance was held constant. People who read a low-level message that concretely described the consequences of engaging or not engaging in healthy eating selected healthy foods 74.1% of the time (SD = 24.74), while people who read a high-level message that abstractly described the consequences selected healthy foods only 69.9% of the time (SD = 23.87), $t(1628) = 2.53$, $p = 0.012$, $d = 0.173$. Concrete, rather than abstract, descriptions of the impact of healthy eating increased the likelihood of choosing healthy foods.

We next looked at preferences among people assigned to the temporality construal type. Here, abstraction was held constant. We found that temporality did not affect healthy eating choices. People who read messages describing the long-term consequences of healthy diet selected healthy foods 73.9% of the time (SD = 24.14), which did not differ from people thinking about proximal consequences who selected healthy foods 71.8% of the time (SD = 23.88), $t(1628) = 1.26$, $p = 0.208$, $d = 0.087$.

Furthermore, the interaction between Construal Type and Level was not moderated by Gain-Loss Frame, $F(1,1628) = 1.61$, $p = 0.205$, $\eta_p^2 = 0.001$, or by Government Agency, $F(1,1628) = 0.87$, $p = 0.350$, $\eta_p^2 = 0.001$. Gain and loss frames did not shift the overall motivating effect of concrete language on healthier food preferences compared to abstract language. Moreover, gain and loss frames were no more motivating when described as either eliciting distal or proximal consequences.

Though we did find an interaction among Construal Type, Gain-Loss Frame, and Government Agency, $F(1,1628) = 6.11$, $p = 0.014$, $\eta_p^2 = 0.004$, which held even when including gender, age, and BMI as covariates, $F(1,1602) = 6.03$, $p = 0.014$, $\eta_p^2 = 0.004$, we consider this spurious as it is not moderated by Level which would be required to test possible predictions generated from economic and social cognitive theories. We report the results of this interaction and present the means in the Supplement (see Table S3) in addition to all other results from this model, which were non-significant.

4. Discussion

How can health messages be structured to best strengthen intentions to eat healthy foods? In this study, we experimentally tested various facets of message frames and found evidence of a main effect of concrete rather than abstract language. Regardless of whether the message focused on the benefits of eating healthy foods or the costs of not, when consequences were described in vivid, detailed language individuals indicated stronger preferences for healthy rather than unhealthy foods. Moreover, when the abstract nature of the language used was held constant at an average level, discussion of the immediate or long-term consequences of eating habits did not differentially impact reported food preferences.

4.1. Null Effect of Temporality

We found that abstraction but not temporality affected healthy food preferences. This result is concordant with other research. For instance, Bernstein, Wood, and Erickson [40] held constant the abstract nature of the language used and manipulated the timing of the possible consequences. Like the results of our study, they too found that the manipulations of short-term and long-term effects of drinking produced no difference in alcohol consumption, within either the gain or loss framed messages. However, our results are discordant with other work. For instance, gain-framed messages strengthened intentions to quit smoking more so than loss-framed messages when warning labels concerned short-term outcomes [18].

Why are the effects of temporality on shifting the impact of gain and loss frames apparently muddled? Temporality, as a means to varying the message frames when attempting to persuade healthy intentions, may be a multifaceted construct that when manipulated or measured taps into more than considerations of time. For instance, temporality can covary with level of construal (see [41] for a discussion). Indeed, when manipulations discuss immediate consequences, the certainty, vividness, and concreteness of the here and now can give rise to a low-level mindset, while the vagaries of the future can induce a high-level mindset. And when temporality and mindset are confounded, timing may appear to shift the effectiveness of gain and loss frames. Whether these results are due to the temporal frame of the message or construal level it induces are unclear. However, when temporality and mindset are disentangled, as they were in this study, evidence emerges that temporality does not shift the relative impact of gain and loss frame.

Moreover, while on the surface it might seem that time and abstraction are two means to inducing a high-level construal—and as a result, should produce similar outcomes—they are not actually interchangeable in this way; abstraction is a direct manipulation of construal level, while temporality is not, necessarily. Psychological distance, including distance induced through temporality, and construal level are separable constructs [22]. While people might find advantages to representing far off things, people, or events in more abstract, high-level ways, they do not by necessity engage that level of representation by simply invoking greater temporal distance.

When this distinction is applied to the context of health messaging, and when researchers aim to isolate the impact of abstraction and temporality, we may be better positioned to craft effective health communications. Indeed, the implications of our results are that manipulations of the abstract nature of gain and loss descriptions may more effectively shift health intentions than do manipulations of the temporal nature of consequences.

4.2. Individual Differences in Responding to Health Messages

Additionally, it is important to recognize that health message frames, even those we found to effectively strengthen behavioral health intentions, may not improve outcomes for all individuals. Indeed, past research has shown that individual differences in need for cognition, consideration of future consequences, temporal orientation, and regulatory focus may moderate the effectiveness of gain and loss frames (See [31,42–44]). For instance, promotion-oriented people are more influenced by gains, and so abstract, gain-framed messages may be especially persuasive in changing their

health behaviors. Prevention-focused people are more influenced by losses, thus concrete, loss-framed messages may be better suited for these individuals. The public health implications of this nuance may then be that campaigns include mention of both abstract gains and concrete losses in a single message. Such a message may be specifically tailored to include content that appeals to the concerns of individuals with varying personality profiles. While our goal was to experimentally isolate the impact of abstraction, temporality, and gain or loss framing, future research may build upon our results to couple those message features we found to be particular effective to probe whether such a message appeals to a wider audience, including those unique considerations of any individual, regardless of chronic regulatory focus for instance.

4.3. Domain Specificity

As research on the effectiveness of message frames grows, it may be important to model not only features of the message but also the domain. We focused our investigation on health decisions about which individuals had personal control and that require sustained commitment over time. That is, any single consumption decision will not hurt nor aid goals for good health, and individuals have a high degree of personal control over what they choose to eat. These features of the domain to which the messages applied may also be key determinants of which facet of a message motivate change for the better. In fact, when these features are shifted, so too might the impact of concreteness on beneficial outcomes. Evidence suggests that in cases where an individual is not personally responsible for outcomes, high level construals may be more effective. For instance, school principals who set abstract, future-oriented goals shared new opportunities and the plan for education success for the school and teachers in it more often which increased teachers' beliefs that they could educate students effectively [45]; abstract and distally oriented mindsets motivated principals to engage in behaviors that improved the experience of students and teachers. Likewise, abstract rather than concrete mindsets increased people's willingness to perform socially desirable and difficult tasks that benefit others [46].

4.4. Strengths, Limitations, and Future Directions

A strength of our approach lies in its experimental quality. Participant-level variables, like education, literacy, language abilities, and other characteristics might affect responding to public health campaigns that are presented to populations at large, and as a result confound attempts to establish the casual effect of components of messages on health outcomes. Though we did not measure individual differences in education, for example, we can still make claims about the causal effect of facets of the messages we presented as these messages were randomly assigned to participants and the effect of any participant-level demographics, for instance, contributes to variance in the data but does not stand as alternative explanations to the conclusions we draw about the impact of concrete language on promoting healthy food preferences.

Of course, we did not measure actual consumption. Actual behavior may deviate from stated preferences [47], so future research should investigate whether concrete messages similarly increase actual food selection and consumption, in addition to preferences.

5. Conclusions

More than 7 out of every 10 American adults is overweight [48]. While the reasons are many, one prominent factor is failure to eat a healthy diet. Only 1 in 10 adults meet the Centers for Disease Control's (CDC's) daily recommended servings of fruits and vegetables [49]. The current research adds understanding of the social cognitive mechanisms that serve as foundational research for public health programs, including the importance of concreteness in messages such as these, and the many more that will be built in attempts to address the health epidemic seen in the United States and elsewhere.

Supplementary Materials: The following are available online at http://www.mdpi.com/2254-9625/10/2/669\T1\textendash681/s1, Table S1: mean reported perceived distance to when health consequence will be experienced, Table S2: mean percent of healthy foods chosen when BMI, age and gender are not included, Table S3: model

parameters when predicting percent of healthy options chosen in a model excluding covariates, Table S4: model parameters when predicting percent of healthy options chosen in a model including covariates of age, gender, and BMI.

Author Contributions: Conceptualization, E.B. and M.M.; methodology, E.B. and M.M.; formal analysis, E.B., M.M., and E.B.C.; data curation, E.B. and E.B.C.; writing—original draft preparation, E.B. and M.M.; writing—review and editing, E.B., M.M., and E.B.C.; supervision, E.B.; funding acquisition, M.M. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by a New York University Dean's Undergraduate Research Fund award to M.M.

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

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European Journal of
Investigation in Health, Psychology and Education

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Article

Adequate Iodine Intake among Young Adults in Jiangsu Province, China Despite a Medium Iodine Knowledge Score

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Received: 5 February 2020; Accepted: 5 March 2020; Published: 9 March 2020

Abstract: Lack of iodine knowledge might be a risk factor for inadequate iodine intake in populations. Therefore, we aimed to determine the relationship between iodine knowledge and intake in young Chinese adults. A cross-sectional study was conducted in Suzhou, China. Iodine intake was assessed using a validated 33-item iodine-specific Chinese food frequency questionnaire (FFQ) and iodine knowledge was determined using a Chinese iodine knowledge questionnaire. A total of 150 participants (mean age 20.3 years) completed the study. The median iodine intake plus iodized salt was 260 μg/d, indicating iodine sufficiency (>150 μg/d). The median iodine knowledge score was 16/24, suggesting a medium level of knowledge. The majority of participants correctly recognized fish and seafood (95%) and iodized salt (83%) as the most important dietary iodine sources. After adjusting for age and sex, studying in the science cluster and having received iodine education were the predictors of having a higher iodine knowledge score, with adjusted odd ratios (OR) of 4.33 (1.49, 12.61) and 2.73 (1.21, 6.14), respectively. In conclusion, young Chinese adults had an adequate iodine intake despite a medium iodine knowledge score. This study provides support that iodine fortification in China has been successful, but further research is required to more fully substantiate this finding.

Keywords: iodine; iodine intake; iodine knowledge; young adults; China

1. Introduction

Iodine is required by the thyroid for the production of thyroid hormones [1]. Therefore, an adequate iodine intake is important to ensure normal thyroid function in the body. According to the WHO/UNICEF/IGN (Iodine Global Network), the recommended iodine intake for adults is 150 μg/d [2]. When iodine intake is <150 μg/d, the risk of iodine deficiency increases [2]. Insufficient iodine intake has been associated with several adverse effects including goiter [3] and a reduced IQ in children [4]. However, excessive iodine intake might also cause thyroid dysfunction in individuals [5].

Dietary iodine intake is regarded as the most direct biomarker of iodine status in populations and individuals [6]. There are several dietary assessment methods that can be used to assess iodine intake

in populations and individuals [7]. For example, a 24-h diet recall, weighed food record, and food frequency questionnaire (FFQ). Although both the 24-h diet recall and weighed food record can provide detailed dietary intake information, they are associated with a large respondent burden and are time-consuming [8]. On the other hand, FFQ is relatively easy to administer, allowing the collection of usual iodine intake over a specific period of time [8], which minimizes within-person variability [9].

In response to widespread iodine deficiency across China, in 1994 the Chinese government implemented a mandatory salt iodization program and strengthened a health education strategy, which together aimed to eliminate iodine deficiency disorders [10–12]. For example, during the 1980s, the prevalence of goiter in Jiangsu was 26% with a mean urinary iodine concentration (UIC) of 76 μg/L [10]. In addition, over the last two decades, the awareness of iodine deficiency disorders has increased steadily in the Chinese population [11]. To our knowledge, only one study has investigated the association between the level of iodine knowledge and iodine intake, conducted in a group of pregnant Chinese women [13]. There is a lack of data regarding young adults' knowledge of iodine, particularly those living in the coastal provinces (including Jiangsu Province). Knowledge of iodine is important to ensure that adults have adequate iodine intake, especially young women of childbearing age, because a poor iodine status in pregnancy can adversely affect the child [14]. In addition, chronic iodine deficiency is also associated with a higher risk of thyroid dysfunction in both males and females [2].

Therefore, the aim of this study was to determine the relationship between iodine knowledge and iodine intake as well as to examine predictors of iodine knowledge among young adults in China.

2. Materials and Methods

A cross-sectional study was conducted from November 2017 to March 2018 around the campus of Xi'an Jiaotong-Liverpool University (XJTLU) in Suzhou, Jiangsu Province, China. Only adult students of Chinese nationality aged ≥18 years who were able to read, speak, and write Chinese characters were recruited in the study. Convenience sampling was used in the recruitment of participants. The study protocol was approved by the faculty supervisor in accordance with Xi'an Jiaotong-Liverpool University's Policy for the Procedures for the Ethical Assessment of Undergraduate Final Year Projects Involving Human Research and in compliance with the University's Research Ethics Sub-Committee Guidelines.

2.1. Assessment of Iodine Knowledge Level

Participants were asked to complete a sociodemographic questionnaire that included questions about age, sex, and the presence of thyroid disease. Questions regarding iodine knowledge and attitudes, such as "What is iodine?", "I think I get enough iodine through diet", "Which of the following foods are the most important dietary iodine sources?", and "What is the iodine status in China?", were also included (Supplementary 1). These validated questions were adapted from previous studies [13,15,16]. In addition, these questions were further validated in our setting and pilot tested in order to check for validity, comprehension, and clarity. An expert opinion (Z.F.M.) was also obtained during the validation process. Participants were asked to recall if they had (a) enough, (b) some, or (c) never received iodine education. The former two options and the last option were classified as "yes" and "no" to iodine education, respectively. The question on iodine education referred to a broad, general question(s) about any kind of iodine education. Participants were not asked to recall a specific iodine education campaign. Iodine knowledge questions were used to calculate the knowledge score of participants with a Cronbach's alpha of 0.60, which was considered to be acceptable [15]. These scores ranged from 0 to 24, with four different categories (i.e., poor knowledge (0–6 points), low knowledge (7–12 points), medium knowledge (13–18 points), and high knowledge (19–24 points)). As there were only 19 participants with low knowledge scores, participants were placed into two groups based on their knowledge scores as follows: low to medium knowledge (0–18 points) and high knowledge (19–24 points) [15].

2.2. Assessment of Dietary Iodine Intake

In addition, participants were also required to complete a 33-item iodine specific FFQ about items that are the main dietary sources of iodine in the Chinese population, such as porridge, buns, noodles, soymilk products, meat, eggs, yoghurt, seafoods, vegetables, fruit, and snacks [17]. The use of iodized salt was also included. Participants were asked to select the appropriate options based on the amount and frequency of consumption of the food over the past month. For each food item, the frequency options included "2 or more times a day", "once per day", "5–6 times per week", "once a week", "1–3 times per month", "less than once a month", or "never". The iodine intake from each food was determined using the Chinese Food Composition Table [17]. The FFQ had previously been validated in Chinese adults [17] with iodine intake estimated from the FFQ associated with 24-h urinary iodine excretion (UIE) in a group of Chinese adults ($r = 0.47$, $P = 0.009$) [17]. Although the correlation was moderate, it was within the acceptable range (0.20–0.49) to indicate agreement between FFQ and UIC [17].

2.3. Statistical Analysis

SPSS, Version 23 (IBM Corp., Armonk, NY, USA) was used for the statistical analysis. Descriptive statistics were used to determine the means, standard deviations, and medians for the sociodemographic variables. An unpaired t-test was used to explore whether there was a difference in iodine intake between participants with low to medium and high knowledge levels. Logistic regression was then used to assess the association between iodine knowledge 0 = low and medium scores (knowledge scores ranging from 0–18) and 1 = high scores (knowledge scores ranging from 19–24)) and other variables, after adjusting for age and sex.

3. Results

A total of 150 participants (i.e., 57 males and 93 females) were recruited into the study (Table 1). The gender split of those eligible to participate was similar to the ~40:60 male:female ratio study sample and more than 80% of eligible students at this university study in the non-science cluster as in the group sampled. Males had a significantly higher mean age than females (mean ages of 21.1 years and 19.8 years, respectively) ($P < 0.001$). Most of the participants were undergraduate students (97%) and were from the non-science cluster (such as humanities and social science undergraduate degrees) (83%). Almost one quarter (24%) took dietary supplements but only 11% reported the use of iodine supplements. Only 6% of participants were smokers while 2% had experienced a thyroid condition such as goiter before. More than half of the participants (68%) did not use iodized salt or were unsure whether the type of salt they consumed was iodized when at home.

Nearly half (49%) of the participants had received iodine education. Both males (98%) and females (97%) were confident that they knew what iodine was. However, more males (49%) were more confident that they consumed enough iodine through their diet when compared to females (32%). Overall, around 60% of the participants reported that they were not sure about whether they had consumed enough iodine through their diet. There were 25 students from the science cluster; of these, 52% (n = 13) received iodine education.

Most of the participants correctly recognized fish and seafood (95%) and iodized salt (83%) as the most important dietary sources for iodine (Table 2). However, only 7% of the participants identified milk as an important food source for iodine. In addition, 11%, 10%, and 7% of participants incorrectly identified nuts, meat, and fruits as important food sources for iodine.

Table 1. Participants' characteristics.

Characteristics	Total (n = 150)	Males (n = 57)	Females (n = 93)	P-Value
Age (years)	20.3 ± 2.0	21.1 ± 1.9	19.8 ± 1.9	<0.001
Levels of study, n (%)				
Undergraduate	146 (97.3)	55 (96.5)	91 (97.8)	nd [1]
Postgraduate	4 (2.7)	2 (3.5)	2 (2.2)	
Clusters, n (%)				
Science	25 (16.7)	9 (15.8)	16 (17.2)	<0.001
Non-science	125 (83.3)	48 (84.2)	77 (82.8)	
Supplement use				
Yes	36 (24.0)	18 (31.5)	18 (19.4)	0.132
No	114 (76.0)	39 (68.4)	75 (80.6)	
Smokers	9 (6.0)	5 (8.8)	4 (4.3)	0.271
Have experienced thyroid condition before				
Yes	3 (2.0)	1 (1.8)	2 (2.2)	nd [1]
No	147 (98.0)	56 (98.2)	91 (97.8)	
Have received iodine education before				
Yes	74 (49.3)	28 (49.1)	46 (49.5)	0.968
No	76 (50.7)	29 (50.9)	47 (50.5)	
Iodized salt users at home				
Yes	48 (32.0)	16 (28.1)	32 (34.4)	0.713
No [2]	102 (68.0)	41 (71.9)	61 (65.6)	

[1] nd, not determined due to low cell count. [2] Included the participants who were unsure whether the type of the salt they consumed was iodized.

Table 2. Young Chinese adults' knowledge regarding dietary iodine sources, iodine functions, and the national iodine status.

Iodine Knowledge	Total (n = 150)	Males (n = 57)	Females (n = 93)	P-Value
Most important dietary iodine sources, n (%)				
Meat	15 (10)	5 (8.8)	10 (10.8)	0.695
Milk	10 (6.7)	5 (8.8)	5 (5.4)	0.425
Fruits	11 (7.3)	4 (7.0)	7 (7.5)	0.907
Fish and seafood	142 (94.7)	55 (96.5)	87 (93.5)	0.423
Bread	5 (3.3)	1 (1.8)	4 (4.3)	nd [1]
Vegetable oil	1 (0.7)	1 (1.8)	0 (0.0)	nd [1]
Nuts	16 (10.7)	9 (15.8)	7 (7.5)	0.112
Iodized salt	125 (83.3)	51 (89.5)	74 (79.6)	0.114
Do not know	1 (0.7)	0 (0.0)	1 (1.1)	nd [1]
Iodine is important for, n (%)				
Normal child growth and development	95 (63.3)	34 (59.6)	61 (65.6)	0.464
Preventing blindness	21 (14.0)	9 (15.8)	12 (12.9)	0.621
Normal fetal development	57 (38.0)	20 (35.1)	37 (39.8)	0.565
Strength in teeth and skeleton	31 (20.7)	13 (22.8)	18 (19.4)	0.612
Maintaining normal metabolism	65 (43.3)	29 (50.9)	36 (38.7)	0.144
Preventing spina bifida	23 (15.3)	8 (14)	15 (16.1)	0.730
Do not know	10 (6.7)	3 (5.3)	7 (7.5)	0.584
Iodine status in China, n (%)				
Too low intake is a current problem	20 (13.3)	9 (15.8)	11 (11.8)	0.488
Too high intake is a current problem	20 (13.3)	7 (12.3)	13 (14)	0.767
Too low intake was a problem earlier, not now	91 (60.7)	39 (68.4)	52 (55.9)	0.148
Do not know	20 (13.3)	2 (3.5)	18 (19.4)	0.006

[1] nd, not determined due to low cell count.

In terms of iodine function, more than half of the participants (63%) correctly identified that iodine is important for normal child growth and development. About half of the participants (43%) correctly recognized that iodine is important for maintaining normal metabolism, and 38% of the participants correctly recognized that iodine is important for normal fetal development. Also, more than half of the participants (61%) correctly identified that a very low iodine intake was previously a problem in China but is not a problem now.

The median iodine intake plus iodized salt of the participants was 260 μg/d. In addition, aquatic products, eggs, staple food, meat, and milk, and dairy products were identified as the five main food sources of iodine intake among young Chinese adults (Table 3). There was no association between the use of iodized salt and iodine intake (P = 0.284).

Table 3. Mean daily iodine intake from foods only in young Chinese adults.

Food Categories	Examples of Foods	Contribution to Iodine Intake (%)
Staple food	Steamed bread, rolls, and cakes	1.7
	Rice and rice products	5.9
	Buns, dumplings, and wonton	0.7
	Noodles, vermicelli, and ramen	2.8
	Porridge	1.0
Total		12.2
Beans and bean products	Beans	0.2
	Soybean milk	3.0
	Bean product	0.8
Total		4.0
Meat	Pork	0.1
	Beef and mutton	0.3
	Chicken	0.3
	Meat product	8.6
Total		9.3
Eggs	Egg	7.3
	Duck egg	4.0
	Century egg	1.7
	Salted duck egg	3.6
Total		16.6
Milk and dairy products	Milk	14.0
	Yogurt	3.6
Total		17.6
Aquatic products	Freshwater fish	1.5
	Sea fish	3.9
	Shrimps	3.7
	Kelp	2.7
	Seaweed	17.7
Total		29.5
Vegetables	Fresh vegetables	3.3
	Lotus root	0.9
	Agarics and snow fungus	0.3
	Small pickles	0.2
Total		4.7
Fruits and nuts	Fruits	5.0
	Peanut	0.1
	Red dates	0.0
	Other nuts	0.1
Total		0.2
Snacks	Cookies	0.4
	Cake	0.6
Total		1.0

Iodine knowledge scores were calculated and are presented in Table 4. Scores ranged from 8–24 with a median (p25–p75) of 16 (14–19). Most of the participants (69%) had low and medium knowledge levels, and about 31% of the participants had a high iodine knowledge level.

Table 4. Iodine knowledge levels in young Chinese adults.

Iodine Knowledge Score	Males (n = 57)	Females (n = 93)	P-Value	Total (n = 150)
Total score	17 (14–19) [1]	16 (13–19)	0.194	16 (14–19) [1]
Score categories, n (%)				
Low to medium	39 (68.4%)	65 (69.9%)	0.096	104 (69.4)
High	18 (31.6%)	28 (30.1%)		46 (30.7)

[1] Median (p25–p75) (all such values).

There was no significant association between iodine knowledge levels and iodine intake after adjusting for age (r = 0.06, P = 0.50) (Table 5). Using logistic regression, studying in the science cluster significantly increased the probability of having a higher iodine knowledge level with an adjusted odds ratio (OR) (95% CI) of 4.33 (1.49, 12.61). In addition, having received iodine education also significantly increased the probability of having a higher iodine knowledge level with an adjusted OR (95% CI) of 2.73 (1.21, 6.14).

Table 5. Iodine intake of young Chinese adults with different iodine knowledge levels.

	Iodine Intake (μg/d)		P-Value
	Low and Medium Iodine Knowledge Level (n = 104)	High Iodine Knowledge Level (n = 46)	
Total (n = 150)	267 (237, 298) [1]	255 (235, 281)	0.713
Males (n = 57)	265 (236, 318)	255 (246, 298)	0.427
Females (n = 93)	267 (235, 287)	256 (233, 279)	0.738

[1] Median (p25–p75) (all such values).

4. Discussion

Iodine deficiency affects about 30% of the total world populations, particularly children and pregnant women [2]. Iodine deficiency has been prevalent in China since the 1930s and about 15% of children had mild mental retardation in many endemic areas [10,18]. As a result, in the 1960s, interventions of salt iodization were implemented to improve the iodine status in these areas [10]. At that time, awareness of the consequences of iodine deficiency was poor in many high-risk regions of China [10]. Therefore, improving health education about the importance of obtaining enough iodine in the diet was an important strategy to eliminate iodine deficiency disorders [19].

We found a relatively high daily iodine intake in these young Chinese adults living in Suzhou, Jiangsu Province, China. Our findings were consistent with the iodine intake reported in other studies conducted in China [17]. Tian et al., using an iodine-specific FFQ, found a mean iodine intake of 261 μg/d in adults (mean age of 22 years) from Tianjin, China [17]. A study by Ding et al. reported that in Zhejiang province, adults living in inland areas had a significantly higher mean iodine intake than those near coastal areas (351 vs. 257 μg/d) [20]. The overall median iodine intake for adults in Zhejiang province was 272 μg/d, and a 24-h diet recall was used to assess the iodine intake [20]. Another study by Zou et al. reported that the iodine intake of adults in Shanghai was 226 μg/d [21]. The relatively high iodine intake among the young Chinese adult population is likely a result of the universal iodized salt (USI) program implemented to ensure that all population groups have sufficient iodine intake [22]. Given the medium level of iodine knowledge of this sample, it is important to know how important iodine education is compared to population prophylaxis by (USI) alone. However, this is probably beyond the scope of this project and it may be impossible to separate the effects of USI and iodine education when introduced simultaneously.

The iodine intake reported by our study was also relatively higher than other studies conducted outside of China [23,24]. New Zealand adults had a median iodine intake of 132 μg/d, which included iodine from iodized salt [23]. A study by O'Kane et al. reported that women of childbearing age living in the UK and Ireland had a median iodine intake of 152 μg/d [24]. Inadequate iodine intake, particularly in women of childbearing age, is of particular concern because iodine deficiency is likely to continue into pregnancy. In addition, given that most pregnancies are unplanned [25], it is important for women of childbearing age to have adequate iodine status. Iodine deficiency during early pregnancy has been associated with several adverse effects in neurocognitive development in children, including verbal IQ and reading scores [4].

To our knowledge, our study was the first study to investigate iodine knowledge and its relationship with iodine intake in a group of young adults in China. Most studies that explored iodine knowledge level only included pregnant and lactating women, who are most vulnerable to iodine deficiency [13,15,24,26]. Very few studies have chosen adults as a target population [16,24,27]. In particular, studies investigating the relationship between iodine knowledge and iodine status in the young adult population are still sparse. In addition, there is no knowledge data prior to 1994 that could be used to see if knowledge has improved since the introduction of iodine education programs. Therefore, we are unable to examine if knowledge has improved since the introduction of iodine education programs.

Our study found a relatively higher iodine knowledge level among young Chinese adults than the findings reported in a group of young Norwegian women [16] (iodine knowledge scores of 16 vs. 14, respectively). The authors reported no difference in iodine knowledge scores between students who were studying health science and other sciences [16]. A study of women of childbearing age conducted in the UK and Ireland by O'Kane et al. reported a positive association between younger age and the iodine knowledge level ($P < 0.05$) [24]. In addition, a higher education level was associated with a lower risk of inadequate iodine intake (<150 μg/d) [28], because educated adults were more likely to eat foods rich in iodine and were aware of the consequences of iodine deficiency. Our study recruited university students, who had a higher education level. Therefore, a relatively high iodine knowledge level among our participants could be possibly due to a high education level. As we did not determine if a higher iodine knowledge level was due to either the participants' university education or public health education about iodine, we were unable to confirm if the association between iodine knowledge and education has more to do with the participants' university education than public health education about iodine. As our lowest score was eight and only 19 participants had low knowledge score (scores ranging from 7–12), we did not have any participants with poor knowledge (i.e., scores <6) (very low iodine intake) to clarify the influence of a very-low iodine knowledge level on iodine intake. Although iodine education may well be a predictor of a higher iodine knowledge level, our study did not further examine if it leads to a behavioral change that is reflected in increased iodine intake. One of the possible reasons why fewer females were confident that they were consuming enough iodine in their diet compared to males maybe that females were under-reporting their food intake.

Our study also found that iodine education was one of the predictors for the iodine knowledge score, which is consistent with the findings from the UK and Ireland [24]. In China, iodine education activities such as promotional events and displays are carried out continuously by the relevant local and regional government authorities in order to increase the awareness and understanding of how to prevent Iodine Deficiency Disorders (IDD) in populations [29,30]. In addition, China has a National IDD Prevention Day on 15 May each year [30]. Social media platforms such as WeiBo and WeChat are also used by the local and regional government authorities to address some misconceptions about the safety of iodized salt [30].

Our study had several strengths, including the use of a validated Chinese FFQ in adults to assess iodine intake [17]. In addition, the collection of habitual iodine intake levels from food sources might serve as a better biomarker of iodine status on an individual level. Although the FFQ is a relatively crude dietary assessment method, it is better suited for categorizing individuals according to different

iodine intake levels. In addition, we believed that participants who said no to iodine education might well have had it and just not remembered. Therefore, a low knowledge level might not be due to a lack of education. Future studies should include a more comprehensive questionnaire to investigate the impact of education on iodine intake. We also categorized participants who were unsure whether the type of salt they consumed was iodized as non-iodized salt users, which might underestimate the actual number of participants who were iodized salt users. However, it is possible that some of the participants who were unsure whether the type of the salt they consumed was iodized were using non-iodized salt, because presently, in China, the policy on the availability of non-iodized salt has been relaxed. Consumers can now purchase non-iodized salt from shops or on online e-commerce platforms such as Taobao [29,30].

As iodized salt is usually added to food products during cooking and at the table, an accurate estimation of iodized salt intake is very difficult to assess Moreover, iodine intake is not well measured from dietary assessments due to the difficulties in determining salt intake, and iodized salt can be a major contributor to iodine intake. Therefore, it is very challenging to accurately assess the contribution of iodized salt to the iodine intake. The iodine content in iodized salt in China is set at 25 mg iodine/kg salt (range: 18–33 mg iodine/kg salt).In conducting this study we could not find no knowledge data prior to 1994 that could be used to see if knowledge has improved since the introduction of iodine education programs. Future studies should consider asking participants to recall specific iodine education campaigns because such understanding may then assist in the development of successful educational interventions for at-risk groups, including women of childbearing age. Convenience sampling was used in our study because it is easy and affordable. However, this sampling method is likely to introduce potential bias and our findings were not likely to be representative of all young adults in the region. It is possible that less-educated young adults may have less iodine knowledge, and this may impact on their iodine intake and resultant iodine status. Care needs to be taken to not exaggerate the findings beyond the sample examined if they are not similar to all young adults in the region or beyond. Another limitation of our study was that UIC was not assessed in participants. Measuring UIC is the recommended method of iodine assessment [2]. This is because iodine intake is not well measured from dietary assessment due to difficulties in determining salt intake, and iodized salt is a major contributor to iodine intake [31]. Therefore, it is suggested that future studies should include the collection of blood and urine samples in order to allow for a more comprehensive determination of the iodine status [32].

5. Conclusions

In our sample, young Chinese adults had adequate iodine intake and a medium iodine knowledge level. Although our study adds to growing evidence that iodine education and mandatory iodine fortification in China are successful components in the elimination of IDD in populations, our results are not representative of all young adults in China. In addition, it might be the fortification alone which is the important driver for adequate intake. Therefore, future studies should be designed to determine the relationship between the level of iodine knowledge and iodine intake in population sub-groups that are more vulnerable to iodine deficiency.

Supplementary Materials: The following are available online at http://www.mdpi.com/2254-9625/10/1/554\T1\textendash563/s1, Questionnaire S1 sociodemographic questionnaire, iodine knowledge and attitudes.

Author Contributions: Conceptualization, Y.J. and Z.F.M.; formal analysis, Y.J. and Z.F.M.; methodology, Y.J., X.L., Z.F.M., Z.D., R.C., X.L., and S.S.; writing—original draft, Y.J. and Z.F.M.; writing—review and editing, Y.J., X.L., Z.F.M., Z.D., R.C., X.L., and S.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: The authors would like to thank all participants for taking part in the study.

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

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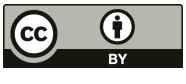

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