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Risks of "cyber-relationships" in adolescents and young people

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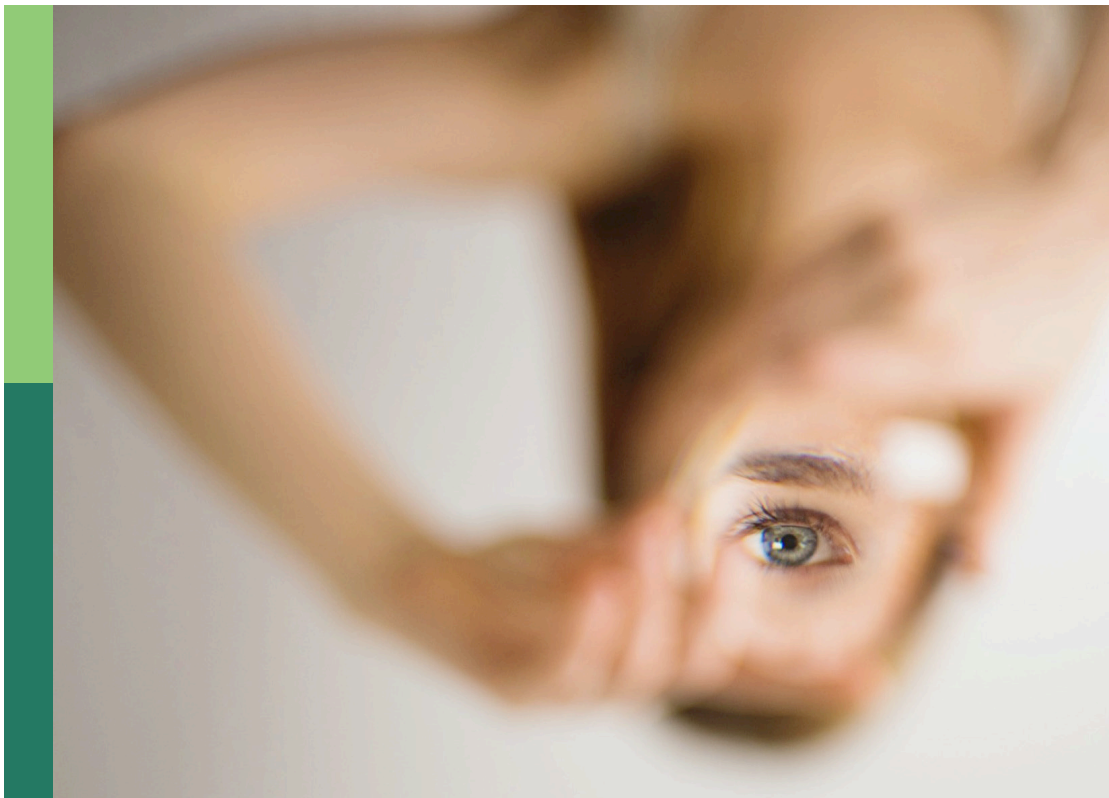

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Risks of "cyber-relationships" in adolescents and young people

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Table of contents

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Editorial: Risks of "cyber-relationships" in adolescents and young people

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Editorial on the Research Topic
Risks of "cyber-relationships" in adolescents and young people

How young people and adolescents interact today has changed considerably concerning the forms of interaction of a few decades ago, with the Internet and social media playing a leading role in their daily lives. Nearly 90 % of 13–17 year old adolescents use at least one social media platform to some degree (Anderson and Jiang, 2018). Thus, young people and adolescents use virtual social networks to form groups or initiate social relationships (Martínez-Ferrer and Moreno, 2017), to maintain contact with their peers (Senkbeil, 2018), and even to initiate and maintain their first romantic relationships (Lykens et al., 2019).

The immediacy, accessibility, lack of limits, and lack of real exposure can facilitate the emergence of new problems that, although they also existed before (e.g., bullying, addictions, intimate partner violence), now take new forms (e.g., cyberbullying, Internet addiction, generalized pathological internet use, Internet gaming disorder, cyber dating violence). The Diagnostic and Statistical Manual of Mental Disorders (DSM) has also been updated and has included in its manual, for example, internet gaming disorder as a disorder that needs further analysis in its latest edition (DSM-5; American Psychiatric Association., 2013). Thus, new risks for young people and adolescents potentially affecting their wellbeing are arising (George and Odgers, 2015). Some of these internet risks (e.g., cyberbullying, cyber dating abuse) could be understood as psychosocial problems that are initiated and maintained in an online context but keep a reciprocal and bidirectional relationship with the person's offline reality (Machimbarrena et al., 2018). These risks can have severe consequences for victims and aggressors, who often present internalizing and externalizing problems (Montiel et al., 2015; Garaigordobil and Machimbarrena, 2019; Azhari et al., 2022; Gámez-Guadix et al., 2022; Wachs et al., 2022), lower leves of health related quality of life (González-Cabrera et al., 2018), suicidal ideation (Quintana-Orts et al., 2022) and interference in academic, social, and family life (Cerniglia et al., 2016; Wright and Wachs, 2021).

This Research Topic aimed to study the risks of these new forms of interaction, the so-called "cyber-relationships". Thus, this Research Topic brings together a series of scientific articles on these new realities. These articles are grouped into four main blocks: (1) the inappropriate use of the Internet and social networks; (2) Internet Gaming Disorder; (3) cyberbullying; and (4) instruments for evaluating these new forms of relationships.

As far as pathological Internet use is concerned, this Research Topic includes five articles. The article by Lin et al. about the influence of interpersonal sensitivity on smartphone addiction concluded that the fear of missing out and relational self-construal in college students played a moderated mediation effect on the relationship between smartphone addiction and the personality trait of interpersonal sensitivity (constantly worrying about negative social evaluation). This study has exciting implications for clinical practice and educational practitioners. Equally interesting in terms of clinical implications are the results of the brief research report of Moretta and Buodo about the relationship between affective and obsessive-compulsive symptoms in internet use disorder, where a strong and positive association between mild-moderate Internet use disorder and obsessive-compulsive symptoms was found. These authors found that hoarding (uncontrollable accumulation of digital information resulting in stress symptoms), obsessing, and depression symptoms were positively linked to Internet use disorder severity.

The study by Wang et al. explores problem network behavior and analyses the effect of factors such as adolescents' shyness, gender, and loneliness. It provides suggestions for the rational use of these networks. Loneliness was also a variable of interest in the study by Wang et al., who studied the mediating roles of internet gaming disorder, social network use, and the generalized pathological internet use (GPIU) in the relationship between depression and loneliness in Chinese adolescents, and found that loneliness could predict depression through the Internet gaming disorder and social network use to GPIU. Tian et al. conducted a study about the association between generalized and specific problematic Internet use to further deepen our understanding of pathological Internet use. They found that Internet gaming was the most critical predictor of GPIU: the effect of Internet gaming on GPIU was larger than the effects of online shopping, online pornography, and SNS usage.

Internet gaming is another main block of the present Topic, where two articles have been included. Firstly, Zhang et al. aim to analyze whether Internet Gaming Disorder (IGD) is associated with a high level of mind-wandering (defined as task-irrelevant thoughts) and how social anxiety plays a role in this relationship. The results suggested that excessive gaming behavior might increase mind-wandering and that social anxiety partially mediated this relationship. The second study is the article by Broman et al., developed in seven European countries about gambling, gaming, and problematic Internet behavior, to explore if these problems are affected by sexual orientation status. They found no differences among heterosexual and sexual minority men, but sexual minority women were associated with problematic gambling and gaming behavior.

The third block of the Research Topic is cyberbullying, which includes six articles. The article by Fernández-Antelo and Cuadrado-Gordillo brings a novel approach to this phenomenon since it studies the perception of aggressors and victims about cyberbullying and helps us understand better the factors and mechanisms that are involved in it. In turn, Zhong et al. explore the influencing factors of cyberbullying among Chinese college students, such as students' personal background, average daily Internet use, personality traits, emotions, and digital citizenship. They found that all these factors were relevant in cyberbullying perpetration and victimization, leading to interesting cyberbullying intervention and governance processes. The importance of adequate monitoring, adequate training of students, and adult supervision are emphasized. In this line, Ngo et al. explore the mediating effects of social support (family, peers, and teachers) on the associations between cyberbullying and psychological problems (anxiety, depression, and stress). They found a protective mediation effect of family support on the association between cyberbullying (experience and observation) and psychological problems.

Contrary to expectations, peer and teacher support did not protect students from experiencing or witnessing cyberbullying. Thus, positive child-parent relationships are critical in adolescence, so they feel they can confide in their parents when they suffer violence from their peers or even when they observe it. Many studies focus on bystanders as crucial figures in maintaining and curbing harassment. This is the case of the other three studies included in this Research Topic: the study by Barlinska et al., the review study by Polanco and Salvo-Garrido, and the article by Leung. On the one hand, Barlinska et al. concluded that activating more cognitive empathy among bystanders is crucial because it increases the likelihood of intervening in bystander behavior. In this line, Leung also emphasizes the role of empathy for bystanders, as he found that past cyberbullying victimization was positively related to cyber-defending behavior, which the activation of a greater empathy might explain. However, Polanco and Salvo-Garrido conclude that bystanders are not a homogeneous group in terms of characteristics and behavior and that contextual variables should also be taken into account since cyberbullying is a phenomenon that requires a multidisciplinary approach.

Lastly, the fourth block of articles of the Research Topic comprises two articles on evaluation instruments. On the one hand, Gaete et al. present a validation of the Revised Olweus Bully/Victim Questionnaire (OBVQ-R) among adolescents in Chile. This self-report questionnaire was initially used in different countries and had good psychometric properties. On the other hand, Persram et al. developed a new comprehensive teen dating violence victimization measure and evaluated its psychometric properties in Canadian adolescents.

In short, this Research Topic brings together a series of exciting articles that broaden our knowledge about the new forms of online relationships among young people and adolescents, with interesting practical implications, which open new avenues of research on online risk among young people and the development of intervention strategies to ensure young people's wellbeing in the 21st century.

Author contributions

All authors have been the editors of the Research Topic, have contributed to the editorial article, and contributed to manuscript revision, read, and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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ORIGINAL RESEARCH
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Divergent Perceptual Processes on Cyberbullying Between Victims and Aggressors: Construction of Explanatory Models

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Understanding the causes of adolescents' aggressive behavior in and through technological means and resources requires a thorough analysis of the criteria that they consider to be identifying and defining cyberbullying and of the network of relationships established between the different criteria. The present study has aimed at making a foray into the attempt to understand the underlying structures and mechanisms that determine aggressors' and victims' perceptions of the cyberbullying phenomenon. The sample consisted of 2148 adolescents (49.1% girls; $SD = 0.5$) of ages from 12 to 16 ($M = 13.9$; $SD = 1.2$). The data collected through a validated questionnaire for this study whose dimensions were confirmed from the data extracted from the focus groups and a CFA of the victim and aggressor subsamples. The analysis of the data is completed with CFA and the construction of structural models. The results have shown the importance and interdependence of imbalance of power and intention to harm in the aggressors' perceptual structure. The criteria of anonymity and repetition are related to the asymmetry of power, giving greater prominence to this factor. In its perceptual structure, the criterion "social relationship" also appears, which indicates that the manifestations of cyberbullying are sometimes interpreted as patterns of behavior that have become massively extended among the adolescent population, and have become accepted as a normalized and harmless way of communicating with other adolescents. In the victims' perceptual structure the key factor is the intention to harm, closely linked to the asymmetry of power and publicity. Anonymity, revenge and repetition are also present in this structure, although its relationship with cyberbullying is indirect. These results allow to design more effective measures of prevention and intervention closely tailored to addressing directly the factors that are considered to be predictors of risk.

Keywords: cyberbullying, aggressor, victims, perception modeling, intentionality

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INTRODUCTION

The lack of agreement when defining and delimiting the concept of cyberbullying has been generating increasingly pronounced controversy about the criteria that determine it (Slonje and Smith, 2013). To the existing discrepancies among researchers on the conceptualization of cyberbullying, we must add the different perspectives that adolescents have about this construct. In this sense, we can find that young people classify certain

virtual aggressions as episodes of cyberbullying without becoming them. Or worse, it could be that manifestations of cyberbullying are interpreted as harmless behaviors. On the other hand, the influence exerted by the experiences of aggression or victimization experienced in the definition of cyberbullying is not yet sufficiently verified. Research on the perceptions that adolescents have of cyberbullying has found that the type of involvement with any given cyberbullying situation significantly influences which criteria the adolescent considers as defining this construct (Vandebosch and Van Cleemput, 2008; Dredge et al., 2014).

Identifying Criteria of Cyberbullying

The principal achievement would seem to be general agreement on five criteria that distinguish cyberbullying from aggressive behavior in on-line contexts. These criteria may be summarized as: power imbalance, intent to cause another person social, or psychological harm, repetition of aggressive behavior, anonymity, and publicity (Thomas et al., 2015).

Repetition

Thomas et al. (2017) considered repetition of the aggressive behavior to be a defining criterion of cyberbullying, and they take it to exist when there is continuous sending of threatening or insulting messages through virtual forums, mobile telephony, etc. Other researchers, however, warn of the limited relevance of this criterion when defining and identifying cyberbullying episodes, arguing that a single aggression that spreads uncontrollably (virality) may cause recurring harm to the victim in a similar way to that produced if the behavior was performed continuously (Hutson, 2016). Although embarrassing private content may only have been sent to one recipient, it may be seen and then forwarded by others, not only increasing the durability of the harm (Pieschl et al., 2015) but also the perception of its seriousness (Schultze-Krumbholz et al., 2014; Wright et al., 2017).

Imbalance of Power

In cyber scenario, the perception of power is linked to the relative mastery of ICT skills (Barlett et al., 2017b). Knowledge of these tools facilitates the access to and manipulation and dissemination of private material, as well as creating obstacles to identifying the aggressor (Casas et al., 2013). Nonetheless, a victim's mastery of ICT does not prevent them from being subjected to episodes of cyberbullying, so that the relevance of this criterion might be less than at first would seem apparent.

Intention to Harm

The lack of face to face communication causes biases in interpreting the meaning of the message, and this in turn leads to frequent confusion about the intentionality of the person with whom they are interacting or exchanging messages. However, despite these difficulties in identifying the intentionality of cyber behavior, Crosslin and Golman (2014) note that adolescents consider the intention to harm to be a major factor for an episode of aggression to be cyberbullying.

Anonymity

Kowalski et al. (2012) argue that anonymity may encourage certain people to act in a way that they would never consider in real life. The perception of the impunity that identity concealment allows favors the adoption of ethically reprehensible behavior, including the perpetration of aggression and other types of cybercrime (Compton et al., 2014; Barlett et al., 2017a).

Publicity

Finally, the publicity criterion is defined as the open and uncontrolled spread of an aggressive behavior. For researchers such as Patchin and Hinduja (2010), it is one of the criteria with greatest presence in cyberbullying. For Nocentini et al. (2010), however, while they recognize the relevance of this criterion as reflecting the seriousness of the cyber abuse, it is not a factor that defines or delimits the cyberbullying construct. Sticca and Perren (2013) report that Swiss adolescents and Chen and Cheng (2016) that young Taiwanese attach particular importance to the public dimension of cyber abuse, and that they consider it to be a defining characteristic of cyberbullying, in turn, determining the seriousness of the harm.

Combination and Interaction of Criteria as Key Indicators to Identify Cyberbullying

Many of the studies addressing this topic use small samples and resort to exploratory analyses to determine which are the criteria for adolescents that have a direct relationship with cyberbullying, which criteria have an indirect relationship, and which have no relationship. These data will contribute to constructing a preliminary theoretical structural model that allows one to understand youngsters' perception of the phenomenon of cyberbullying (Palladino et al., 2017). These studies have been conducted in countries with different cultures. But this does not mean that culture is the variable that has to be taken as responsible for the divergences that are found since, in today's globalized world, perceptions spread rapidly regardless of culture or ethnicity.

Specifically, Baas et al. (2013) focused on the criteria of intentionality and repetition, and concluded that the perception which children aged 11–12 had of these criteria is ambiguous and arbitrary, and that therefore it is impossible to determine whether the relationship between these two criteria is the most used when defining cyberbullying. Instead, Menesini et al. (2012) note that many European adolescents understand that if a behavior is repeated then it cannot be classified as unintentional, which would reflect a relationship between the repetition and the intentionality criteria.

The relevance of certain criteria over was studied by Nocentini et al. (2010). They noted the importance European adolescents give to such criteria as intentionality and imbalance when differentiating an act of cyber aggression from a cyberbullying episode. However, Dredge et al. (2014) found that very few Australian adolescents take intention to harm and imbalance of power to be essential components in the definition of cyberbullying.

Results concerning the perception of other criteria, such as anonymity or giving publicity to the aggression, are sparse

and contradictory. Schultze-Krumbholz et al. (2014) affirm that adolescents recognize the influence of anonymity and publicity on the seriousness of the cyber aggression but that they do not consider these two factors to be defining characteristics of cyberbullying.

Cuadrado and Fernández (2016) show that adolescents' perception of cyberbullying depends on the role they play of aggressor or victim: victims consider that intentionality, publicity, and imbalance of power are directly related to cyberbullying, with intentionality having the greatest influence of the three; aggressors put power imbalance as being the most important dimension defining cyberbullying, followed by the intention to hurt. Finally, studies such as those of Betts and Spenser (2017) note the normalization of violent behavior as patterns of social relationships and interaction among adolescents. This distorted perception may be a predictor of cyberbullying (Cuadrado and Fernández, 2016). These results, together with those of the works mentioned above, allow us to approach the construction of a preliminary theoretical structural model of adolescents' perception of cyberbullying.

The Study

The numerous controversies and contradictions that still exist regarding the delimitation of the cyberbullying construct demonstrate the need for further research focused on determining the criteria that shape the structure of the perceptions that adolescents have of this phenomenon and on seeking explanations of this behavior. Previous studies analyzed the dependency relationships between pairs of criteria identifying cyberbullying, especially between imbalance and intentionality. However, to understand the underlying mechanisms that define the perception adolescents have of this construct it is not enough to analyse pairs of criteria. It is also necessary to examine the web of potential relationships that includes all the possible factors, both directly observable and latent, that may be attributed to the cyberbullying construct. In the case of the victims, the review of the scientific literature indicates that the continued experimentation of the damage caused by cyber attacks (repetition criterion) reinforces the perception of intentionality of the aggressor to cause psychological, emotional, social damage, etc. In this way, the repetition criterion could maintain an indirect relationship with cyberbullying exerted through the intentionality criterion. Likewise, the absence of technical knowledge to reveal the identity of the aggressors would place this technological domain (power imbalance) as a criterion of first order and the anonymity criterion dependent on it. In addition, in the case of aggressors, the normalization of humiliating behaviors as patterns of relationship between adolescents could cause the criteria of revenge and advertising to maintain an indirect relationship with the cyberbullying construct mediated through these maladjusted social relationships with peers. The objectives of the present study were to: (i) construct possible explanatory models of the perception of cyberbullying from identifying and relating the criteria that form this construct; (ii) determine the predictive values of the criteria of repetition, imbalance, intentionality, publicity, anonymity, revenge, and social relationships for adolescents' perception of cyberbullying; and (iii) analyse the influence of previous cyber victimization and cyber aggression experiences in the construction of explanatory models of the perception of cyberbullying.

METHODS

Sample

The sample consisted of 2,148 adolescents (50.9% boys and 49.1% girls; $SD = 0.5$) of ages from 12 to 16 ($M = 13.9$; $SD = 1.2$).

To select the participants, we applied a stratified multistage, approximately proportional, sampling procedure with conglomerates and random selection of groups in public secondary schools in which Compulsory Secondary Education (ESO) is taught. The strata considered were the provinces and geographical areas of Extremadura (Spain), selecting towns in the north, south, east, and west of the region, and taking their different socio-cultural contexts into account. The conglomerates used were the secondary schools. In each school, one of the four courses making up the ESO (1st year, ages 12–13; 2nd year, age 14; 3rd year, age 15; and 4th year, age 16) was selected at random.

Questionnaire Design

The instrument used for the collection of data was a questionnaire of 28 questions grouped into nine blocks. The first block consists of three questions that allow one to identify whether the adolescents consider themselves to be aggressors, victims, or witnesses of cyberbullying. From this identification, we can analyse how they behave in the rest of the questionnaire, i.e., what perception they have of the phenomenon of cyberbullying. These first three questions also provide insight into how often during the last 3 months they had committed, been victims of, or observed cyberbullying episodes. The scale used comprised four values: "never," "once or twice," "once a week," and "several times a week." This scale has been used in many studies analyzing the prevalence of cyberbullying (e.g., Hemphill et al., 2012; Huang and Chou, 2013; Del Rey et al., 2015). A respondent is considered to have played the role of aggressor, victim, or witness when they say they have been involved at least 1 or 2 times in some of the behaviors they are presented with. It is important to note that the adolescents who manifested themselves as having been both victims and aggressors in any of the modalities that will be presented below were excluded from both the aggressor and victim subsamples, since they play some other role such as bully/victim which we do not analyse in the present study. In the following, we present by way of example the question that allows the adolescents who consider themselves to be victims of cyberbullying to be identified. They were told to indicate how often during the past 3 months they had suffered any of the following behaviors: "(1) I have been insulted through the mobile phone or Internet; (2) I have been threatened or blackmailed through the mobile phone or Internet; (3) lies and false rumors have been spread about me through the mobile phone or Internet; (4) I have been removed from contact lists on social networks, group chats, or emails so as to exclude me; (5) I have had someone pretend to be me, and my email, private chat rooms, or social network profile have been

accessed without my permission; (6) they have sent by mobile phone or Internet incriminating photos or videos, which are denigrating or demeaning to me; (7) they have recorded fights in which I participated and spread them through mobile phones, social networks, or other cyber means; (8) they have sent sexual or erotic type of content in which I took part." If an adolescent answers one or more of these items indicating a frequency of "at least once or twice" and does not declare having committed any of these abuses, they are assigned to the victim subsample. The aggressor subsample is identified analogously.

A reliability analysis of the instrument showed satisfactory internal consistency of the blocks of items aimed at identifying the aggressors, victims, and witnesses (Cronbach's alpha: $\alpha = 0.87$; $\alpha_{aggression} = 0.84$; $\alpha_{victimization} = 0.90$; $\alpha_{witnesses} = 0.77$).

In addition to an exhaustive review of the scientific literature on the topic, focus group sessions with a sample of 49 adolescents (16–18 years) grouped into teams of 7 were employed in preparing the questions directed at determining adolescents' perception of cyberbullying. In these sessions the adolescents were given 15 descriptions of different kinds of cyber attacks and were asked to interpret them, analyzing the goal of the aggressor, the possible reasons that led him or her to commit that certain type of abuse, as well as the implications for the victim. From the explanations that were given for each of the descriptions presented, we categorized the responses in accordance with the absence or presence of the criteria that adolescents associate with the conceptualization of cyberbullying. Based on these responses, a principal component analysis was carried out to extract the criteria that explain a large part of the total variability. The result of this analysis led to seven criteria being selected (**Table 1**): the aggressor's intention to cause harm (Component 1), imbalance of power between the aggressor and victim (Component 2), publicity made of the aggression (Component 3), social relationships and forms of communication used by adolescents in the cyber world (Component 4), repetition of the abuse (Component 5), anonymity behind which those who abuse others hide (Component 6), and revenge (Component 7), whose Cronbach's alpha reliability values ranged between 0.71 and 0.83.

These criteria were incorporated in the form of items into the questionnaire's 25 remaining questions aimed at determining the perception of cyberbullying and the modalities in which it manifests itself. The 25 questions are grouped into 8 thematic blocks corresponding to the different modes in which this phenomenon manifests itself in accordance with the "type of behavior" criterion: insults (including homophobia), threats (including blackmail), spreading false rumors, exclusion (from contact lists, social networking, etc.), identity theft, sexting, posting denigrating images or videos, and recording and disseminating physical aggressions (Willard, 2006; Huang and Chou, 2010; Rivers and Noret, 2010; Kowalski et al., 2012). Each but one of these blocks comprises 3 questions. The exception is the "insults" mode for which there are 4 questions to try to cover the great variety of types of insults that were encountered. With these questions, we can determine the perception adolescents have of behaviors regarded as manifestations of cyberbullying, and the criteria they use to define those behaviors. The scale comprises 5 values to indicate the degree of agreement with each of the items presented (strongly agree, agree, neither agree nor disagree, somewhat disagree, and disagree). Multi-item measurements help to minimize the perceptual bias of the respondent (Selkie et al., 2015). Authors such as Asún et al. (2016) consider that a variable can be treated as a (continuous) scale when its values represent ordered categories with a metric with meaning. These authors affirm that in studies of Social Sciences and Psychology, it would be possible to consider the ordinal variables as continuous variables, understanding as values the cut-off points of the continuous variable.

TABLE 1 | Total variance explained by the components.

	Initial eigenvalues			Sum of the squared saturations of the extraction		
Component	**Total**	**% of variance**	**Accumulated %**	**Total**	**% of variance**	**Accumulated %**
1	5.13	21.18	21.18	5.13	21.18	21.18
2	4.68	19.32	40.50	4.68	19.32	40.50
3	4.03	16.64	57.14	4.03	16.64	57.14
4	2.95	12.18	69.32	2.95	12.18	69.32
5	2.07	8.55	77.87	2.07	8.55	77.87
6	1.74	7.18	85.05	1.74	7.18	85.05
7	1.23	5.08	90.13	1.23	5.08	90.13
8	0.87	3.59	93.72			
9	0.51	2.11	95.83			
10	0.48	1.98	97.81			
11	0.32	1.32	99.13			
12	0.21	0.87	100			

Extraction method: principal component analysis.

Once a draft had been prepared of the 25 questions, it was presented to a group of 78 adolescents to determine the questions' reliability and the degree of comprehension and familiarity with the terms used in the questions. A reliability analysis showed satisfactory internal consistency in the block of items designed to access the perceptions of cyberbullying (Cronbach's $\alpha = 0.79$). We also calculated the degree of internal consistency for each of these eight thematic blocks. The following are the results: insults ($\alpha = 0.82$), threats ($\alpha = 0.71$), spreading false rumors ($\alpha = 0.76$), exclusion ($\alpha = 0.78$), identity theft ($\alpha = 0.85$), sexting ($\alpha = 0.79$), posting denigrating images or videos ($\alpha = 0.77$), and recording and disseminating physical aggressions ($\alpha = 0.82$). Subsequently, once the data of the total sample had been input, the internal consistency coefficients were recalculated. The results did not vary significantly. The following are some examples of the questions included in these thematic blocks.

An example of this type of questions is: "Why do you think some peers threaten others through telephone calls? (1) Because they do not dare do it face to face for fear of reprisals; (2) Because they can hide their identify and inflict fear on others who are stronger; (3) Because it is the way they have of relating; (4) Because that way they feel more powerful; (5) Because it the only way they have to get what they want; (6) Because they feel more accepted by their friends; (7) Because it is a way of getting revenge; (8) Because they record the telephone calls and then

spread them so that the victim repeatedly feels fear; (9) Because they like to see how others suffer; (10) They are jokes or other ways of having fun that are typical of adolescents."

Another example would be: "When a peer continuously insults another person through the mobile phone or the Internet, I consider this conduct to be… (1) something normal among adolescents; (2) the usual way we have of relating; (3) harmless behavior if it occurs sporadically; (4) something irrelevant if the person who insults me is not important to me or unknown; (5) harmless behavior if it occurs in private; (6) an aggression when it harms another person; (7) a form of revenge against others whom you do not like or who have attacked you; (8) an aggression if done by a popular person; (9) an aggression if the insult is accompanied by an offensive image."

Subsequently, a confirmatory factor analysis was performed of the victim and aggressor subsamples in order to confirm the dimensions of the questionnaire when applied to particular groups.

Procedure

With this being a study involving minors, it was necessary to have the parents' consent, and the approval of the Regional Administration's education inspectors and of the different schools' management teams.

To obtain the parents' consent, they were sent a letter describing the nature of the study, the use that would be made of the data, and the commitment to confidentiality and anonymity. This letter was accompanied by a form for the parents to forward to the school if they did not want their children to participate in the study.

The education inspectors and management teams were sent a report in which the objectives of the research, the procedures, and the guarantee of anonymity of the participants were detailed. This was thus in full compliance with the ethical standards governing secondary schools. Previously, both the research objectives and the procedure, instruments and techniques used were supervised and approved by the Ethics Committee of University of Extremadura (Spain).

The data acquisition procedure followed once the parents and school authorities had been informed consisted in the researchers going to each of the selected schools in turn, where they distributed the questionnaires in each of the classes, and remained in those classrooms until all of the participants who had voluntarily wanted to take part had handed them back filled in. For focus groups, only participants (16–18 years) whose parents had given informed consent were selected. This consent document explains to the parents the activity that their sons and daughters are going to carry out, what use will be made of the information collected and the guarantees of anonymity that we offer.

Data Analysis

In accordance with the objectives outlined in this paper, we created different structural models that tested previously by confirmatory factor analyses. These analyses were carried out on: (i) the cyber victim subsample, and (ii) the cyber aggressor subsample. The resulting structural equation models were subjected to maximum likelihood estimation. To check their fit, we used the chi-squared statistic, the comparative fit index (CFI), the goodness-of-fit index (GFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the root mean residual (RMR). To check for overfit in the resulting models, we applied measures of parsimony fitting: the parsimonious normed fit index (PNFI) and the parsimony goodness-of-fit index (PGFI). We also estimated the standardized regression coefficients included in the models.

RESULTS

The Cyber Victim Subsample

The results yielded a cyber victim subsample of 328 participants (131 boys and 197 girls) who claimed to have been subjected to cyber or mobile phone aggression by their peers in the past 3 months. Those who identified themselves as both victims and aggressors were excluded from the study as playing roles that could be likened to that of the bully-victim or victim-aggressor, thus diverging from the objectives of the present work.

The confirmatory factor analysis of the dimensions that comprise the victims' perceptions of cyber aggression showed an adequate fit of the factorial solution: $\chi^2/df = 1.064$, $p < 0.01$; RMSEA = 0.043; RMR = 0.031; CFI = 0.968; TLI = 0.953; GFI = 0.952.

The correlation analysis showed positive direct influences of imbalance ($r = 0.31$, $p < 0.05$), intentionality ($r = 0.69$, $p < 0.001$), publicity ($r = 0.41$, $p < 0.01$), and revenge ($r = 0.27$, $p < 0.05$) on the cyberbullying variable, and a negative direct influence of social relationship ($r = -0.51$, $p < 0.01$) (**Table 2**).

The structural equation model that emerged from the analysis of the cyber victim data comprised seven standardized observable variables and one latent variable, cyberbullying (**Figure 1**). The calculated fitting indices showed the fit of the model to be correct: $\chi^2 = 19.425$; $\chi^2/df = 1.284$, $p = 0.136$; RMSEA = 0.033; RMR = 0.001; CFI = 0.976; TLI = 0.987; GFI = 0.981; NFI = 0.980.

The calculated parsimony fit indices allow us to affirm that the resulting model is not overfitted: PGFI = 0.56; PNFI = 0.64.

The standardized regression coefficients showed a positive predictive relationship of the cyberbullying variable with the variables intentionality ($\beta = 0.691$, $p < 0.001$), imbalance ($\beta = 0.248$, $p < 0.01$), and publicity ($\beta = 0.409$, $p < 0.01$), and a negative relationship with the social relationship variable ($\beta = -0.252$, $p < 0.01$). This last variable also and in turn predicts the publicity given to the cyber aggression ($\beta = 0.290$, $p < 0.05$).

It is important to note that the model also indicates that the victims associate cyberbullying with revenge ($\beta = 0.167$, $p < 0.05$), and that the influence of repetition on the cyberbullying variable is not direct but indirect through the intentionality variable ($\beta = 0.476$, $p < 0.05$). Finally, concerning the variable anonymity, the victims predict its existence through the imbalance of power ($\beta = 0.118$, $p < 0.05$), although they do not believe that anonymity is a predictor of cyberbullying.

The relationships between the variables in this model explain 53% of the variance of the cyberbullying variable.

TABLE 2 | Correlations between the variables that form the victims' perception of cyberbullying behavior.

	1	2	3	4	5	6	7	8
Intentionality								
Imbalance	0.44**							
Publicity	0.62***	0.21*						
Anonymity	0.29*	0.56***	−0.18					
Repetition	0.47**	0.09	0.75***	0.13				
Revenge	0.50**	0.26*	−0.03	−0.12	0.07			
Social Relationship	−0.53**	−0.21*	0.38**	−0.26*	0.29*	−0.32**		
Cyberbullying	0.69***	0.31*	0.41**	0.17	0.20	0.27*	−0.51**	

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

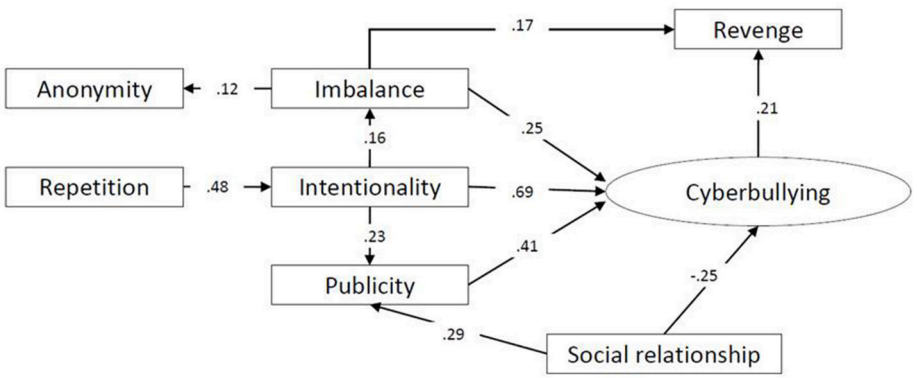

FIGURE 1 | Structural equation model of the cyber victim.

The Cyber Aggressor Subsample

The cyber aggressor subsample consisted of 380 participants (232 boys and 148 girls) who reported having carried out cyber or telephone abuse with the intent to harm some of their peers during the last 2 months.

The confirmatory factor analysis of the dimensions that comprise the aggressors' perceptions of cyber aggression showed a correct fit of the factorial solution: $\chi^2/df = 1.425$, $p < 0.01$; RMSEA = 0.039; RMR = 0.028; CFI = 0.975; TLI = 0.962; GFI = 0.971.

The correlation analysis showed the direct influence on the perception of cyberbullying of three variables, two of them positive – imbalance ($r = 0.45$, $p < 0.01$) and intentionality ($r = 0.27$, $p < 0.05$)—and one negative—social relationship ($r = -0.19$, $p < 0.05$). Based on these results and on the correlations found between the dimensions that configure the perception of cyber aggression, a structural equation model was constructed consisting of seven standardized observable variables and one latent variable, cyberbullying (**Figure 2**). The calculated fitting indices showed a correct fit of the model: $\chi^2 = 19.425$; $\chi^2/df = 1.521$, $p = 0.186$; RMSEA = 0.042; RMR = 0.018; CFI = 0.970; TLI = 0.977; GFI = 0.974; NFI = 0.969.

The calculated parsimony fit indices allow us to affirm that the resulting model is not overfitted: PGFI = 0.58; PNFI = 0.67.

The standardized regression coefficients reflected in this model indicate that there are two variables (anonymity and repetition) which predict the imbalance of power between aggressor and victim, and, in turn, this asymmetry of power strongly predicts the perception of cyberbullying ($\beta = 0.548$, $p < 0.01$). Also, a relationship of interdependence can be observed between the variables imbalance and intentionality, both predictive of cyberbullying. The social relationship variable, closely linked to publicity, is a negative predictor of cyberbullying ($\beta = -0.437$, $p < 0.01$). Finally, there stands out the link between revenge and social relationship ($\beta = 0.092$,$p < 0.05$).

DISCUSSION

In a technological society like today, in which 97% of adolescents between the ages of 12 and 18 use social networks to communicate, share information of all kinds, socialize, or simply have fun (Garmendia et al., 2011), new forms and codes of power emerge, new ways of managing emotional states, of making decisions about friendships, etc. In this scenario, in which what is virtual is occupying an increasingly prominent place and in which the rules of interaction that are prevalent in cyberspace are not always compatible with those established in the physical world, new forms of conflict and violence appear to be caused by the misinterpretation of those rules, or by deliberately ignoring them (Udris, 2014).

The results presented in this paper have revealed the web of interactions that adolescents establish between the criteria

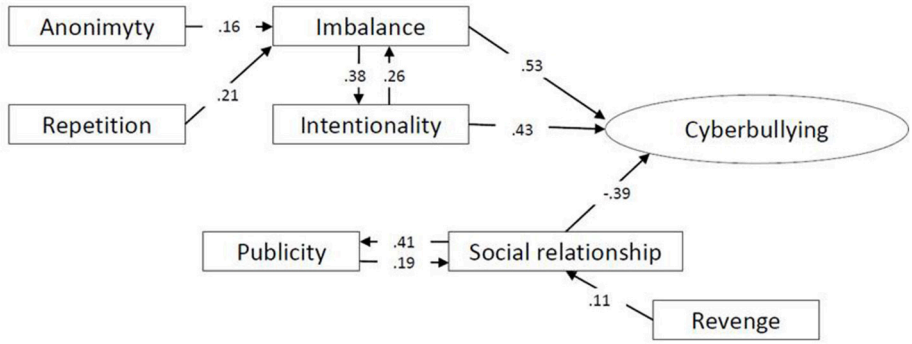

FIGURE 2 | Structural equation model of the cyber aggressor.

that configure their perceptions of cyberbullying. As against the five criteria (intentionality, imbalance, repetition, publicity, and anonymity) that many researchers set as key factors in identifying this phenomenon (Kowalski et al., 2012), the perceptual model of these Spanish adolescents showed that just three of these criteria have a direct influence on their definition of cyberbullying: intentionality, imbalance, and publicity.

Thus, in this model, repetition of the aggressive behavior is excluded from being a determinant factor, to become a factor that is secondarily associated with the publicity criterion. The little relevance that adolescents attach to the repetition of cyber abuse can be explained by the characteristics of the new means and forms of communication that prevail in cyberspace. Speed and the lack of control over the spread of the aggressive behavior once it has been posted to social networks or communicated by mobile phone may, as indicated by Mishna et al. (2010), result in reiterated harm to the victim even though the abuse as such only occurred once.

Another criterion that adolescents relegate to the background is anonymity. Despite the results of some other studies indicating that young people consider the hiding of the aggressor's identity to be predictive of cyberbullying (Hoff and Mitchell, 2009; Udris, 2014), the knowledge or reasonable suspicions that many victims and witnesses have of the authorship of the abuse would explain why this criterion is relativized and linked secondarily to the imbalance of power, understood this latter as skill with the use of technological resources to hide the aggressor's identity.

In addition to these five criteria and their interrelationships, Compton et al. (2014) indicated that, for some young people, fun or entertainment may be constitutive or predictive factors of cyberbullying. However, in the present study we found that adolescents legitimize some cyber aggression by alluding to the emergence of new forms of interaction and communication characteristic of their generation, and therefore do not classify these behaviors as being episodes of cyberbullying. The selective application of moral standards would explain how the same abuse can be interpreted at times as a way of having fun and at other times as being deliberate aggression. This controversial form of dual reasoning may be motivated either by the detection of low levels of ethical competence (Müller et al., 2014) or by an attempt to avoid feeling guilty or accepting certain responsibilities (Sticca and Perren, 2015). The negative relationship that the adolescents in this study established between the social relationship criterion and the cyberbullying construct is evidence for the existence of certain imbalances in their moral reasoning.

Finally, in the explanatory model of the perceptions of cyberbullying constructed from the results of this study there emerges a new factor: revenge. Although Crosslin and Golman (2014) suggested that American adolescents understand revenge to be a motive or reason for the appearance of cyberbullying, Spanish adolescents see revenge to be a justifiable reaction of the victims to cyberbullying experiences that they have suffered.

But undoubtedly one of the factors that has the greatest influence on the determination of the perceptions of cyberbullying is that of previous cyber aggression and cyber victimization experiences. This is evidenced in the present study by the major differences between the explanatory models of the aggressors' and the victims' perceptions of cyberbullying. Although both aggressors and victims coincide in pointing to imbalance and intentionality as predictors of cyberbullying, the aggressors emphasize imbalance whereas the victims emphasize intentionality. The aggressors' possible lack of awareness or inability to foresee the effects that their actions or offensive comments will have on their peers could lead to the aggression committed not being perceived as a moral transgression. As a result, they do not attribute the intention to harm to these acts (Talwar et al., 2014). It is also possible, as noted by Staude-Müller et al. (2012), that the adolescent has internalized and normalized abusive behavior as being seemingly harmless patterns of social relationships with their peers, and therefore they not only do not perceive any intention to harm, but they also establish a strong antagonistic link between social relationship and cyberbullying. For the victims, the allocation of less importance to the imbalance criterion may, according to Park et al. (2014), be because of the perception they have of the type of relationship between aggressor and victim, in which there is not always any confirmation of an asymmetry of power.

The aggressor and victim explanatory models of the perceptions of cyberbullying also differ in how the publicity

criterion is considered. The aggressors closely link this criterion to mechanisms of social interaction, whereas the victims conceive it to be predictive of cyberbullying. The repeated experience of the harm suffered as a result of the dissemination and publicity of the abuse that they have suffered may explain why victims include this criterion as a key factor in the determination of cyberbullying.

Other differences between aggressors and victims are found in their perception of the anonymity criterion. Cyber aggressors perceived anonymity to be an action that contributes to increasing the imbalance of power. The victims, however, believe anonymity to be an obvious result of that same imbalance of power. Only those who have an advanced mastery of ICT skills can effectively make themselves anonymous.

Regarding the differences concerning the repetition of aggressive behavior criterion, the cyber aggressors consider repetition of the abuse to be an explicit manifestation of ostentation of power. The search for social recognition and acceptance by their peers generates in these adolescents the need to continuously display their power, even if they have to resort to ethically reprehensible behavior. The victims, however, understand repetition to be a clear sign of the intention to cause harm. As noted by Menesini et al. (2012), if an abuse occurs repeatedly it cannot be understood to be a fortuitous harmless act, but as a deliberate action that seeks to harm others.

Finally, we detected important differences in the interpretation that aggressors and victims make of the revenge criterion. Those who carry out abuse against their peers conceived of revenge behavior as a mechanism of social interaction lacking any implied intention to harm. This would seem to show that the aggressors are less demanding in the moral evaluations of their behavior, and, as indicated by Talwar et al. (2014), they could be in a position of risking moral maladjustment, with an increased likelihood of interpreting aggressive and revengeful situations as fun or entertainment. On the contrary, the victims are convinced that being cyber-abused provokes a feeling of revenge that in part is related to a prior existence of an imbalance of power. From these results, and in accordance with König et al. (2010) and Runions (2013), for the victims, revenge or cyber revenge could represent a way of restoring the power balance and an increased sense of control and security. However, one must not forget that the feeling of revenge does not arise in a pure and isolated form, but is instead colored by other feelings and emotions that generate disproportionate reactions to the suffering that has been undergone.

CONCLUSIONS

The search for explanations of aggressive and cyber aggressive behavior of adolescents is a recurring theme in psychological research. Nevertheless, despite the effort that has been made and the diversity of approaches taken, many questions remain. The present study has aimed at making a foray into the attempt to understand the underlying structures and mechanisms that determine aggressors' and victims' perceptions of the cyberbullying phenomenon. This phenomenon, though relatively new, constitutes a serious public health problem that affects children, adolescents, and even adults. The consequences of these problems are not virtual, but really and directly affect the population either through symptoms that may be internal (anxiety, sadness, depression, fear, insomnia,…) or external (behavioral problems, hyperactivity, delinquency), or through the emergence of new psychological and somatic symptoms symptoms of uncertain etiology (Aboujaoude et al., 2015).

The results have shown that previous cyber victimization and cyber aggression experiences lead to major differences in the explanatory models that adolescents construct to interpret cyber abusive behavior either as cyberbullying episodes, or as social relationship mechanisms, or as a revenge reaction to aggression that has been suffered.

In this regard, we note that the aggressors' explanatory model is based primarily on two factors: imbalance of power over the victim, and intention to harm. There was also found to be a strong reciprocal relationship between the two factors, demonstrating the importance and interdependence of these criteria in the aggressors' perceptual structure. The asymmetry of power takes on greater prominence, however, when one takes into consideration that it functions as a link promoting indirect causal relationships of the anonymity and repetition factors with the cyberbullying construct.

The victims' perceptual structure is based around three criteria: imbalance of power, intentionality, and publicity. But, unlike the aggressors, the key factor in this structure is not the asymmetry of power, but the intention to harm. This factor, in addition to maintaining a strong causal relationship with cyberbullying, can explain the existence and relevance of other criteria such as the imbalance of power or publicity in these adolescents' perception of cyber abuse. Finally, its status as a key element is further confirmed by the indirect relationship that it mediates between repetition and cyberbullying.

Another of the divergences found in the possible explanatory models of the aggressors' and victims' perceptions lies in the interpretations they make of the social relationship factor. Those who have occasionally committed cyber abuse try to legitimize the aggressiveness in their patterns of social interaction by alluding to a previously experienced feeling of revenge. At other times, these violent forms of relating are interpreted as patterns of behavior that have become massively extended among the adolescent population, and have become accepted as a normalized and harmless way of communicating with other adolescents over the network and by means of other technological resources.

But when victims justify the violent facet of their cyber interactions and do not classify them as abusive situations, they usually resort to explanations related to the attribution of a more playful and fun character than they get in their face-to-face interactions. Nonetheless, they note that when these types of relationships become massively extended then they may indirectly be the cause of cyberbullying situations.

With these structures of direct and indirect interactions between observable and latent factors, one can construct

possible explanatory models that may help one understand the perceptions that aggressors and victims have of cyberbullying. It may then be possible to design more effective measures of prevention and intervention closely tailored to addressing directly the factors that are considered to be predictors of risk.

LIMITATIONS

One limitation of the present study lies in the composition of the sample. The cluster used allowed adolescents in both rural and urban areas, comprising diverse socio-cultural contexts, to be included. But it took account of neither the availability of technological resources nor the participants' level of ICT competence. It would be interesting to consider these variables in future research, especially if two groups, such as aggressors and victims, are compared. Greater technological competence on the part of one of the groups could lead to a reorientation of how some results are interpreted.

AUTHOR CONTRIBUTIONS

IF-A and IC-G are responsible for all tasks related to the design and development of the article, as well as the capture and analysis of the analyzed data.

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Cyberbullying Among Adolescent Bystanders: Role of Affective Versus Cognitive Empathy in Increasing Prosocial Cyberbystander Behavior

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The purpose of this study was to investigate if affective (vicarious sharing of emotions) and cognitive empathy (mental perspective taking) induction may stimulate adolescent online bystanders' intervention in cyberbullying cases. The role of reporting the abuse is crucial because it is a form of active support to the victim, initiated by children, to stop the bullying. The effectiveness of empathy activation in decreasing negative cyberbystander reinforcing behavior has been proved in previous studies. The effects of affective and cognitive empathy activation on positive cyberbystander behavior, defined as reporting the bullying online, were explored in two follow-up studies $N = 271$ and $N = 265$. The influence of experiencing cyberbullying as perpetrator, victim, and as determined by gender on prosocial cyberbystander behavior was also controlled. The results indicate that only cognitive empathy activation increases the likelihood of intervening bystander behavior. Neither affective empathy induction, previous experience of cyberperpetration, cybervictimization, nor gender affected the engagement in prosocial bystander behavior. The conclusion of the research is that a program consequently activating more reflective cognitive empathy induction can contribute toward the establishment of healthier behavioral patterns among bystanders to cyberbullying, increasing the probability of their reporting the cyberbullying acts.

Keywords: cyberbullying, cyberbystanders, adolescents, affective empathy induction, cognitive empathy induction, prosocial cyberbystander behavior

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INTRODUCTION

One of the most serious threats to individual and social well-being online is cyberbullying among adolescent internet users. It is an extremely damaging type of interpersonal violence present in schools throughout different countries (Kowalski et al., 2014; Zych et al., 2015; Smith et al., 2016; Wright et al., 2016). In most cases, cyberbullying is interconnected with school bullying and has an important negative impact on aggressive behavior at school and mental health outcomes (Beran and Li, 2007; Juvonen and Gross, 2008; Pyżalski, 2013; Fletcher et al., 2014). Cyberbullying engages a wide scope of groups and roles among pupils – victims, perpetrators and witnesses. Given this broad impact, it often becomes a problem for the entire school culture and often beyond – a social problem. Previous research has shown that cyberbullying can be more serious (as perceived by the victims) than traditional bullying, mainly due to the (often inevitable) wide publicity of online attacks (Smith et al., 2008; Sticca et al., 2013). It thus has the potential for an almost

unlimited audience. The challenge of escaping or controlling the harassment, focusing on exploring ways to increase helpful responses to online harm, seems a crucial task. Empathy plays a central role in human behavior (Hogan, 1969) also in the online context (Barlińska et al., 2013). Thus it seems essential in regulating the prosocial behaviors of bystanders to cyberbullying.

Cyberbullying

Nowadays cyberbullying has become a common occurrence and a substantial concern. The way the phenomenon is defined has an impact on prevention and intervention practice. One of the most commonly used definitions is "any behavior performed through electronic or digital media by individuals or groups that repeatedly communicates hostile or aggressive messages intended to inflict harm or discomfort on others" (Tokunaga, 2010; p. 278). Some researchers emphasize cyberbullying's similarity to traditional bullying (Olweus, 2012). Others highlight the need for a different understanding, questioning the adequacy of the classic criteria of peer violence as it relates to cyberbullying (Menesini et al., 2012; Palladino et al., 2017).

Peers, social status, and student–teacher relationships play a dominant role in the socialization of adolescence, both online and offline (Hinduja and Patchin, 2013; Longobardi et al., 2018). This highlights the importance of bystanders as a powerful social influence in creating positive anti-bullying behavioral models, with such responses as intervention in cyberbullying cases (Salmivalli et al., 1996; Menesini et al., 2003; DeSmet et al., 2012; Barlińska et al., 2013, 2015; Macháčková et al., 2013, 2015; Bastiaensens et al., 2014; Pfetsch, 2016). Research into cyberbullying has recently turned its attention to the role of cyberbystanders. It has been found that, across studies, prevalence rates of cyberbystanders vary just as in cases of cyberperpetration and cybervictimization, possibly due to different methodological approaches (e.g., formulation of questions, reference time frames or cut-off criteria), age ranges, or cultural differences (Cook et al., 2010). In total, prevalence rates for cyberbystanders range between 20 and 55% (Pfetsch, 2016); these are higher rates than for mean prevalence rates of around 15% for cyberbullies and cybervictims (Modecki et al., 2014). Such high scores justify the need for prevention programs focused on the role of bystanders. Encouraging cyberdefenders' tendency to report online bullying is crucial, as it is one of the most effective ways to support the victim(s) (O'Neill and McLaughlin, 2010; Livingstone et al., 2011).

In general, researchers differentiate several typologies of bystanders in both the offline and online contexts (Salmivalli et al., 1996; Olweus, 2001; DeSmet et al., 2012; Bastiaensens et al., 2014; Shultz et al., 2014). While there are some differences, what is underlined in each model is the importance of prosocial bystander behavior as an effective solution to bullying. The data prove that the picture of cyberbystanders' reactions is more complex than in traditional bullying, mainly due to the specifics of computer-mediated communication (DeSmet et al., 2012, 2016; Barlińska et al., 2013, 2015; Macháčková et al., 2013, 2015; Bastiaensens et al., 2014; Obermaier et al., 2014; Pfetsch, 2016). Given the reduced social and contextual cues available (Kiesler et al., 1984), chances of prosocial reactions to the cyberbullying acts are lessened.

In terms of modifying cyberbystanders' participation in online bullying, the few studies in this area have demonstrated the importance of emphasizing a triadic approach and focusing on group processes, as a means of fully understanding and effectively moderating the phenomenon of cyberbullying (Barlińska et al., 2013, 2015; Macháčková et al., 2015; Pfetsch, 2016).

A number of intervention programs designed to tackle cyberbullying have already been developed (i.e., Menesini et al., 2012; Williford et al., 2013). Some even exclusively target cyberbullying (e.g., Ortega-Ruiz et al., 2012; Schultze-Krumbholz et al., 2016), and some include bystander or peer support elements, as have proved effective in reducing victimization from cyberbullying on the global level (Salmivalli et al., 2011; Menesini et al., 2012; Palladino et al., 2012). Nevertheless, one area that remains largely unknown involves which specific factors can encourage bystanders' intervention in cyberbullying. Studies on cyberbystanders showed that, as in offline bullying, most bystanders witnessed passively and took no action (Salmivalli, 2010; Dillon and Bushman, 2015; Song and Oh, 2018). These data legitimate the need for exploring how to effectively increase bystander intervention in cyberbullying – both in terms of effective factors and establishing a successful ethos of activating such factors.

In the current investigation, targeting positive bystander behavior (understood as reporting the harassing act) was chosen as a viable approach to reduce cyberbullying. One of the most natural factors reducing various forms of aggression and having the potential to influence cyberbystanders' prosocial reactions is empathy.

Empathy: The Affective and Cognitive Aspects

Empathy is described as an affective response that is more appropriate to the situation of the other person than to one's own (De Vignemont and Singer, 2006). This is a complex and multidimensional phenomenon that includes, on the one hand, the ability to notice, feel, and automatically respond to other people and, on the other, to understand their emotional states (Batson, 1991; Hoffman, 2000). Empathy has been often associated with prosocial behavior as the crucial condition of sharing and understanding the emotional and mental states of others (Eisenberg and Strayer, 1987). The term empathy is used to refer to two related, yet different human abilities: mental perspective taking (cognitive empathy) and the vicarious sharing of emotion (affective empathy) (Batson, 1991; Davis, 1996; Hoffman, 2000).

Affective empathy reflects the innate, automatic capacity to respond with arousal to the signs of discomfort or other affective states of the other. It is initiated through direct contact, which ensures access to species-universal information that activates affective empathy mechanisms (Preston and De Waal, 2002). The empathic arousal mechanisms, which appear at an early stage of human development, are the circular reaction and motor imitation. At a later stage, responses to another person's

circumstances become increasingly governed by cognitive factors based on learning mechanisms. This is how cognitive empathy develops (Hoffman, 2008).

Cognitive empathy, defined as the ability to understand the beliefs, feelings and intentions of the other (Decety and Jackson, 2004; Decety, 2007) involves more complex cognitive processes and empathy triggering mechanisms (Hoffman, 2000). Through classical conditioning and association, other people's perceived emotions can be related to our own past experiences. Due to language-mediated association, empathic arousal becomes independent from the present or past contact with another person. The most advanced mechanisms, i.e., understanding various roles and perspective taking, allow us to anticipate the consequences of our actions for other people. Contrary to genetically determined affective empathy (Matthews et al., 1981; Rushton et al., 1986; Zahn-Waxler et al., 1992), cognitive empathy is driven primarily by environmental factors, such as parental or school influence (Baron-Cohen, 2011). Modeling, inducing, and perspective-taking are often mentioned as parenting techniques facilitating the development of cognitive empathy (Hoffman, 2000). They are also basic techniques implemented in school programs.

The most frequently mentioned aspects of empathy are its social significance and benefits associated with morality, altruism, fairness, prosocial and helping behavior, and cooperativeness (Eisenberg and Miller, 1987; Batson and Shaw, 1991; Eisenberg and Morris, 2001; Hoffman, 2008). Empathy is indicated as one of the mechanisms of prosocial behavior or altruism (i.e., empathy–altruism hypothesis; Batson et al., 1987; Batson, 1991, 2011; Hoffman, 2000, 2008; Szuster, 2016).

Empathy activation strategies have been included in intervention programs (Chandler, 1973; Chalmers and Townsend, 1990), where they have proved effective in promoting prosocial bystander behaviors and reducing both offline and online bullying in schools (Salmivalli et al., 2011).

Empathy is also correlated positively with emotion regulation and emotional behavior (Eisenberg, 2000), and negatively with negative emotions frequency (Davis et al., 1996). It is also connected with a sense of guilt, which in turn can stimulate prosocial behavior (Hoffman, 2008). This kind of activation may be found to effectively increase prosocial behavior also in cyberspace.

Less is known about which kind of empathy (affective or cognitive) is more effective in inducing helping behavior. Although numerous studies confirm the connection between both types of empathy and help offering (Davis, 1996; Eisenberg, 2000; Batson, 2011; Bloom, 2016), the nature of such help is different depending on whether it is motivated by affective or cognitive empathy. Since the beginning of scientific interest in the phenomenon, cognitive empathy was found to be the underpinning of long-term cooperation (Smith, 1759/1976). Contemporary research findings show links between cognitive empathy and anticipation of long-term consequences of help-giving (Batson and Ahmad, 2001), limiting victim blaming (Lerner, 1977), as well as modifying the established stereotypes related to potential help benefactors (Batson and Ahmad, 2009). On the other hand, affective empathy inducing universal mechanisms not only provides a buffer against aggression, but is also the first and foremost mechanism generating helping behaviors (Piliavin et al., 1982). This profound effect of affective empathy, manifested in the form of numerous donations for people in need whose images are created through media, can easily be observed in hundreds of social campaigns (Bloom, 2016).

Experimental evidence confirming the relation between empathy and altruism (Batson, 1991) indicates that cognitive empathy (corresponding with empathic care and focused on understanding the emotional states of others) is conducive to help-offering, irrespective of situational factors (such as mood or how easily helping may be avoided), whereas help yielded by affective empathy (corresponding with emphatic anger) is of a conditional character. It is generated when there is no other way to reduce the discomfort caused by the suffering of another person.

This consistent concept indicating a regulatory role of empathy in social functioning remains the subject of diverse discussions (Bloom, 2016; Jordan et al., 2016). Illustrative of these differences is the contrast between feeling what you believe others feel (often described as empathy) and caring about the welfare of others (often described as compassion or concern). Research which explored the relationship between the Empathy Index and measures of concern and cooperative, altruistic behavior revealed that empathy and concern consistently load on different factors (Jordan et al., 2016). Furthermore, it showed that empathy and concern motivate different behaviors: concern for others is a uniquely positive predictor of prosocial action, whereas empathy is either not predictive or negatively predictive of prosocial actions. This limits a monolithic, mostly positive character of regulatory effects commonly identified with empathy and provokes a more selective way of thinking about the very nature of the phenomenon. Nevertheless, the fundamental question: what is the empathy constituting factor – still remains valid, as the mechanism operates on various levels and is dependent upon a special brain circuit that consists of as many as 12 cerebral centers (Stone et al., 1998; Lamm et al., 2007; Shamy-Tsoory et al., 2009).

The above data give rise to a question regarding the role of the two types of empathy in regulating the prosocial behaviors of bystanders to cyberbullying.

Empathy and Cyberbystanders

The regulatory role of empathy in bystanders' reactions to cyberbullying has been demonstrated by the results of various studies (Barlińska et al., 2013, 2015; Pfetsch and Ittel, 2014; Macháčková et al., 2015; Pfetsch, 2017). Empathy has consistently been found to predict defending victims of both traditional bullying (Nickerson et al., 2008) and cyberbullying (Macaula and Boulton, 2017). Data focused on cyberbystanding point to empathy as one possible protective factor against negative online behavior (as a cyberbully or passive cyberbystander) (Barlińska et al., 2013, 2015; DeSmet et al., 2016), and also as one that increases the probability of prosocial online behavior (supporting the victim) (Pfetsch and Ittel, 2014; Macháčková et al., 2015; Macaula and Boulton, 2017). Several studies show that persons with higher dispositional empathy may be more

likely to intervene in a prosocial manner (Freis and Gurung, 2013; Macháčková et al., 2013; Macaula and Boulton, 2017).

Additionally, researchers show that activation of empathic reactions appears to be dependent upon situational factors related to cyberbullying incidents such as specific technological settings, friend vs. acquaintance of the cybervictim, the bully's popularity, clear vs. unclear circumstances, perceived fairness of the behavior of involved parties, directness or proximity of the cyberbystander to the cybervictim, severity of the act, receiving a request for help from the victim or not, etc. (DeSmet et al., 2014; Macháčková et al., 2015, 2016; Palladino et al., 2017). This justifies the growing need to explore the effectiveness of situational empathy induction as a factor potentially increasing cyberbystander interventions. Such findings may provide a basis for launching school and evidence-based anti-cyberbullying education projects.

In our previous studies on empathy activation with respect to cyberbystander behavior (Barlińska et al., 2013, 2015; Szuster et al., 2016), the effectiveness of empathy in decreasing cyberbystander reinforcing behavior has been proved. However, to date only the potential to diminish the scale of cyberbullying via empathy activation using this method has been applied; thus, further exploration is needed.

The Role of Cyberperpetration and Cybervictimization Experience

Substantial evidence clearly points to various links between offline and online bullying roles in terms of: cyberperpetration as a predictor of traditional school bullying (Raskauskas and Stoltz, 2007; Ybarra and Mitchell, 2007; Juvonen and Gross, 2008; Dehue et al., 2012; Sticca et al., 2013); traditional school bullying perpetration experience as a cyberperpetration predictor (Ybarra et al., 2007; Dehue et al., 2008; Erdur-Baker, 2010; Twyman et al., 2010); and links between the roles (the bully–victim status) (Ybarra and Mitchell, 2004; Walrave and Heirman, 2011; Dehue et al., 2012). The role overlap between cyberbystanders, cyberbullies, and cybervictims offers evidence that roles in cyberbullying acts are not mutually exclusive (Pfetsch and Ittel, 2014).

The limited research that relates to predicting cyberbystander behavior from previous experience of cybervictimization and cyberperpetration presents important findings. Being a cyberbully has proved to be an important predictor of reinforcing cyberbystander behavior (Fawzi and Goodwin, 2011; Barlińska et al., 2013, 2015; Szuster et al., 2016). On the other hand, helping the victim was predicted by victimization in both traditional bullying and cyberbullying (Fawzi and Goodwin, 2011), though some studies (Barlińska et al., 2013, 2015) showed no impact.

The relationship between cyberperpetration and cybervictimization experience and cyberbystanders' intervening behavior has also been verified in the present study.

Cyberbystander Behavior and Gender

Gender is a variable traditionally present in the exploration of aggressive behavior both in face-to-face and online contexts.

Previous research on gender differences regarding cyberbullying incidents has provided inconclusive findings. On the one hand, two meta-analyses (Cook et al., 2010; Barlett and Coyne, 2014) showed a significantly higher involvement of boys in cyberperpetration; further, girls more often than boys fall victim to cyberviolence. However, these differences were found to be rather negligible. On the other hand, other studies have found that girls are more likely than boys to be cyberbullies (Pornari and Wood, 2010), especially in more indirect forms of online aggression, such as rumor-spreading through Internet blogs and circulation of photos/videos. Alternatively, a systematic narrative review conducted by Tokunaga (2010) revealed that most of the studies showed no gender differences with respect to cyberperpetration or cybervictimization rates.

In many aspects gender differences in cyberbystander reactions remain even more equivocal. In some studies females were found to offer greater support and assistance than males when witnessing cyberbullying, and were more often nominated as peer helpers (Rigby and Slee, 1991; Menesini et al., 1997, 2003; Oh and Hazler, 2009; Bastiaensens et al., 2014; Quirk and Campbell, 2014); in other research no gender differences were found in both positive and negative bystander reactions to cyberbullying (Li, 2006; Fawzi and Goodwin, 2011; Barlińska et al., 2013, 2015; Macháčková et al., 2013; Szuster et al., 2016).

The relationship between gender and the cyberbystanders' intervening behavior has also been controlled in the present study.

Current Research

The role of reporting cyberabuse is crucial, for two reasons. First, it is a form of active support to the victim initiated by children to stop the bullying (Pfetsch, 2016; Smith, 2016). Second, it is the only form of support with the potential of activating an intergenerational and multi-shareholder reaction to bullying (Livingstone et al., 2011).

The main objective of the current research was to explore the effectiveness of affective and cognitive empathy activation in stimulating adolescents' intervention in cyberbullying cases. The effectiveness of empathy activation in decreasing negative cyberbystander reinforcing behavior has been proved in our previous studies (Barlińska et al., 2013, 2015; Szuster et al., 2016). This induction, tested on Polish junior high school students (N = 2411), was found to significantly and repeatedly reduce the reinforcing cyberbullying response. In the current follow-up series of two studies, a verification was conducted to determine whether empathy inductions may be a viable option for stimulating cyberbystanders to react prosocially and report cyberbullying abuse.

Two other factors which have proved to modify adolescent reactions toward cyberbullying were also included – cyberperpetration and cybervictimization experience and gender. Previous viewing of the material used to activate empathy was also controlled for.

It was expected that activation of both affective and cognitive empathy would increase frequency of behaviors aimed at helping cyberbullying victims. Affective and cognitive empathy were activated in two separate experimental studies. It was anticipated

that higher odds would be found of choosing prosocial cyberbystander behavior understood as active reporting of online bullying in the experimental groups (where empathy was inducted), compared to control groups (without any induction). The influence of experience of cyberbullying as perpetrator, victim, and the role of gender on positive bystander behavior was also controlled.

STUDY 1

As argued before, affective empathy preceding a cyberbullying act may increase the probability of cyberbystander helpful reactions throughout automatic activation of emphatic arousal. Study 1 was designed to test whether affective empathy activation is associated with a higher likelihood of cyberbystander intervening behavior. Activation of affective empathy preceding a potential cyberbullying act may increase the probability of cyberbystander helpful responses through automatic activation of emphatic arousal. We decided to test whether affective empathy activation is associated with a higher likelihood of cyberbystander intervening behavior.

Method

This experimental study was conducted using a web application that simulated a social networking site and a messaging service. The study was approved by the ethics committee of the faculty of Psychology of the University of Warsaw.

Participants

Participants were junior high school students (N = 271, comprising 121 boys and 151 girls) from 10 public junior high schools located in an average socioeconomic status neighborhood in three Polish districts. All students were between the ages of 11 and 17 years (M_{age} = 13.05 years, SD_{age} = 0.80). The selection for the sample was purposeful and was carried out in cooperation with the Polish Saferinternet awernode[1], who sent invitations for participation in the study to schools reporting problems with cyberbullying. Assignment to the experimental or control conditions was done by drawing halves of the classes.

Procedure

The study was anonymous and conducted in groups and on school premises; written informed consent was obtained from the headmaster, parents, and pupils. Students were randomly assigned to control and experimental groups. Each participant logged in using a unique, one-time password that provided access to study material. The research took place at the school during computer classes. The full study was preceded by a technical pilot with the participation of teachers on computers in IT laboratories where the research was carried out. The duration of the procedure was about 20 min. Students who did not take part in the study were offered an alternative educational activity.

[1]http://www.saferinternet.pl/about-us.html

The first task was different for the experimental vs. control group. In the experimental group participants watched a 2-min film (the story of a victim of cyberbullying), while the control group viewed no exposition. Then, the participants in all groups received the second task, "Message from a friend". After reading the message, they were asked to choose how to act: report vs. send (see **Table 1**). Next, they completed a questionnaire of the experience of cyberbullying victimization and perpetration. Finally, questions on age, province of the school, and gender were asked. At the end of the study, students, teachers, and parents were provided with general feedback.

Measures

"Film"

To activate affective empathy, a 2-min video recording was used presenting a case of cyberbullying, the victim's feelings, and the effects on her behavior. It told the story of a young girl who became a victim of cyberbullying by being filmed by a school colleague while she was dressing for physical education in a locker-room. The video was posted on the web and gradually gained popularity; as a result, she became a figure of derision. She experienced strong negative feelings and emotions such as shame, humiliation, ridicule and fear. This situation also had an impact on behavioral expressions: isolation from contemporaries, staying at home, and school absenteeism. The film showed the course of events and consequences by presenting the cyberbullying victim's behavior. It also included a statement expressing the girl's feelings and experiences. The procedure and its effectiveness in empathy activation[2] has been validated and applied in several similar studies (Barlińska et al., 2013, 2015; Szuster et al., 2016). As the film is already implemented in an anti-cyberbullying school program, we additionally asked participants whether they had seen the film before (for later use as a control variable in the model).

"Message From a Friend"

To simulate social youth interactions in cyberbullying situations, a special application called "Message from a friend" was used. At the beginning of this simulated peer interaction, pupils are having a short chat with a virtual friend who, at the end of the chat, sends a message insulting a different pupil (a photomontage presenting a dog with a boy's head) with the

[2]The effectiveness of the empathy manipulation procedure was previously established in a pilot study using a Polish adaptation of the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988; Barlińska et al., 2013).

TABLE 1 | Study design I – conditions and indicators.

Study conditions	Behavior of a cyberbystander	
	Cyberbullying intervening behavior	Cyberbullying reinforcing behavior
Activation of affective empathy (specific for a given situation)	Report the abuse	Send
Control group		

following comment: "Hi, this is my classmate, he looks like a total fool." The situation was inspired by cases reported to the Polish helpline.org.pl website (part of the Safer Internet project that provides support to the victims of Internet threats). The participants could choose between sending the insulting message forward (cyberbullying reinforcing behavior) or reporting it (positive intervening behavior).

Cyberbullying Questionnaire

A questionnaire about cyberbullying experience (Barlinìska and Wojtasik, 2008) was employed. The questionnaire consists of two parts, each containing 10 questions related to the experience from the perpetrator's perspective (e.g., "Have you ever posted or sent material that was false or embarrassed someone?") and that of the victim (e.g., "Has anyone ever posted false or embarrassing materials about you?"). Answers are indicated on a 4-point Likert-type scale (1 – never, 4 – several times). Both scales (M_{victim} = 0.40, SD = 0.52, and $M_{\text{perpetrator}}$ = 0.38 SD = 0.52) proved to be internally consistent, α = 0.73 and α = 0.77, respectively. The composite scores were used in further analyses.

Plan of Analysis

All analysis were conducted using SPSS 25. The logistic regression model was chosen due to having a dichotomous dependent measure and several continuous and binary predictors. It is reported following Peng, Lee, Ingersoll guidelines (Peng et al., 2002). Analysis was conducted to evaluate whether the activation of affective empathy rose to the likelihood of intervening cyberbystander behavior. Additionally, it was considered whether, as in prior research findings (Barlińska et al., 2013, 2015; Szuster et al., 2016), the experiences of cyberperpetration influenced the frequency of choosing helping behavior. The impact of gender and cybervictimization on cyberbystander behavior, which was not significant in previous studies (Barlińska et al., 2013, 2015; Szuster et al., 2016) was controlled. Additionally, previous viewing of the material was controlled.

Results

To assess the impact of affective empathy on cyberbystander intervening behavior, we conducted a logistic regression analysis (**Table 2**). The analysis showed that the model was not significant. There were no missing values and all analyses were conducted on the full sample. All the overall model statistics turned out to be suboptimal. Neither manipulation of affective empathy nor any of the controls (cyberbullying history, age, or gender) turned out to be significant in predicting helping bystander behavior.

TABLE 2 | The results of the logistic regression analysis for activation of affective empathy, cyberperpetration, cybervictimization, gender, and previous viewing of the film on intervening cyberbystander behavior.

Predictor	*B*	*SE B*	Wald's χ^2	OR [CI95%]
Control film (0 – didn't see)	−0.29	0.41	0.50	0.75 [0.33–1.67]
Gender (0 – boys)	0.10	0.26	0.14	1.10 [0.66–1.84]
Cyberperpetration	0.09	0.31	0.07	1.09 [0.59–2.01]
Cybervictimization	−0.34	0.31	1.22	0.71 [0.38–1.30]
Affective empathy (0 – no empathy)	0.39	0.26	2.20	1.47 [0.88–2.46]
Overall model			χ^2	
Likelihood ratio test			2.38	
Score test			3.83	
HandL			3.33	

Cox and Snell R^2 = 0.01; Nagelkerke R^2 = 0.02.

Discussion

The results of the current study indicated that affective empathy activation did not increase cyberbystander intervening behavior. In contrast, previous studies using this method (Barlińska et al., 2013, 2015; Szuster et al., 2016) revealed its potential in limiting cyberbystander reinforcing bullying behavior. The results suggested that gender does not affect cyberbystanders' behavior, which is consistent with some of the results of other research (Li, 2006; Fawzi and Goodwin, 2011; Macháčková et al., 2013; Barlińska et al., 2013, 2015; Szuster et al., 2016). The results on lack of impact of cybervictimization on cyberbystander behavior are in line with some results on pro-bullying reactions (Barlińska et al., 2013, 2015; Szuster et al., 2016), but differ from some studies focused on tendencies to help the victim (Fawzi and Goodwin, 2011). These differences may be due to methodological differences in the measurement of cyberbystander behavior (i.e., self-reports of experiences vs. experimental manipulation); they therefore need further exploration.

The obtained results show that the regulatory role of empathy in increasing intervention in cyberbullying may be more complex than in cases of inhibiting negative and antisocial cyberbystander behaviors. For the first, the specifics of cyberspace generate limitations. Affective empathy stimulation may be more difficult in this context where, in comparison to face to face contact, emotional signals are largely unavailable (Kiesler et al., 1984). Direct contact has been demonstrated to be an important condition of the automatic nature of affective empathy activation mechanisms, whereas cognitive empathy is free from such constraints (Hoffman, 2000).

Secondly, assessing the status of affective empathy in the context of cyberbullying intervention programs is not simple. An evaluation study of a German program, "Media Heroes" (Schultze-Krumbholz et al., 2016), revealed significant effects on affective empathy only in the case of a longer intervention. The short intervention, as in the current study, did not have any effects on cyberbullying rates. This result confirms that the conditional nature of involvement in cyberbullying and its dependency upon situational factors tends to be related especially to affective empathy and cyberbystander behavior (Pfetsch, 2016). The large audience on the Internet, combined with the distance between actors, can have implications for cyberbystanders' reactions. This is especially applicable to conditions of activation of affective empathy (Latané and Darley, 1970), leading to online passivity in intervening behavior (Macháčková et al., 2015; Song and Oh, 2018). It may be that situational activation of affective empathic responses may be not sufficient to increase the probability of prosocial online behavior (i.e., cyberbystander intervention). This would imply a greater effectiveness of

cognitive empathy as a mechanism for increasing the adolescent's prosocial online behavior.

STUDY 2

The effectiveness of cognitive empathy activation in increasing the likelihood of cyberbystander intervening behavior was tested in this second study.

Method

The same web application as in Study 1 was used. Independent variables were the activation of cognitive empathy, experience as a cyberbully, experience as a cyberbullying victim and gender. Some additional controls were introduced: the number of attempts in giving correct answers in the experimental task and previous viewing of the film. The dependent variable was a cyberbystander's choice between intervention in cyberbullying cases (reporting the bullying act) and reinforcing cyberbullying behavior (sharing it with peers). The study was approved by the ethics committee of the faculty of Psychology of the University of Warsaw.

Participants

Participants were junior high school students (N = 265, comprising 168 girls and 96 boys) of nine public junior high schools located in an average socioeconomic status neighborhood in three Polish districts. All students were between the ages of 10 and 16 (M_{age} = 14.14 years, SD_{age} = 1.65). Selection of the participant group and assignment to the experimental or control conditions was the same as in Study 1.

Procedure

The study followed a between-participants design. The place of the investigation, procedure, feedback and consent rules were similar to those in Study 1. First, pupils were randomly assigned to experimental (empathy activation) or control (neutral activation) conditions. Next, the "Message from a friend" task, with the selection of type of behavior, was conducted. Finally, the experience of cyberbullying questionnaire was administered.

Measures

As mentioned, the same two measures were employed as in Study 1: the application "Message from a friend" and the 10-item questionnaire of cyberbullying experience. Both instruments proved to be reliable: M_{victim} = 0.40, SD = 0.48, α = 0.61, and $M_{perpetrator}$ = 0.42, SD = 0.58, α = 0.78.

"Empathy Activating Task"

The opening task in the second study was the cognitive empathy manipulation. Its effectiveness was previously established (Barlińska et al., 2013, 2015). The same video showing a case of cyberbullying was used as the basis for the "empathy activating task". The main modification, intended to activate the process of cognitive empathy, was asking the experimental participants to select, from a list of possible emotions, which feelings the victim conveyed in the recording. Specifically, before viewing the film, the students were told to concentrate on how the victim might feel and try to identify with the situation depicted, focusing on those aspects that reflected her emotions. Afterwards, the participants checked off from a multiple-choice list those emotions that appeared in the video. The list comprised both adequate emotion labels (demonstrated or stated by the actress in the movie) and inadequate (not present in the film). Selecting the wrong set of answers was followed by an instruction, "Please try again to select the correct answers". Three trials were available. The number of trials was a controlled variable operationalizing repetitiveness (perceived as an important condition of effectiveness of cognitive empathy induction). The set of correct and incorrect answers is based on the results of a pilot study on 80 junior high school students – the five most commonly cited characteristics of feelings were used for the correct answers set, and two randomly selected were used for the incorrect set. These are presented in **Table 3**.

TABLE 3 | Correct and incorrect answers in the cognitive empathy activation condition.

Correct	Incorrect
Fear	Satisfaction
Anger	nothing special
Injustice	
Shame	
Harm	

In the control condition, the task was to answer the question, "Where is the action movie set?" focusing on the elements of the background and selecting scenes that appeared in the video from a longer list presented in **Table 4**.

For control purposes, in both conditions the number of trials was recorded and used in the analysis.

Plan of Analysis

As in the first study logistic regression analysis was performed with SPSS 25. The analysis was conducted to evaluate whether activating cognitive empathy would increase the likelihood of intervening cyberbystander behavior. The impact of gender, cyberperpetration and cybervictimization on cyberbystander behavior was analyzed. Additionally, the number of attempts in giving correct answers and previous viewing of the film was controlled.

Results

We conducted logistic regression analysis to determine the impact of cognitive empathy activation on bystander helping

TABLE 4 | Correct and incorrect answers in the control condition.

Correct	Incorrect
In the girl's room	On the street
On the computer screen	In church
On the mobile phone screen	
In the gym	
In the school locker room	

behavior. There were no missing values and all analyses were conducted on the full sample. The analysis showed that the model fit the data well and was significant. Overall statistics were significant; further, pseudo R squares, indicating the amount of explained variance, were substantial (**Table 5**).

Similar to Study 1, gender and prior cyberperpetration and cybervictimization were found to be insignificant. Two of the controls were found to be significant. First, those participants who had previously seen the film chose to intervene seven and one-half times more often than those who had not seen the movie. Similarly, the group of participants who did not remember if they had seen the movie still chose the intervening cyberbystander behavior almost three times more often those who viewed it for the first time. Second, the number of trials also proved to be significant. The effect shows that, with every single attempt, the probability of choosing helpful behavior increased almost twofold.

Our main result shows that cognitive empathy activation has a significant and substantial effect on increasing the tendency to report the abuse. Participants in the experimental condition, in which cognitive empathy was activated, were six and one half times more likely to choose a helping reaction than participants in the control condition. It is worth mentioning that this effect was independent of all other controls.

Discussion

Active taking of the perspective of a cyberbullying victim proved to significantly increase the probability of reporting abuse by bystanders to cyberbullying. The results of this study confirm previous findings indicating that cognitive empathy is a significant factor related to both offline (Hoffman, 2000; Nickerson et al., 2008; Caravita et al., 2009) and online helping behavior (Macháčková et al., 2013; Schultze-Krumbholz et al., 2016). Other effects obtained in the first study have been replicated: gender, cybervictimization, cyberperpetration did not increase the intervening cyberbystander behavior.

Independent, significant effects of previous viewing of the film and the number of attempts giving correct answers significantly increased the probability of reporting cyberbullying by bystanders. These results are in line with data showing that longer and repetitive forms of intervention intensify reflective information processing and, consequently, increase its effectiveness (Hoffman, 2000; Schultze-Krumbholz et al., 2016). They also confirm the effectiveness of strategies focusing the cyberbystander on the victim's perspective (Macháčková et al., 2016). Additionally, the effect of number of trials is most probably an outcome of deeper processing of the manipulation material, thereby enforcing the impact of the manipulation. Yet, the independent nature of the effects of empathy activation and the number of trials justify an interpretation in terms of additive influences of cognitive empathy and reflectiveness, with the latter being the result of longer concentration on content related to emotional consequences of cybervictimization. A good explanation for this phenomenon is found in social learning theory (Bandura, 1973); this model is consistent with the need for a repetitive and longer form of empathy training to effectively reduce cyberbullying behavior.

These considerations suggest a deeper understanding of the other person's situation can encourage prosocial online behavior such as reporting cyberbullying acts.

GENERAL DISCUSSION

Cyberbullying, with its own specific features, requires different modes of effective intervention than those that apply to face-to-face bullying (Ttofi and Farrington, 2011; Ang, 2015; Nocentini et al., 2015). It is of paramount importance to identify factors that not only reduce cyberbullying acts but, first and foremost, lead to intensify proactive behavior (i.e., reporting the negative behaviors). The present research focused on cyberbystander behavior which was the effect of the decision: what to do with online content that is

TABLE 5 | The results of the logistic regression analysis for activation of cognitive empathy, cyberperpetration, cybervictimization, gender, previous viewing the film, and number of trails on intervening cyberbystander behavior.

Predictor	*B*	*SE B*	Wald's χ^2	OR [CI95%]
Gender (0 – boys)	0.06	0.31	0.04	1.06 [0.57–1.96]
Control film – yes (0 – didn't see)	2.02	0.49	16.97***	7.54 [2.88–19.73]
Control film – don't remember (0 – didn't see)	1.00	0.35	8.27**	2.72 [1.37–5.39]
No of trials	0.54	0.13	16.89***	1.71 [1.37–5.39]
Cyberperpetration	−0.03	0.28	0.01	0.97 [0.56–1.67]
Cybervictimization	−0.33	0.35	0.89	0.76 [0.36–1.43]
Condition (0 – no empathy)	1.86	0.35	28.46***	6.41 [3.24–12.67]
Overall model			χ^2	
Likelihood ratio test			50,27***	
Score test			54,31***	
HandL			8,85	

*$p < 0.05$, **$p < 0.01$,***$p < 0.001$.
Step 1: Cox and Snell $R^2 = 0.19$; Nagelkerke $R^2 = 0.25$.

harmful to a peer? Reporting such abuse in a situation where one's psychological well-being and fundamental norms are being violated may be viewed as civil courage (Livingstone et al., 2011). Relevant research clearly states what kind of dispositional correlates are connected to prosocial online behavior: well developed social skills, low levels of moral disengagement, high social self-efficacy and high levels of both affective and cognitive empathy (Gini et al., 2007, 2008; Nickerson et al., 2008; Menesini et al., 2012). Cognitive empathy is one of these individual dispositions that could be effectively trained. Results of research on empathy development emphasize the significance of both parental and school impact. Manifestation of sorrow or joy in reaction to child's behaviors and, first and foremost, directing a child's attention to the impact of his/her behaviors upon others reinforces emphatic response mechanisms (Hoffman, 2000).

In the present study, focused on raising the chances for bystander intervention in cases of cyberbullying, only cognitive empathy activation proved to be effective. The limitations of affective empathy induction on prosocial bystander behavior also have been revealed. The obtained results confirm that cognitive empathy is one of those determinants which can be effectively activated, even in the form of a brief intervention, stimulating cyberbystander intervening reactions to cyberbullying. Also, higher effectiveness of repetitive induction has been confirmed. Our results are coherent and consistent with others concerning: (a) the role of perspective taking (Batson, 1991, 2011; Eisenberg, 2000; Hoffman, 2000); (b) the relationship of cognitive empathy to cyberbullying (Steffgen et al., 2011; Pfetsch and Ittel, 2014) and, especially, (c) the association of cognitive empathy and cyberbystander responses (Barlińska et al., 2013, 2015; Freis and Gurung, 2013; Macháčková et al., 2013). They also support current knowledge on the importance of situational factors in determining whether a person intervenes in a cyberbullying incident (DeSmet et al., 2016; Macháčková et al., 2016; Pfetsch, 2016). In particular, they highlight the role of situational cognitive empathy priming, as may increase availability (and thus awareness) of the other person's perspective (De Vignemont, 2006).

Several conclusions follow the results of this study. First, the findings show the complexity of the relationship between activated empathy and prosocial and antisocial behavior. Contrary to the results of previous research on the effectiveness of both affective and cognitive empathy in limiting pro-bullying cyberbystander behavior (Barlińska et al., 2013), only cognitive empathy induction was found to significantly increase helping cyberbystander behavior. These results are consistent with some scarce data (e.g., Krueger et al., 2001) suggesting that altruism and antisocial behavior are uncorrelated tendencies stemming from different sources. That is, activating prosocial (reporting the abuse) and reinforcing (sending on) cyberbystander behavior are not simply mirror effects. Rather, based on our findings, the circumstances leading to their activation may be distinct. Further, considering the obtained results in context of the phenomenon of empathy appears particularly worthy, as they corroborate its complex and multidimensional nature. They also confirm Bloom's hypothesis suggesting that empathy and concern are psychologically distinct, with empathy (in our terms, the affective dimension) playing a more limited role in people's moral choices than commonly thought.

Why was affective empathy induction found to be an ineffective prosocial behavior strategy? According to the perception–action model of empathy (Preston and De Waal, 2002), related to affective empathy, merely observing what the other person feels automatically triggers the neural pathways which evoke the same affective states as those evoked in that other. On an unconscious level, it is possible to detect another's state and react in a syntonic way, even if we are unaware of our own feelings. If we recognize the other's pain or joy, we can also automatically react to it by feeling the same. Such shared emotions can lead to appraisal of the other's situation and deciding how to respond. Does such interpersonal transmission lead to positive consequences for the other person? In most cases syntonic reactions are considered positive from the standpoint of that other. But in the case of negative affect, contagion can lead to negative consequences for both parties. Feedback from the observer, moreover, can increase the subject's anxiety. The observer who feels discomfort may try to keep his/her distance or may respond in a negative, even aggressive way. Further, affective empathy activates the automatic channel of behavior regulation. The option of sharing experiences with friends is more consistent with the automatic mode than is reporting abuse. This is particularly seen in adolescents (DeSmet et al., 2016). It is a behavior pattern that is repeated numerous times, an element of a universal adolescent online functioning script. Thus the processing mode induced by affective empathy facilitating automatic script-like behaviors may, paradoxically, create a preference for sharing cyberbullying acts more than reporting them as abuse.

Why was cognitive empathy found to compensate for affective empathy deficits in inducing prosocial behaviors? According to the social cognitive neuroscience model of human empathy (Decety, 2007), the empathy arises as a result of dynamic interaction of the following four functional elements: (a) affect-sharing between the self and others; (b) self-awareness and self-other differentiation; (c) the subject's mental flexibility to adopt the perspective of the other and, lastly, (d) regulatory processes, including emotion regulation. Cognitive empathy—built upon an appreciation of another's situation and needs—is connected with a person's favorable affects and behavior. Its two fundamental features are: (a) the capacity for conscious recognition, and (b) reflective appraisal of the other's state or situation. It requires involvement of complex cognitive and evaluative processes like perspective taking (Batson et al., 1997). Behaviors are strictly related to one's concentration on the other person; the accompanying emotions are of post-cognitive nature. This is conducive to effective emotion regulation and increased behavior control. As a result, it makes cognitive empathy-motivated involvement more suitable for the online environment.

These presumptions about the specific mechanisms and strategy determinants of effective empathy activation on cyberbystander behavior are in line with some scarce data on the effectiveness of interventions geared specifically toward the online context. DeSmet et al. (2018), for example, concluded that empathy training was needed to achieve a change in negative cyberbystander behavior. The effectiveness of our proposed method of activating empathy should be further tested in a comprehensive school program, not a single component study (as currently presented). An approach exploring the effectiveness of empathy activation in various relationships that proved to affect bullying – peer and student–teacher, should be tested (Longobardi et al., 2018). Ttofi and Farrington (2011) clearly stated the need for theoretically grounded and rigorously implemented and evaluated programs to prevent cyberbullying. Until now, most studies on evidence- and school-based anti-cyberbullying programs focused mostly on cybervictims and cyberbullies. Despite the growing attention on cyberbystanders, there still are knowledge gaps regarding which interventions will encourage prosocial online responses (through effective situational activation of factors leading to same). The current research fills this gap, adding conclusions for prevention of antisocial online behavior. In sum, results of the current studies suggest that actively taking the perspective of the cybervictim (cognitive empathy) can lead to more interventions and fewer passive reactions in cyberbystanders. To achieve such results in school practice, educators need to implement focused cognitive empathy-activating tasks. These can enhance students' empathy and encourage prosocial bystander responses, especially for those likely to be involved in reinforcing cyberbullying.

The current investigation has its strengths and limitations. The main strength is the general design using an experimental approach with video clips, due to the ecological appropriateness and attractiveness to the studied group: adolescents. On the other hand, the main limitations are, to a degree, a consequence of the methodological approach: the obtained results were gathered from a purposefully recruited sample. Future research on effectiveness of empathy induction on cyberbystander behavior should collect data from a randomly selected sample. Also, the impact of order effects should be considered in further research. Additionally, only one of several possible prosocial reactions, reporting the abuse, has been tested. A broader set of potential responses (e.g., defending, comforting) could yield valuable insight. In line with this concern, a conclusion of both ineffectiveness of affective and effectiveness of cognitive empathy activation is constrained to this specific form of prosocial online behavior. Additionally, the severity of the cyberbullying act was not differentiated. The bullying behavior witnessed by the participants is a relatively mild form that may restrict generalizing our findings to more or less severe forms of cyberbullying.

Notwithstanding these limitations, our results suggest that cognitive empathy focuses a person's attention on the external situation of another person. This, in turn, activates prosocial behavior mechanisms aimed at improving the predicament of the other without expecting any external reinforcements (Berkowitz and Macaulay, 1970). Thereby, it justifies the finding that cognitive empathy leads to more selective and insightful perceiving of social situations in cases where even such slight symptom of cyber-aggression can prompt a helping reaction.

The educational recommendations provided herein require further exploration in a more complex study on the effectiveness of a holistic, evidence-based anti-cyberbullying program. Such a context should include activities aimed at inducing cognitive empathy, as may give rise to alternative, prosocial activities in cyberbystanders. Future research and interventions should take into account the complex nature of the mechanisms of empathy induction in a more holistic school based approach. These may require different actions to effectively trigger prosocial, and diminish antisocial, cyberbystander behavior.

AUTHOR CONTRIBUTIONS

JB contributed to conducting the research, the theoretical part on cyberbullying and cyberbystanders, and to the description of the procedure, methods, and discussion. AS contributed to the theoretical part on empathy and to the discussion. MW contributed to the analysis.

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The Effect of Shyness on Adolescent Network Problem Behavior: The Role of Gender and Loneliness

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With the latest, rapid developments of the Internet, young people have become the main group in the online world. Congruently, Internet problem behaviors have shown a significant growth trend among adolescents. The present paper explores the factors affecting adolescents' problem network behavior from the perspective of their shyness, gender, and loneliness, and provides suggestions for guiding these young people toward using the network rationally. The study surveyed 5,130 teenagers from Shandong province in China to investigate the moderating effect of gender on the relationship between shyness and problem network behavior, and the mediating effect of loneliness on the moderating effect. The results indicated that the level of shyness among girls was significantly higher than that among boys, whereas the prevalence of cyberbullying, pathological Internet use, and Internet gaming disorder was significantly lower for girls than for boys. The relationship among shyness, cyberbullying, and Internet gaming disorder was found to be moderated by gender, and the problems of cyberbullying and Internet gaming disorder faced by shy boys were greater than those faced by shy girls. In addition, the moderating effect of gender on cyberbullying and Internet gaming disorder was found to occur through the mediating factor of loneliness. The paper concludes with a discussion of the theoretical significance and generalizability of our research results.

Keywords: shyness, loneliness, network problem behavior, gender, mediating moderation model

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INTRODUCTION

Within the fast-paced development of modern society, Internet use has become an important activity in the daily lives of young people worldwide (Gómez et al., 2017). The 43rd Statistical Report on Internet Development in China confirmed that, as of December 2018, the proportion of the country's students using the Internet in this way was 25.4%. The characteristics of the Internet mean that it offers continuous and significant opportunities for growth and improvement for teenagers. However, Internet use is like a double-edged sword: utilized reasonably (such as literature search, video call, and so on), it provides convenience and connectedness, whereas unreasonable network use (such as online games and so on) can cause young people to experience a number of network problem behaviors and may have a very serious negative impact on the physical and mental health of individuals.

The Relationship Between Shyness and Network Problem Behavior

In the online environment, individuals generally abide by certain social rules. Yet, in this context, some people may demonstrate behaviors that deviate from these social norms, use the Internet unreasonably, or display hindered individual social adaptation.

In the present study, such "network problem behavior" specifically encompasses pathological Internet use (hereafter, "PIU"), Internet gaming disorder, and cyberbullying. PIU can be understood as an individual's inability to control his or her use of the Internet, resulting in negative effects (Spada, 2014). Davis (2001) proposed a cognitive-behavioral model, which divided PIUs into special PIUs and general PIUs. Generally, PIU refers to the fact that there is no destination to rely on the network, and special PIU refers to the excessive use of the Internet by Internet users for specific purposes, such as the addiction of online games. In this study, PIU refers specifically to general PIU. Online gaming is a relatively new type of entertainment that combines traditional games with the Internet, thereby offering enhanced interactivity and virtuality aspects, but, for teenagers in particular, a condition referred to as Internet gaming disorder has been linked to a variety of behavioral problems (Zhang et al., 2016). Because of its major mental health impact, the loss of control over online gaming was termed "Internet gaming disorder" (IGD) (Ko, 2014). Cyberbullying refers to the intentional bullying of others by information technology through the Internet or mobile network, which is the behavior that the wider public strive to avoid (Furlong et al., 2004; Zhao and Gao, 2012). An example is making rude or mean comments on others on social networking sites. It is often accompanied by other negative behaviors or outcomes, such as poor peer relationships and low academic performance (Katzer et al., 2009), which may cause adolescents to experience a variety of physical and mental problems and have a negative impact on individual academic performance and healthy growth (Wanda, 2013).

Shyness is a personality trait encompassing a type of inhibition or discomfort shown by individuals in interpersonal situations that will significantly affect their participation in activities (Henderson and Zimbardo, 2001; Lo Coco et al., 2018). As a personality trait, shyness is a key factor affecting individual behavioral characteristics. Studies have found that individuals with shy tendencies account for 48% of the total sample (Heiser et al., 2003). Moreover, a study by Lei and Zhang (2002) found that shyness was a significant variable in predicting bullying. Shy individuals commonly demonstrate greater social avoidance, which may make it more difficult for other people to accept them and so they instead become bullies (Ren et al., 2018). At the same time, shy individuals may also show more aggression due to a hostile attribution tendency (Gao et al., 2016a,b).

In recent years, research has identified a relationship between shyness and network problem behavior. According to Young's (1999) ACE model, the characteristics of online anonymity, convenience, and escapism could help shy individuals reduce discomfort in real interactions and could improve their social skills through social networking and build good relationship with others. However, if a shy individual relies too much on the compensation of the Internet without restraint, it may develop into PIU (Kraut et al., 1998). What's more, according to reinforcement theory, the slot-machine mechanism or the ever-increasing use of technology is one of the elements of IGD, and the improvements in technology that facilitate this can make an individual feel psychologically satisfied, and thereby allow them to avoid or eliminate the discomfort brought about through real life. Shy people are more likely to escape from reality and achieve satisfaction in this way (Lei and Zhang, 2002). Furthermore, national and international scholars alike have observed a positive correlation between shyness and PIU, with some studies concluding that shyness is a typical personality trait of online game addicts (Zhang et al., 2006).

The Mechanisms of Shyness and Network Problem Behavior

While the relationship between shyness and problem network behavior has been established, the moderating (e.g., gender) and mediating (e.g., loneliness) mechanisms between the two remain underexplored.

Loneliness is a negative emotional experience, and it occurs when the quality and quantity of social relationships an individual expects to have differ significantly from the actual situation. Related research shows that personality traits are related to individual loneliness. Loneliness is a negative consequence of shyness, and the two are significantly positively related (Aydin et al., 2013). Some studies have directly pointed out that shyness is a prerequisite for loneliness (Zambarano, 2001). Due to lack of social skills and social support, shy individuals are apt to create obstacles in their interaction with others and to avoid social evasion and rejection behaviors, which makes them more prone to loneliness. At the same time, studies have found that shy individuals are more likely to experience peer relationship difficulties and more likely to experience loneliness (Zhao et al., 2012). High shyness often coexists with a strong sense of loneliness. Shyness is an important predictor of loneliness. Lonely individuals are more inclined to use social networking to regulate negative emotions to compensate for their poor social skills in real life. A study that used adolescents as subjects showed that lone individuals would use the Internet more frequently to communicate private topics and meet new friends (Bonetti et al., 2010).

Several studies have found that loneliness triggers increased levels of online behavior (Hamburger and Ben-Artzi, 2003; Sahin, 2012; Feng et al., 2018). Indulging in the Internet for long periods of time may greatly reduce an individual's communication with others in real life, and the exchange of genuine emotions may become less common. Lonely individuals are more inclined to use social networks to regulate their negative emotions, yet excessive Internet dependence may lead to an addiction to it (Ping et al., 2011). In addition, individuals who suffer from loneliness are more likely to be dissatisfied with their existing relationships and to perceive others' neutral behaviors as being aggressive, which may cause cyberbullying (Olenikshemesh et al., 2012). The emotional deficiency of lonely individuals in real life may be resolved through online social activities and

emotional communication during games played in the virtual world (Griffiths et al., 2004).

According to the social role theory, gender can lead to differences in social behaviors by influencing social role expectations (i.e., gender role expectations) and individual beliefs or skills (i.e., gender role performance) (Xie D. Z. et al., 2015). Both shyness and problem network behavior have been found to exhibit gender differences. Prior studies have shown that the relative levels of girls' shyness are significantly higher than those of boys (Liu et al., 2012). Sherer (1997) first posited that men were more likely to be addicted to the Internet than women. Levels of boys' Internet addiction have since been found to be significantly higher than those of girls as well (Zhang et al., 2011). Compared with girls, boys have more experience in playing online games (Zhang et al., 2014) and stronger motivation in respect of such activity. At the same time, the cyberbullying levels of boys are also significantly higher than those of girls (Shou and Chen, 2015). What's more, some studies explored gender as a moderating variable and found that the relationships among shyness and loneliness/social avoidance, psychological safety, and Internet problem behavior were moderated by gender (Xie J. L. et al., 2015; Zhou and Liu, 2015; An, 2017).

Hypothetical Model

At present, there is no prior research that directly examines the moderation effect of gender with respect to the relationship between shyness and problem network behavior and the mechanism behind it. The present study proposes to explore the relationship between adolescent shyness and online problem behaviors on the basis of gender differences, and to explore the mediation effect of loneliness.

In addition, studies have found that PIU groups are younger than those exhibiting addictive behaviors, with adolescents between the ages of 12 and 18 being most likely to develop PIU symptoms (Tsai and Lin, 2004). Accordingly, this study selected as its sample participants students from the sixth grade of primary school to college-age students in order to obtain comprehensive data pertaining to the investigation of the research question.

Based on the aforementioned discussions, the following hypotheses and theoretical model (**Figure 1**) were proposed:

Hypothesis 1. The shyness level of girls is significantly higher than that of boys.

Hypothesis 2. Shyness is significantly positively related to PIU, IGD, and cyberbullying.

Hypothesis 3. The relationship between shyness and network problem behavior is moderated by gender, and the issue of shy boys is greater than that for girls.

Hypothesis 4. The moderating effect of gender on shyness and network problem behavior is realized through the mediating variable of loneliness.

MATERIALS AND METHODS

This study conformed with the code of ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans and was approved by the Ethics Committee of Shandong Normal University. Additionally, our research obtained written informed consent from the parents of the participants.

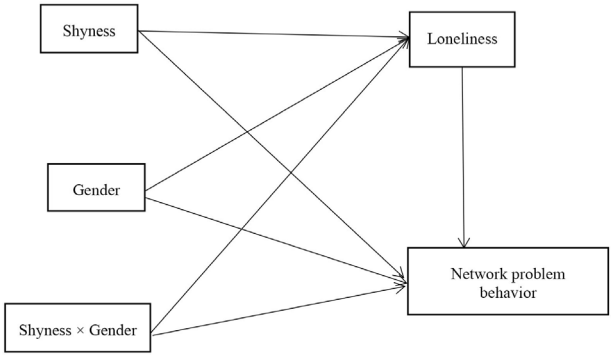

FIGURE 1 | Hypothesis model of the relationship between shyness and problem network behavior.

Participants

Students from primary school (sixth grade class), junior high school, senior high school, and university all in the city were randomly selected in Eastern China. Participants were selected through a combination of stratified sampling and simple random sampling. A total of 5,500 questionnaires were distributed. After eliminating the invalid questionnaires (a scale with half or more of its contents unanswered was considered invalid), 5,130 valid questionnaires were returned, representing an effective response rate of 93.27%. Among these participants, 537 were primary school students (10.5%), 1,673 were junior high school students (32.6%), 675 were senior high school students, and 2,245 were university students (43.8%); 2,303 were boys (44.89%) and 2,827 were girls (55.11%), and their ages ranged from 10 to 23 years old (average age, 16.20 $\pm$ 3.24 years).

Procedures

Taking the class as the unit, we carried out the group test in the classroom. All of the experimenters have a master's degree in psychology. The head teachers of each class assisted in conducting the tests on the primary, middle, and high school student participants in order to manage and improve the quality of the completed questionnaires. The questionnaires were completed by and data collected from the students in the classroom.

Measures

The Revised Henderson Undergraduate Shyness Scale

The Revised Henderson Undergraduate Shyness Scale (RHUSS) was compiled by Henderson and Zimbardo (2002) and the revised one by Wang et al. (2009) was used. The revised scale showed high reliability and validity in the Chinese youth sample study (Wang et al., 2009). The revised shyness scale consisted of 17 topics, divided into four dimensions, namely, seeking approval, self-blame, fear of rejection, and self-restriction of

expression. One sample item is, "I worry about being immature in social situations." It featured a five-point scale (1 = *strongly disagree*, 5 = *strongly agree*), and the higher the score, the higher the level of shyness. In this study, Cronbach's alpha coefficient with respect to the scale was 0.869. We also conducted CFA, with x^2/df = 14.408, $p < 0.001$, RMSEA = 0.047, CFI = 0.948, IFI = 0.949, AGFI = 0.956, and GFI = 0.970.

The UCLA Loneliness Scale

The UCLA loneliness scale compiled by Russell (1996) was translated and revised to obtain a Chinese version. One sample item is, "I am unhappy doing so many things alone." The scale had a total of 20 questions and used four-point numerical response rating (1 = *never*, 4 = *always*). The higher the total score, the higher the level of loneliness. For the reverse measure, we carried out reverse scoring. In this study, Cronbach's alpha was 0.855. We also conducted CFA, with x^2/df = 10.934, $p < 0.001$, RMSEA = 0.044, CFI = 0.966, IFI = 0.967, AGFI = 0.956, and GFI = 0.975.

Cyberbullying Scale

The cyberbullying scale adapted from Ybarra et al. (2007) was translated and revised to obtain a Chinese version. Three questions were presented and participants responded to them according to a seven-point scale, with the numerical response ratings ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). One sample item is, "Make rude or mean comments on others on social networking sites." The higher the total score, the higher the online bullying level. In this study, Cronbach's alpha coefficient with regard to the scale was.85. We also conducted CFA, with x^2/df = 15.151, $p < 0.001$, RMSEA = 0.053, CFI = 0.984, IFI = 0.971, AGFI = 0.958, and GFI = 0.981.

Generalized Pathological Internet Use Scale

The Generalized Pathological Internet Use Scale (GPIUS) originally prepared by Gómez et al. (2017) was translated and revised, and a Chinese version of the scale was obtained. It had a total of 11 questions and used a seven-point rating scale (1 = *strongly disagree*, 7 = *strongly agree*). One sample item is, "You have connected to the Internet even though you knew it could get you in trouble." The higher the total score, the higher the degree of PIU. In this study, Cronbach's alpha was 0.883. We also conducted CFA, with x^2/df = 15.996, $p < 0.001$, RMSEA = 0.054, CFI = 0.980, IFI = 0.980, AGFI = 0.963, and GFI = 0.982.

Internet Gaming Disorder Test (IGDT-10)

The IGD test compiled by Király et al. (2017) was translated and revised, and a Chinese version of the test was obtained. The scale consisted of 10 items, encompassing "continue," "focus," "negative consequences," "escape," "tolerance," "lost control," "abandonment of other activities," "deception," "avoidance," and the measurement of individual IGD obstacles in nine dimensions. One sample item is, "When you were not playing, how often have you fantasized about gaming, thought of previous gaming sessions, and/or anticipated the next game?" It featured a seven-point numerical response scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*); the higher the total score, the higher the use of online games. In this study, Cronbach's alpha coefficient of the scale was 0.915. We also conducted CFA, with x^2/df = 10.253, $p < 0.001$, RMSEA = 0.042, CFI = 0.996, IFI = 0.996, AGFI = 0.978, and GFI = 0.994.

Statistical Analysis

We used SPSS (version 19.0) statistical analysis software to manage and analyze the data, mainly using statistical methods for describing statistics, the correlation analysis, and the analysis of variance. Confirmatory factor analysis was performed using the AMOS 24.0 software package. The mediation effect was analyzed using SPSS 19.0.

To test the common method biases, the common variance analysis was conducted by the factor analysis. Then we analyzed the statistics via descriptive and correlation analyses. In addition, we examined the mediating roles of gender and loneliness.

For moderating effect, when the product coefficient of the predictive variable and gender is significant, we consider the moderating effect to be significant. The bootstrapping method was conducted to test the mediation effects. This method produced 95% bias-corrected confidence intervals of these effects from 1,000 resamples of the data. Confidence intervals that did not contain zero indicated that effects were significant.

RESULTS

Common Method Biased

Using self-reporting methods to collect data is likely to lead to common method bias, and so this study used Harman's single factor analysis to test for it (Podsakoff et al., 2003). The unrotated principal component factor analysis showed that the characteristic root value of nine factors were greater than 1, and the variance explained by the first factor was only 20.005%, which is less than the critical standard of 40%, indicating that there was no obvious common method bias in the study.

Descriptive Statistical Analysis

Results from the descriptive statistical analysis are shown in **Table 1**.

Taking gender and study stage as independent variables, and shyness, loneliness, cyberbullying, PIU, and IGD as dependent variables, multivariate analysis of variance was conducted. The results showed that gender and study stage had significant interaction effects on loneliness, $F_{(3,5122)} = 2.638$, $p < 0.05$, $\eta^2 = 0.002$; the interaction effect on PIU was significant, $F_{(3,5122)} = 12.022$, $p < 0.001$, $\eta^2 = 0.007$; the interaction effect on cyberbullying is significant, $F_{(3,5122)} = 15.657$, $p < 0.001$, $\eta^2 = 0.009$. The interaction between shyness and IGD was not significant. Further simple effect analysis showed that the level of loneliness had significant differences between boys and girls in the university group, and the level of loneliness in boys was significantly higher than that in girls ($p < 0.001$). There were significant differences between boys and girls in the primary and junior high school groups. The PIU level of boys was significantly higher than that of girls ($p < 0.001$); cyberbullying had significant gender differences in junior high school, senior high school, and

TABLE 1 | Descriptive statistical analysis of all variables.

	Primary school		Junior high school		Senior high school		University	
	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl
Shyness	45.503 (9.967)	45.696 (10.206)	44.578 (11.857)	45.300 (11.179)	46.850 (13.078)	48.848 (13.478)	45.879 (11.646)	47.642 (10.620)
Loneliness	41.076 (9.093)	41.224 (9.472)	41.487 (9.308)	41.550 (8.960)	43.156 (10.650)	42.000 (9.935)	42.155 (9.275)	41.316 (8.543)
Cyberbullying	4.472 (2.654)	4.301 (2.347)	5.133 (3.269)	4.612 (2.499)	5.216 (3.592)	4.429 (2.740)	5.620 (3.295)	4.057 (2.115)
PIU	30.611 (13.279)	26.217 (11.639)	38.199 (13.865)	35.268 (13.438)	39.170 (14.191)	40.072 (13.677)	38.354 (12.480)	39.391 (11.508)
Internet gaming disorder	24.194 (12.485)	18.220 (9.302)	30.121 (13.899)	21.847 (11.235)	28.198 (14.647)	20.277 (12.667)	29.452 (12.548)	20.365 (10.451)

college groups, and boys' cyberbullying levels were significantly higher than those of girls ($p < 0.001$).

The main effect of gender in shyness was significant, $F_{(1,5122)} = 9.471$, $p < 0.05$, $\eta^2 = 0.002$; the level of shyness of girls was significantly higher than that of boys; the main effect of gender in cyberbullying was significant, $F_{(1,5122)} = 67.064$, $p < 0.001$, $\eta^2 = 0.013$; boys' cyberbullying level was significantly higher than that of girls. What's more, PIU's gender main effect was significant, $F_{(1,5122)} = 9.965$, $p < 0.05$, $\eta^2 = 0.002$; boys' PIU level was significantly higher than that of girls. The main effect of gender in IGD was significant, $F_{(1,5122)} = 380.621$, $p < 0.001$, $\eta^2 = 0.069$; the level of boys' IGD was significantly higher than that of girls.

The main effect of study stage in shyness was significant, $F_{(3,5122)} = 13.652$, $p < 0.001$, $\eta^2 = 0.008$. The level of shyness of senior high school students was significantly higher than that of junior high school students and primary school students. College students' shyness level was significantly higher than that of junior high school students. The main effect of study stage in loneliness was significant. $F_{(3,5122)} = 3.496$, $p < 0.05$, $\eta^2 = 0.002$. High school students' loneliness level was significantly higher than that of primary school students. The main effect of study stage in cyberbullying was significant, $F_{(3,5122)} = 4.440$, $p < 0.01$, $\eta^2 = 0.003$. Junior high school students' cyberbullying level was significantly higher than that of primary school students. The main effect of study stage in PIU was significant, $F_{(3,5122)} = 104.832$, $p < 0.001$, $\eta^2 = 0.058$. The PIU level of college students was significantly higher than primary school students and junior high school students. Senior high school students' PIU level was significantly higher than that of primary school students and junior high school students. What's more, junior high school students' PIU level was significantly higher than that of primary school students. The main effect of study stage in IGD was significant, $F_{(3,5122)} = 21.831$, $p < 0.001$, $\eta^2 = 0.013$. The IGD level of junior high school students was significantly higher than that of primary school students, high school students, and college students. High school students' IGD level was significantly higher than that of primary school students, and college students' IGD level was significantly higher than that of primary school students.

Correlation Analysis

Results from the correlation analysis are shown in **Table 2**. Gender was not significantly related to PIU, but all other variables were significantly related to each other. There was a significant negative correlation between gender and loneliness/cyberbullying/IGD. In addition, other variables were positively correlated with each other.

The Relationship Between Shyness and Network Problem Behavior: Mediating Moderation Model

Following Ye and Wen (2013), an intermediary moderation model test method was used to examine whether gender's moderation of the relationship between shyness and problem network behavior plays a role in loneliness.

TABLE 2 | Correlation analysis of all variables.

		1	2	3	4	5	6
1	Gender	1	–	–	–	–	–
2	Shyness	0.061**	1	–	–	–	–
3	Loneliness	−0.038**	0.450**	1	–	–	–
4	Cyberbullying	−0.168**	0.126**	0.235**	–	–	–
5	PIU	−0.021	0.369**	0.282**	0.306**	1	–
6	Internet gaming disorder	−0.323**	0.213**	0.238**	0.415**	0.511**	1

**$p < 0.01$

The first step was to establish a relationship model among shyness (X), gender (U), cyberbullying, PIU, and IGD (Y), and to test whether the relationship between shyness and network problem behavior is moderated by gender. To avoid multiple collinearity, the relevant variables were centered. The regression equation was as follows:

$$Y = c_0 + c_1X + c_2U + c_3UX + e_1 \quad (1)$$

The results are shown in **Table 2**.

As can be seen from **Table 3**, the interaction between shyness and gender had a significant effect on cyberbullying and IGD, indicating that the direct effect of shyness on cyberbullying and IGD was regulated by gender. The effect of the interaction between shyness and gender on PIU was not significant, which suggests that the direct effect of shyness on PIU was not regulated by gender.

A simple slope test showed that, for cyberbullying, the predictive coefficient β of shyness in the male population (i.e., boys) was 0.055, $p < 0.001$; in the female population (girls), the predictive coefficient β was 0.016, $p < 0.001$. This indicates that shyness has a significant relationship on cyberbullying, but the relationship is weaker with respect to girls than to boys. The specific results are illustrated in **Figure 2**.

For IGD, in the boys' group, shyness had significant relationship with IGD, with the prediction coefficient β being 0.34, $p < 0.001$; in the girls' group, the coefficient was reduced to 0.19, $p < 0.001$. This indicates that shyness has a significant relationship with IGD, but the relationship is weaker with respect to girls than to boys. The specific results are shown in **Figure 3**.

The second step was to establish a relationship model among shyness (X), gender (U), loneliness (W), and their interactions with cyberbullying and IGD (Y), and to test the mediating role of loneliness in the moderation model expounded above. The regression equations were as follows:

$$W = a_0 + a_1X + a_2U + a_3UX + e_2 \quad (2)$$

$$Y = c_0' + c_1'X + c_2'U + c_3'UX + b_1W + b_2UW + e_3 \quad (3)$$

The results are shown in **Table 4**.

As can be seen from **Table 3**, the effect of shyness on loneliness was significant, β = 0.360, $p < 0.001$; and the effect of gender and loneliness on cyberbullying was significant, β = −0.031, $p < 0.05$, which suggests that gender regulates the effect of loneliness on cyberbullying by indirectly regulating the effect of shyness on cyberbullying. The effect of gender and shyness on cyberbullying c'_3 was significant, β = −0.032, $p < 0.001$, indicating that there were some mediations in the moderation effect. In the relationship between shyness and cyberbullying, the gender moderation effect c_3 was −0.041, wherein the direct effect c'_3 was −0.032, the indirect moderation effect c_3–c'_3 was −0.009, and the indirect moderation effect was 21.95%.

The effect of shyness on loneliness was found to be significant, β = 0.360, $p < 0.001$; the effect of gender and loneliness on the IGD was not significant, β = −0.030, $p > 0.05$; b_1 was not significant, and a_3 was not significant. Bootstrap interval tests were performed on a_3b_1, a_3b_2, and a_1b_2, where the confidence interval at 95% of a_3b_1 did not contain 0, indicating that the

TABLE 3 | Simple moderation model test results: relationship among shyness and cyberbullying, PIU, and Internet gaming disorder.

Dependent variable	Independent variables	β	*t*	R^2	DR^2	*F*
Cyberbullying	Shyness	0.033	9.681***	–	–	72.958***
	Gender	−1.021	−13.063***	0.046	–	–
	Shyness × Gender	−0.041	−6.109***	0.053	0.007	–
PIU	Shyness	0.417	28.177***	–	–	258.724***
	Gender	−1.490	−4.365***	0.168	–	–
	Shyness × Gender	−0.007	−0.222	0.168	0.000	–
Internet gaming disorder	Shyness	0.257	17.923***	–	–	251.260***
	Gender	−8.741	−26.445***	0.159	–	–
	Shyness × Gender	−0.154	−5.376***	0.163	0.004	–

***$p < 0.001$.

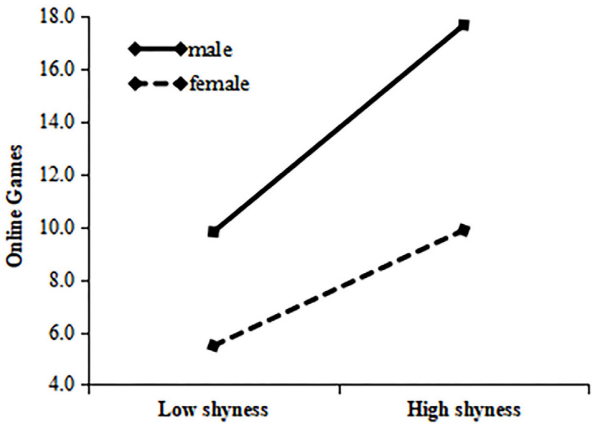

FIGURE 2 | Gender's role in moderating between shyness and cyberbullying.

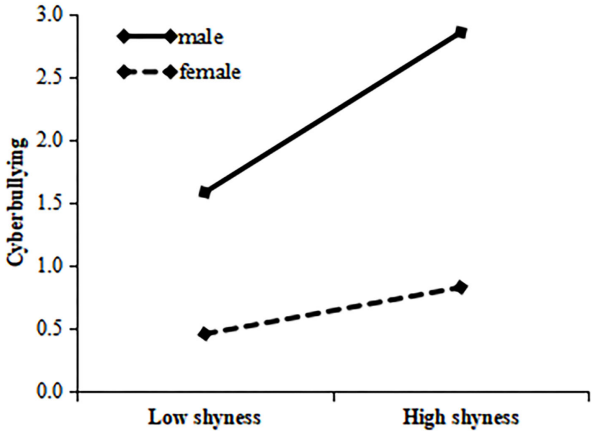

FIGURE 3 | Gender's role in moderating between shyness and Internet gaming disorder.

mediating effect of loneliness was significant; the effect of gender and shyness interaction on IGD c'_3 was significant, $\beta = -0.149$, $p < 0.001$, indicating that the regulatory effect was partially mediated. Regarding the relationship between shyness and IGD, the gender moderation effect c_3 was −0.154, wherein the direct effect c'_3 was −0.149, the indirect moderation effect $c_3 - c'_3$ was −0.005, and the indirect moderation effect was 3.25%.

DISCUSSION

This study examined the relationship between adolescent shyness and network problem behavior, the role of gender in moderating these relationships, and its mechanism of action. With reference to the relationship between shyness, IGD, and cyberbullying, a mediating moderation model was established. That is to say, the role of gender in the moderation was largely via the mediating factor of loneliness. The research results offer a particular practical benefit for developing understanding of the relationship between shyness and problem network behavior in relation to gender, and toward guiding young people to use online networks judiciously.

The Impact of Shyness on Network Problem Behavior

Through correlation analysis, our research on the relationship between shyness and problem network behavior found that shyness and loneliness, cyberbullying, PIU, and IGD were significantly positively correlated, and, in the model in which shyness directly affected network problem behavior, shyness could significantly positively predict network problem behavior, which was consistent with previous research (Lei and Zhang, 2002).

Studies have found that shyness may have various adverse consequences, including effects on individual emotions and self-awareness (Henderson and Zimbardo, 2001). The anonymity of online networks and non-face-to-face communication methods can promote individual self-disclosure to some extent (McKenna et al., 2010). However, the Internet is also considered to be a communication method through which participants can risk alienating each other (Gómez et al., 2017). Individuals who are accustomed to online communication may further reduce opportunities for face-to-face communication in real life. Reducing adolescents' ability to feel and participate in real-life situations may increase their levels of shyness. Yang and Tung (2007) found that individuals with shyness traits were more likely to have issues with Internet addiction than individuals without such traits. When the Internet becomes the main social tool used by shy individuals, they are more likely to form network dependencies (Lei and Zhang, 2002).

There are three models that can be used to explain IGD in shy individuals. One is the use and satisfaction theory. Suler (1999) found that the desire for social interaction was one of the needs of Internet addicts. When the total social needs in the real life of a shy individual are not met, they will turn to an online network; when the satisfaction that the network brings to the individual becomes stronger than that derived from real life, the shy individual may develop an Internet addiction. The second model pertains to the social-cognitive theory proposed by Bandura (1999), which emphasizes behavior, environment, and personal interaction. Shy individuals may have a negative perception of the environment and of others, and Internet addiction can result from this cognition. The third is the cognitive behavior model, as proposed by Davis (2001) from the perspective of psychiatry, through which it may be posited that the negative influence of the network on the shy individual is mainly caused by the negative cognition of the individual, which is unrelated to the nature of the Internet itself.

In addition, studies have shown that shy individuals typically behave highly aggressively (Gao et al., 2016a,b). According to the shy social adaptation model, shy individuals transform their self-blame caused by retreating and avoiding behavior into resentment against others, and then exhibit aggressive behavior. The present study confirmed that shyness was positively related to cyberbullying, and thus provided further evidence for the shy social adaptation model.

TABLE 4 | Mediating moderation model test results: relationship among shyness and cyberbullying and Internet gaming disorder.

Dependent variable	Independent variables	β	*t*	R^2	DR^2	*F*
Loneliness	Shyness	0.360	36.416***	–	–	335.275***
	Gender	−1.192	−5.213***	0.207	–	–
	Shyness × Gender	0.027	1.367	0.207	0.000	–
Cyberbullying	Shyness	0.009	2.515*	–	–	85.992***
	Gender	−0.938	−12.215***	0.046	–	–
	Shyness × Gender	−0.032	−4.285***	0.053	0.007	–
	Loneliness	0.066	13.998***	0.080	0.027	–
	Loneliness × Gender	−0.031	−3.327*	0.091	0.001	–
Internet gaming disorder	Shyness	0.179	11.286***	–	–	190.732***
	Gender	−8.481	−25.873***	0.159	–	–
	Shyness × Gender	−0.149	−4.689***	0.163	0.004	–
	Loneliness	0.215	10.733***	0.182	0.019	–
	Loneliness × Gender	−0.030	−0.745	0.182	0.000	–

*$p < 0.05$; ***$p < 0.001$.

The Role of Gender in Moderation of Shyness and Network Problem Behavior

The results of this study showed that there was a gender difference in the relationships among shyness, cyberbullying, and IGD. Specifically, boys were found to be more sensitive than girls, which is consistent with previous research (Zhang et al., 2011). The reason for this result may be found in social culture considerations, wherein boys and girls experience different social role expectations. Such social categorizations are typically more tolerant of women's expression of negative emotions, and women are often told that they need to be protected; therefore, arguably, they are more motivated to seek help (Shou and Chen, 2015). Girls who seek help may reduce the negative effects of shyness by confiding in others to gain support, and thereby reduce network behavior problems. For boys, however, the social role expectations are that they will be stronger and braver; hence, when shy boys' behaviors are inconsistent with male gender stereotypes, negative evaluations from peers may be triggered. At the same time, boys have been found to be more skilled and interested in online network operations (Zhang et al., 2014) and are more inclined to use the Internet to vent their negative emotions.

Equally, according to evolutionary psychology theory, the "adaptation problem" is a major challenge to be solved in the evolutionary process (Shang and Xiong, 2007). In the present study, girls' cyberbullying and manifestations of IGD were found to be less problematic, and one of the possible reasons for this could be that girls are at a disadvantage in resource competition (Lian et al., 2017), which will motivate them to develop stronger environmental adaptability than boys to enhance their social adaptation function. Therefore, girls will be more adaptable in the face of a bad social environment caused by shyness, the negative impact of shyness for them will be smaller, and the possibility of it causing network problem behavior is also reduced.

Based on these inferences, when it comes to preventing IGD and cyberbullying, it would seem to be necessary to give shy boys more attention than shy girls. The effect of gender on the relationship between shyness and PIU was not found to be significant, which also suggests that we need to classify network problem behavior in a more detailed manner when we study the gender differences in the relationship between shyness and network behavior problems.

The Role of Loneliness in Act of Shyness and Network Problem Behavior

This study found that loneliness plays a mediating role among shyness, cyberbullying, and IGD. Shyness can significantly predict loneliness and problem network behavior, and loneliness is significantly positively correlated with network problem behavior (Hamburger and Ben-Artzi, 2003; Sahin, 2012; Feng et al., 2018). Overall, our results suggest that shy adolescents are more likely to be lonely, which, in turn, increases the propensity for cyberbullying and IGD. This study identified the internal mechanism of shyness affecting network problem behavior; that is, individual loneliness due to shyness was the proximal factor of shyness affecting adolescent cyberbullying and IGD.

The positive correlation between loneliness and IGD may be explained by what is known as the "poor-to-rich" model, derived from the theory of social compensation, which postulates that the network can enhance the connection between individuals and others. The social deficits of lonely individuals in their real lives can be addressed through the interactivity of IGD and by gaining supportive interpersonal relationships (Valkenburg et al., 2005). According to the theory of compensation, lonely individuals will make up for interpersonal interactions that cannot be realized in real life through online networks. At the same time, lonely individuals usually lack social support and social skills and are unable to get help when they encounter problems. They are typically emotionally unstable and easily perceive others' behaviors as bullying behaviors, which may lead to more cyberbullying behaviors.

IMPLICATIONS

In order to reduce the occurrence of network problem behaviors and to help teenagers use the Internet reasonably, we put forward the following suggestions. First, parents and educators should

guide young people to use online networks correctly, to prudently face all kinds of information and temptations therein, and to understand the pros and cons of the Internet. Second, educators should develop their own abilities accordingly, as well as be able to effectively identify shy young people, especially shy boys, and guide them toward adopting appropriate methods to alleviate the discomfort caused by shyness. In addition, parents and schools should guide young people to participate in additional outdoor activities, provide more offline communication platforms, and offer further opportunities for youth interpersonal interactions (Formica et al., 2017; Mannino and Faraci, 2017). Finally, different education measures should be taken for boys and girls to conduct earlier and more timely interventions for shy individuals in order to help them develop good online habits.

LIMITATIONS AND FUTURE DIRECTIONS

The study had limitations, as follows. First, the cross-sectional research method used herein may have its own disadvantages, and so the relationship between the related variables requires further longitudinal study to validate and support our findings. Second, this study focused on the mediating role of loneliness, but future research could investigate whether other negative emotions such as anxiety and depression have similar mediating effects. Despite these limitations, however, this research provides further empirical evidence that shyness and loneliness should be considered as personal traits that are relevant to network problem behavior, as well as documenting that there are different effects in adolescents according to their gender. However, future study can explore the relationship between multidimensional social competence and cyberbullying, and face-to-face harassment and cyberbullying (García-Fernández et al., 2015; Romera et al., 2017). In addition, there may be different impact mechanisms on the PIU problem of disabled and homosexual people in the subject group, which needs more attention (Mannino and Schiera, 2017; Mannino et al., 2017). Finally, the present research was conducted in a Chinese cultural setting, and the cross-cultural applicability of the conclusions must be properly verified. Related research should be conducted in different countries and cultures.

CONCLUSION

(a) The shyness level of girls was significantly higher than that of boys, and the gender difference of cyberbullying, PIU, and IGD was significantly lower than that of boys.

(b) Shyness was positively correlated with loneliness, cyberbullying, PIU, and IGD.

(c) The relationship among shyness, cyberbullying, and IGD was moderated by gender; the issue of shy boys is greater than that of girls.

(d) The moderating effect of gender on cyberbullying and IGD was achieved through the mediating factor of loneliness, which suggested that shyness had a gender difference in the effects of cyberbullying and IGD, and loneliness played a mediating role.

DATA AVAILABILITY STATEMENT

The datasets generated for this study will not be made publicly available. The datasets for this manuscript are not publicly available because the datasets are used only for the team of this article by the permission of the guardians. Requests to access the datasets should be directed to PW, 122394108@qq.com.

ETHICS STATEMENT

This study conformed with the code of ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans and was approved by the Ethics Committee of Shandong Normal University. Additionally, our research obtained written informed consent from the parents of the participants.

AUTHOR CONTRIBUTIONS

PW is the research designer. YY is in charge of writing. FG and YT participated in the discussion and offered suggestions. RZ is the first corresponding author. JW is the second corresponding author. XZ is the third corresponding author.

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Internet Gaming Disorder Increases Mind-Wandering in Young Adults

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As a primary symptom defining Internet gaming disorder (IGD), preoccupation indicates a mind state in which gamers think about a gaming activity so much that other things appear less important and/or interesting to them. Previous studies have examined the negative impacts of IGD on both cognitive and affective functions, yet no study has investigated the influence of IGD on daily mind state changes that interfere with ongoing tasks. The current study hypothesized that more IGD symptoms lead to a higher frequency of mind state shift in terms of mind-wandering. As social anxiety is related to both IGD and mind-wandering, we further hypothesized that social anxiety would partially contribute to the relationship. Survey data were collected from 632 young adults who were divided into two groups based on whether they reported playing games or not. In the player group, the number of IGD symptoms present was positively related to mind-wandering (r = 0.269, $p < 0.001$) and social anxiety (r = 0.235, $p < 0.001$), with the latter two showing a positive correlation in both players (r = 0.37, $p < 0.001$) and non-players (r = 0.57, $p < 0.001$). A mediation analysis for the players showed a partial mediation effect of social anxiety on the relationship between IGD and mind-wandering (mediation effect: PM = 0.292, $p < 0.001$), and the model was replicated in an independent sample. This study suggests that excessive gaming behavior may increase mind-wandering and a shift towards such a non-productive mind state could exert long-term detrimental effects in adolescents and young adults.

Keywords: Internet gaming disorder, social anxiety, mind-wandering, mediator effect, behavioral addiction

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INTRODUCTION

The popularity of Internet games has profound impacts on human society and individuals in many ways. The impact of the high prevalence of Internet gaming especially on young people is indispensable (Wang et al., 2014). In contrast to the real physical world we live in, some video games create virtual worlds with functional objects and/or characters that are mentally compelling to most people. Because it is so attractive to some individuals, they repeatedly spend too much time on playing games regardless of negative consequences, raising the public concern of Internet gaming disorder (IGD). To address the increasing public concern regarding the negative consequences of excessive digital gaming, official bodies, including the American Psychiatric Association (2013), have suggested the unification and consensus of IGD. Later, Petry et al. (2014) proposed nine diagnostic items for IGD, corresponding to the nine DSM-5 constructs including preoccupation, tolerance, withdrawal, persistence escape, problems, deception, displacement, and conflict (American Psychiatric Association, 2013). The total number of these nine symptoms' presence during the past 12 months is used to characterize IGD severity.

As a new phenomenon in the digital era, both the risk factors and the negative effects of IGD are interesting topics of ongoing research. A number of studies have shown that the quality of parent–child relationships may be the primary risk factors of IGD (Sugaya et al., 2019). In contrast, IGD is also related to cognitive and psychosocial problems such as impaired executive control (Dong et al., 2010), higher loneliness (Qin et al., 2007), lower self-esteem (Lemmens et al., 2011), and social phobia (Sioni et al., 2017). Although preoccupation with gaming has been listed as one primary diagnostic symptom in DSM-5, these previous studies have only examined the negative impacts of IGD on cognitive and affective functions. Preoccupation with gaming activity indicates a mind state in which gamers think about a gaming activity so much that other things appear less important and/or interesting to them. A shift towards such a non-productive mind state could exert long-term detrimental effects in adolescents and young adults who need to devote tremendous time in study to equip them well for the rest of their life. To our best knowledge, no study so far has investigated the influence of IGD on daily mind state shift.

The shift of mind state away from an ongoing task is usually termed as mind-wandering (MW; Smallwood and Schooler, 2006). It has been demonstrated that mind-wandering occupies as much as 30–50% of our waking life (Kane et al., 2007; Schooler et al., 2011), and mind-wandering is even regarded as the brain's default mode of operation because of its spontaneous feature (Raichle et al., 2001; Buckner et al., 2008; Christoff et al., 2009; Baird et al., 2012). Thereby, studies of the neural underpins of mind-wandering have primarily focused on the default mode network that is metabolically more active at resting state than the task state when attention is oriented towards an external stimulus (Buckner et al., 2008). The level of mind-wandering has been shown to associate with the default mode network activity (Mason et al., 2007). Although it seems a trait-like personal character, previous studies have demonstrated that the level of mind-wandering can be reduced through mindful training (Rahl et al., 2016), suggesting that it can be changed in response to behavioral adaptation. Hypothetically, it also could be altered by other activities, such as excessive gaming, that leads to the emergence of a preoccupation symptom of IGD. Although mind-wandering may not always associate with negative outcomes (Baird et al., 2012), a large body of research has found that a high level of mind-wandering is related to negative cognitive and emotional consequences. For example, mind-wandering is regarded as a pervasive and problematic influence on the performance and well-being of adolescents (Mrazek et al., 2013b). Research has also found that the problems of mind-wandering among young people are widespread and significant (Polderman et al., 2010). The frequency of mind-wandering during lectures is specifically related to worse learning, and high-level mind-wandering leads to diminishing reading comprehension in college students (Risko et al., 2012). In addition to the cognitive aspects, literature has revealed that mind-wandering is associated with worse mood, less self-esteem, lower satisfaction, and more perceived stress (Killingsworth and Gilbert, 2010; Mrazek et al., 2013b), which, on the other hand, are closely related to social activity anxiety (Argyle and Lu, 1990; Neto, 1993; van Tuijl et al., 2014). A study found that patients with social anxiety disorder had high attention deficit–hyperactivity disorder (ADHD) comorbidity (Koyuncu et al., 2015), suggesting the positive correlation between social anxiety and mind-wandering resulting from attention failure. Another study showed that anxiety played an important role in MW in both ADHD and non-ADHD individuals (Figueiredo, 2020). The correlation between anxiety and mind-wandering has also been supported by neuropsychological studies on affective dysfunction and attention failure (Seli, 2019). Although there are no studies showing a direct relation between social anxiety (SA) and MW, one would speculate based on the above-mentioned studies that a high level of social anxiety is associated with more frequent mind-wandering.

Studies have shown that social anxiety plays an important role in the development of gaming disorders (Vanzoelen and Caltabiano, 2016). Individuals who feel anxious and have difficulty building relationships in the real world may choose the Internet to alleviate such anxiety. Online gaming is an ideal platform for individuals with high levels of social anxiety to build interpersonal relationships in which they can establish personal factions, organizations, and teams (Brenner, 1982). On the other hand, as time spent playing online games increases, the quality of interpersonal relationships decreases and the level of social anxiety increases (Lo et al., 2005), suggesting an interaction between online gaming disorder and social anxiety. Although online games may temporarily alleviate social anxiety, they do not improve real-world social relationships. On the contrary, the satisfaction of online games can encourage people to overindulge in the virtual world, which can lead to impairment of real-world relationships.

The current study, therefore, aims to examine whether IGD is associated with a high level of mind-wandering and how social anxiety plays a role in this relationship.

In summary, the preoccupation with gaming in IGD may lead to a high frequency of task disruption that defines mind-wandering. Social anxiety concurrent with IGD may also exert an impact on mind-wandering as anxiety has also been shown to interfere with task-focused thinking (Sarason, 1984), yet no empirical evidence has been shown to articulate such relationships. The objective of the present study was to examine the relationships among IGD, social anxiety, and mind-wandering. We hypothesize that (1) IGD is positively associated with the level of mind-wandering, (2) IGD is positively related to the level of social anxiety, and (3) the relationship between IGD and mind-wandering is partially mediated by social anxiety.

MATERIALS AND METHODS

Subjects and Procedures

The participants were asked to fill out an online survey concerning Internet gaming activity, social anxiety, mind-wandering, and demographic information (see section "Measures"). If the respondents reported that they play Internet games, they were asked to report the average time spent

on Internet games per day during the past 12 months. Four catch trials were pseudorandomly distributed into the survey to identify the participants who fulfilled the survey carelessly. The respondents were assured in the survey instruction that this information would be used for the purpose of scientific research and would be analyzed only by the research team. In total, 687 young people (35% male) participated, and they each received three RMB for compensation of their time. The participants who did not answer the catch trials correctly or reported "do not play game" but responded to one or more IGD symptoms were excluded from analysis. Finally, 637 respondents (93%) were included in the statistical analyses (see section "Statistic Analysis"). We call this cohort "the primary sample" to differentiate it from the replication sample (see section "Replication").

Measures

IGD Symptoms Based on DSM-5

The Chinese version of the nine-item scale for IGD developed based on DSM-5, which was referred to as the DSM scale in the present study, was used to characterize gaming activity-associated addiction-like behaviors (Petry et al., 2014). These items were proposed by international experts to measure the intended concept behind each of the nine DSM-5 criteria for IGD and were translated into 10 main languages including Chinese (Petry et al., 2014). This scale includes one item for each of the nine underlying IGD diagnostic criteria. According to DSM-5, tentative gaming disorder is identified based on the total number of the nine symptoms met in the past 12 months (American Psychiatric Association, 2013). The respondents rated all items with either no (0) or yes (1), yielding DSM scores ranging from 0 to 9. The DSM scale had a Cronbach's alpha of 0.74 in the present study.

Social Anxiety

Social anxiety was measured using the Chinese version of Liebowitz Social Anxiety Scale (LSAS; Liebowitz and Klein, 1987; He and Zhang, 2004). The LSAS (Liebowitz and Klein, 1987) comprises 24 social situations to be rated for the level of fear (0 = none to 3 = severe) as well as avoidance (0 = none to 3 = usually) for the past week. The LSAS has good psychometric properties in European American samples (Heimberg et al., 1999), and the Chinese version of LSAS also shows excellent internal consistency and temporal stability (He and Zhang, 2004). The LSAS score is calculated by the sum of the fear and avoidance ratings of the 24 items, yielding a score range of 0 to 144 (i.e., $3 \times 24 + 3 \times 24$), with a higher score indicating a high level of social anxiety. The LSAS questionnaire had a Cronbach's alpha of 0.96 in the present study.

Mind-Wandering

Mind-wandering was characterized using the Mind-Wandering Questionnaire (MWQ) (Mrazek et al., 2013b). The MWQ is a five-item questionnaire that evaluates the levels of mind-wandering trait with a six-point Likert-type scale ranging from 1 (almost never) to 6 (almost always). The total MWQ score is calculated by the sum of the five items, yielding a score range of 5–30, with a higher score indicating a higher frequency of mind-wandering. The Chinese version of the MWQ has been validated as good, with a Cronbach's alpha of 0.72 in a previous study (Luo et al., 2016). In the current study, it had a Cronbach's alpha of 0.84.

Statistical Analysis

The subjects were grouped into non-game player and game player subgroups based on the self-report of game playing, and the demographic information was summarized for each subgroup separately. Then, we tested the three hypotheses about the relationships among IGD, social anxiety, and mind-wandering in the game player subgroup with correlational analyses and mediation analyses correspondingly. We also conducted a complementary analysis to examine the differences in mind-wandering and social anxiety between non-game players and three subgroups of game players divided based on DSM-5 symptoms present in them. All the statistical analyses were conducted with SPSS 25.0. The mediation analyses were carried out using the SPSS macro PROCESS (model 4)[1] as suggested by Hayes (2017). To test the mediation model in which we hypothesized that social anxiety (LASA score, the mediator variable M) mediates the relationship between mind-wandering (MWQ score, the outcome variable Y) and IGD (DSM score, the independent variable X), the PROCESS estimates the following three regression models (with covariates omitted).

$$\text{The mediator model}: M = i_1 + aX + e_1$$

$$\text{The conditioned model}: Y = i_2 + bM + c'X + e_2$$

$$\text{The total effect model}: Y = i_3 + cX + e_3$$

where i_1, i_2, and i_3 are regression intercepts, e_1, e_2, and e_3 are errors in the estimation of each model, respectively, and a, b, c, and c' are the regression coefficients. The indirect effect of IGD (X) on mind-wandering (Y) through social anxiety (M) is the product of a and b, and the significance of this indirect effect is indicated by the bootstrap confidence intervals such that if the interval does not across zeros, the mediation effect is considered as significant (Hayes, 2017). The direct effect of IGD (X) on mind-wandering (Y) is indicated by c', and the significance of c' involves testing the null hypothesis $c' = 0$.

Replication

To validate our mediation model, we conducted another survey in an independent sample. In addition to the DSM scale used in the initial survey, Internet Addiction Test (IAT; Young and De Abreu, 2010) was also included in the replication survey to assess the robustness of the mediation model. The IAT is a 20-item questionnaire concerning Internet use-associated problematic behaviors, including psychological dependence, compulsive use, and withdrawal as well as problems related to school, sleep, family, and time management. All items were scored on a five-point Likert-scale (never, rarely, occasionally, often, and

[1] http://www.afhayes.com

always, corresponding to scores from 1 to 5). The IAT has been validated as a reliable self-report instrument that can be used to characterize IGD (Widyanto et al., 2010). In total, data from 276 respondents were collected, and 35 were excluded from the analysis based on the same exclusion criteria used in the primary sample. Finally, 181 respondents who reported to play games were used to assess the reproducibility of the model, with DSM score and IAT-20 score as the independent variables (X) separately.

RESULTS

Descriptive Statistics of the Primary Sample

In the primary sample, the subjects' age ranged between 17 and 30 years (M = 20.7, SD = 1.9). Based on the answer to the question "Do you play Internet game? Yes/No," 84 (12% male) subjects who responded "No" were grouped into the non-game player group, whereas the rest (553, 40%, male) of the subjects who responded "Yes" were grouped into the game player group. Among the game players, 73% (N = 408) reported playing Internet games for less than 2 h per day, 20% (N = 108) reported playing Internet games for 2–4 h per day, and 7% (N = 37) reported playing Internet games for more than 4 h per day on average in the last 12 months.

Correlations Among IGD, Mind-Wandering, and Social Anxiety in Game Players

In the game player group, DSM score was significantly and positively correlated with social anxiety as measured by LSAS (r = 0.234, p < 0.001, **Figure 1A**) and mind-wandering (r = 0.263, p < 0.001, **Figure 1B**), with the latter two constructs also significantly and positively correlated (r = 0.364, p < 0.001, **Figure 1C**). No gender effect was found in the three measurements, while age was positively correlated with DSM score (r = 0.469, p < 0.001).

The Mediation Role of Social Anxiety on the Relationship Between IGD and Mind-Wandering

The predicted mediation model was tested with Andrew F. Hayes' SPSS macro PROCESS (Hayes, 2017) by evaluating the three regression models described above, with the resulting coefficients and statistics listed in **Table 1**. As shown by the mediator model (F = 11.279, R^2 = 0.058, p < 0.001), conditioned model (F = 28.559, R^2 = 0.173, p < 0.001), and total effect model (F = 15.655, R^2 = 0.079, p < .001), the effect on mind-wandering attributed to IGD (the DSM score) was reduced from 0.298 to 0.216 (see **Table 1**) by social anxiety, the mediator variable. The significance of this indirect effect of IGD on mind-wandering through social anxiety was bootstrapped using 5,000 bootstrap samples with replacement. The point estimate of the indirect effect was 0.082, with a standard error of 0.018. The 95% bias-corrected confidence interval (from 0.049 to 0.121) did not include zeros, indicating that the mediation effect was significant. In addition, the direct effect of IGD, c', remained significant in the conditioned model (c' = 0.216, p < 0.001, **Table 2**), indicating a partial rather than complete mediation by social anxiety. Given that the total effect of IGD on mind-wandering was 0.298 and the indirect effect through social anxiety was 0.082, social anxiety accounted for 27.5% of the effect of IGD on mind-wandering.

Complementary Results Comparing Game Players vs Non-game Players

To compare the differences in mind-wandering and the level of social anxiety between non-gamers and game players with different IGD severity, the game players were assigned to the following four subgroups according to Lemmens et al. (2015): (1) low-risky game players (LG) that included those with DSM score lower than 3 (n = 202, MWQ = 16.41 ± 4.88; LSAS = 48.00 ± 22.318), (2) risky game players (RG) that included those with DSM score between 3 and 5 (n = 267, MWQ = 18.55 ± 4.67; LSAS = 56.50 ± 22.04), (3) high-risky game players (HG) that included those with DSM score higher than 5 (n = 84, MWQ = 19.85 ± 4.976; LSAS = 61.63 ± 21.78), and (4)

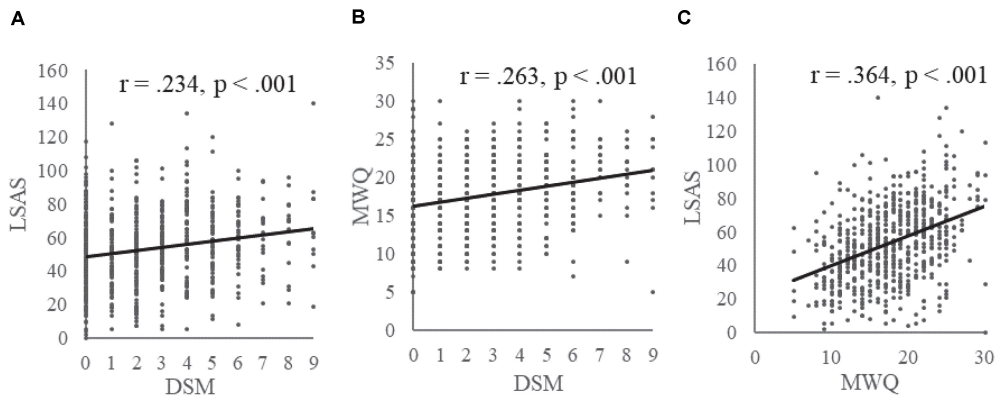

FIGURE 1 | Correlations between Internet gaming disorder symptoms, social anxiety, and mind-wandering. The DSM symptoms were positively correlated with social anxiety as measured by Liebowitz Social Anxiety Scale **(A)** and mind-wandering **(B)**, with the latter two also positively correlated with each other **(C)**.

TABLE 1 | Effects in the mediation model.

Model (outcome variable)		β	SE	*T*	*P*
Mediator (Liebowitz Social Anxiety Scale, LSAS)	Constant	61.153	11.071	5.524	< 0.001
	DSM	0.261	0.461	5.568	< 0.001
	Gender	−0.021	1.954	−0.502	0.616
	Age	−0.061	0.548	−1.296	0.195
Conditioned (MWQ)	Constant	16.463	2.344	7.024	< 0.001
	LSAS	0.315	0.009	7.877	< 0.001
	DSM	0.216	0.089	4.776	< 0.001
	Gender	−0.058	0.403	−1.495	0.136
	Age	−0.064	0.113	−1.443	0.150
Total effect (MWQ)	Constant	20.699	2.405	8.607	< 0.001
	DSM	0.298	0.100	6.432	< 0.001
	Gender	−0.065	0.424	−1.579	0.164
	Age	−0.083	0.119	−1.784	0.021
		Effect	**BootSE**	**BootLLCI**	**BootULCI**
Indirect effect		0.082	0.018	0.049	0.121

TABLE 2 | Effects in the mediation model (DSM as independent variable).

Model (outcome variable)	*F*	r^2	*p*		β	SE	*t*	*P*
Mediator (Liebowitz Social Anxiety Scale, LSAS)	6.578	0.100	< 0.001	Constant	61.425	8.264	7.433	< 0.001
				DSM	0.249	0.394	3.491	< 0.001
				Gender	0.190	1.828	2.656	0.009
				Age	−0.065	0.381	−0.906	0.366
Conditioned (MWQ)	15.953	0.266	< 0.001	Constant	13.171	3.138	4.198	< 0.001
				DSM	0.205	0.135	3.067	0.003
				LSAS	0.397	0.025	5.827	< 0.001
				Gender	0.054	0.618	0.815	0.416
				Age	−0.101	0.126	−0.156	0.121
Total effect (MWQ)	8.390	0.124	< 0.001	Constant	22.089	2.983	7.404	< 0.001
				DSM	0.304	0.142	4.315	< 0.001
				Gender	0.130	0.660	1.832	0.069
				Age	−0.127	0.137	−1.797	0.074
					Effect	**BootSE**	**BootLLCI**	**BootULCI**
Indirect effect					0.099	0.033	0.037	0.168

non-game players (NG) who reported not playing online games (n = 84, MWQ = 16.77 ± 5.82; LSAS = 53.40 ± 24.27).

Analysis of variances (ANOVAs) and post-test with Bonferroni correction were run to test the differences of MWQ and LSAS score between NG and each player subgroup (LG, RG, and HG). The result showed significant group effects on MW (F = 10.21, p < 0.001) and SA (F = 14.11, p < 0.001). The result of the *post hoc* tests with multiple comparisons showed significantly higher MWQ scores in the HG group than those in the NG group (p < 0.001). The MWQ scores were also significantly higher in the RG group than those in the NG group (p = 0.006). Regarding the difference in LSAS score, no differences were shown between NG and other player groups. Both MWQ and LSAS scores in NG showed no significant difference from those in the LG group (**Figures 2A,B**).

Replication of the Mediation Model

The replication sample has an average age of 21 years, with a standard error of 2.7 years, and 95 (52%) out of the total 181 respondents were female. The Cronbach's alpha of DSM (M = 3.49, SE = 2.32), IAT-20 (M = 55.68, SE = 13.91), LSAS (M = 61.57, SE = 12.78), and MWQ (M = 19.71, SE = 4.68) were 0.716, 0.915, 0.925, and 0.806, respectively. The four variables were positively correlated with each other (**Table 3**).

Mediation Model With DSM Score as Independent Variable

The parameter estimations of the three models are shown in **Table 2**. As shown in the table, the effect on mind-wandering attributed to IGD (DSM score) was reduced from 0.304 to 0.205 by the mediator variable social anxiety

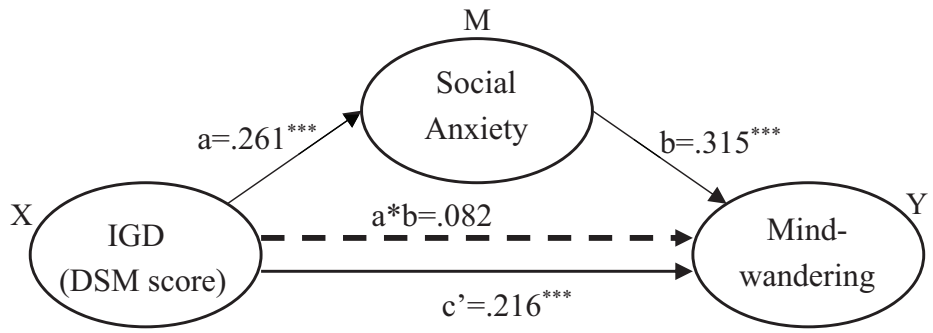

FIGURE 2 | The average scores of Mind-Wandering Questionnaire (MWQ) and Liebowitz Social Anxiety Scale (LSAS) in different subgroups. ANOVAs and *post hoc* tests with multiple comparisons were conducted to compare the difference between non-gamers (NG) and three subgroups of gamers. The MWQ score in NG were significantly lower than in risky game players ($p = 0.006$) and risky game players ($p < 0.001$). The LSAS score in NG were not significantly different than those in the game groups. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

(LSAS). Bootstrapping with 5,000 bootstrap samples estimated an indirect effect of social anxiety to be 0.100, with a standard error of 0.034 and a 95% bias-corrected confidence interval from 0.035 to 0.169. In addition, the direct effect of IGD, c', also remained significant in the conditioned model ($c' = 0.205$, $p = 0.003$, **Table 2**), indicating a partial rather than complete mediation by social anxiety (**Figure 3**). Social anxiety accounted for 32.6% effect of IGD on mind-wandering in the replication sample.

Mediation Model With IAT-20 Score as Independent Variable

The significance tests of the three models with IAT-20 indicating IGD severity are shown in **Table 4**. As shown by the statistical parameters of the three models, the effect on mind-wandering attributed to IGD (IAT-20) was reduced from 0.517 to 0.387 by the mediator variable social anxiety (LSAS). The bootstrapped indirect effect was 0.100, with a standard error of 0.130 and a 95% bias-corrected confidence interval from 0.056 to 0.212. In addition, the direct effect of IGD, c', also remained significant in the conditioned model ($c' = 0.387$, $p < 0.001$, **Table 4**), indicating a partial rather than complete mediation by social anxiety (**Figure 4**). Social anxiety accounted for 25.1% effect of IGD on mind-wandering when IGD was characterized with IAT-20.

DISCUSSION

In the present study, associations among IGD, mind-wandering, and social anxiety were found to be positive and significant (**Figure 1**). Furthermore, we found that the positive relationship between gaming disorder and mind-wandering was partly mediated by social anxiety (**Figure 5**). These relationships were replicated in an independent sample (**Figures 3**, **4**). Comparing with non-players, only high-risky gaming players showed higher social anxiety, but both risky and high risky players showed a significantly high frequency of mind-wandering (**Figure 2**). Previous studies on gaming disorder have mostly focused on the cognitive and affective aspects of IGD (Mehroof and Griffiths, 2010; King and Delfabbro, 2014; Ko et al., 2014; Bargeron and Hormes, 2017; Yen et al., 2017). The present study suggests that mind-wandering, which is defined as task-irrelevant thoughts (Smallwood and Schooler, 2006), is a new dimension of IGD-related behavior.

The DSM-5 includes a preoccupation criterion reflecting how often an individual consistently thinks about gaming during non-gaming time. Based on this diagnostic symptom, pathological gaming activity may increase the frequency of mind-wandering when game players are not playing Internet games, and the current study provides empirical evidence for this speculation. Previous neural imaging studies have also provided evidence for the potential correlation between IGD and mind-wandering. For example, a fMRI study scanning adolescents with IGD under resting state showed altered connectivity in the default mode network (Ding et al., 2013). Specifically, the connectivity with the PCC was positively correlated with Internet addiction scores in the posterior cingulate gyrus (Ding et al., 2013), suggesting that participants with higher Internet addiction scores had increased activity in the DMN at resting state, which is possibly related to a higher level of mind-wandering. In the following paragraphs, we discuss how elevated mind-wandering may exert a negative effect on individuals with excessive gaming activity.

Mind-wandering will interrupt with ongoing task and impair task performance. Although why IGD severity is positively correlated with mind-wandering is elusive, a possible route could be that excessive gaming behavior alters the attention system or simply taps on the default mode network, resulting in higher-level mind-wandering. Regardless of the causality, more mind-wandering concurrent with IGD may cause

TABLE 3 | Correlations between DSM, IAT-20, Liebowitz Social Anxiety Scale (LSAS), and Mind-Wandering Questionnaire (MWQ) in the replication sample.

	IAT-20	LSAS	MWQ
DSM	0.493***	0.240***	0.298***
IAT-20	–	0.499***	0.528***
LSAS	–	–	0.240***

***$p < .001$.

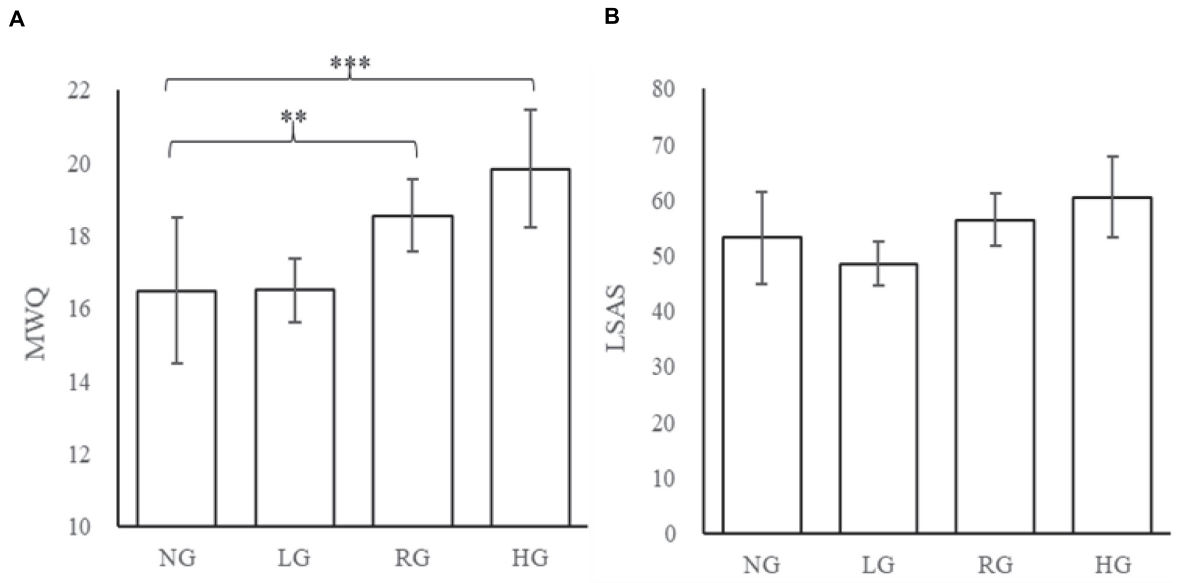

FIGURE 3 | Mediation analysis (DSM as independent variable) in the replication sample shows that the relationship between Internet gaming disorder and mind-wandering is partially mediated by social anxiety. $^{**}p < 0.01$, $^{***}p < 0.001$.

TABLE 4 | Effects in the mediation model (IAT-20 as independent variable).

Model (outcome variable)	*F*	r^2	*p*		β	SE	*t*	*P*
Mediator (Liebowitz Social Anxiety Scale, LSAS)	20.276	0.256	< 0.001	Constant	34.778	8.615	4.037	< 0.001
				IAT-20	0.483	0.062	7.191	< 0.001
				Gender	0.083	1.696	1.242	0.216
				Age	0.009	0.351	0.134	0.894
Conditioned (MWQ)	22.155	0.335	< 0.001	Constant	8.518	3.124	2.727	0.007
				IAT-20	0.387	0.024	5.347	< 0.001
				LSAS	0.269	0.026	3.769	0.002
				Gender	−0.010	0.591	−0.155	0.877
				Age	−0.051	0.122	−0.810	0.419
Total effect (MWQ)	23.083	0.281	< 0.001	Constant	11.936	3.099	3.852	< 0.001
				IAT-20	0.517	0.022	7.828	< 0.001
				Gender	0.012	0.610	0.190	0.850
				Age	−0.048	0.126	−0.745	0.457
					Effect	**BootSE**	**BootLLCI**	**BootULCI**
Indirect effect					0.13	0.040	0.056	0.2177

diverse problems relating to academic performance and daily life. For example, high-level mind-wandering leads to a worse mood (Killingsworth and Gilbert, 2010) and significant academical performance costs (Wammes et al., 2016). Mind-wandering has also been found to natively predict learning (post-test) outcomes (Kane et al., 2017). To discourage task-irrelevant mind-wandering, interpolating lectures with memory tests can help students keep their attention to the lecture content, and task-relevant activities such as note-taking are also helpful to reduce mind-wandering and improve learning (Szpunar et al., 2013). In addition, cultivating mindfulness meditation training is also suggested as an effective and efficient technique for improving working memory capacity and academic performance by reducing mind-wandering (Mrazek et al., 2013a). The present study, together with the above-mentioned studies, suggests that mind-wandering could be a detrimental psychological effect in IGD.

A recent study has also recognized the importance to distinguish between deliberate and spontaneous subtypes of mind-wandering (Seli et al., 2015). The former involves the engagement of controlled processes for internal processing, whereas the latter reflects a failure of executive control (Seli et al., 2015). Elevated mind-wandering associated with pathological gaming behavior could originate from both types

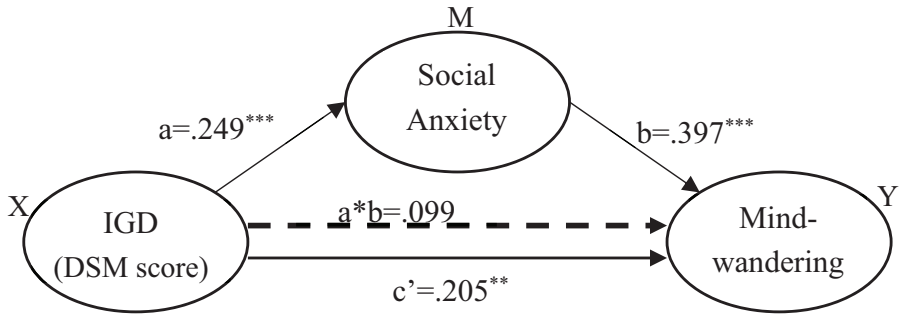

FIGURE 4 | Mediation analysis (IAT-20 as independent variable) in the replication sample shows that the relationship between Internet gaming disorder and mind-wandering is partially mediated by social anxiety. $^{**}p < 0.01$, $^{***}p < 0.001$.

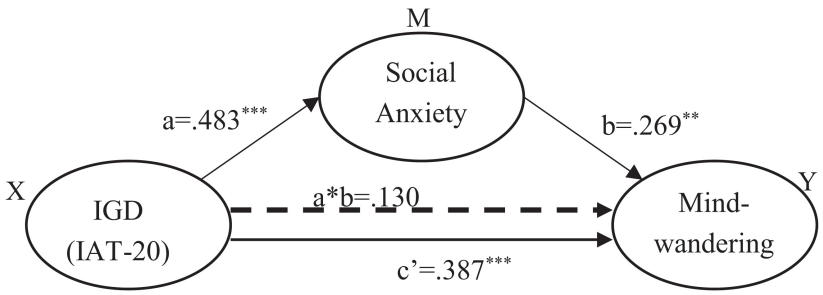

FIGURE 5 | Mediation analysis showing that the relationship between Internet gaming disorder and mind-wandering is partially mediated by social anxiety. $^{***}p < 0.001$.

of mind-wandering. On one hand, individuals with excessive Internet gaming behavior may be more likely to crave for gaming when they are not playing games, which could be regarded as deliberate mind-wandering. On the other hand, one of the criteria of IGD, withdrawal, refers to symptoms that emerge when unable to play or attempting to cut down or stop gaming. The symptoms typically involve feeling restless, irritated, angry, frustrated, anxious, or sad, which suggest that excessive Internet gaming may increase the level of spontaneous mind-wandering by impacting the self-regulation system. Further studies are required to distinguish between the impacts of excessive gaming behavior on the two subtypes of mind-wandering. Nevertheless, either way exerts negative impacts on an individual's long-term benefits.

A previous study has shown an association between excessive Internet use and poor emotional and social skills for social adaptation (Engelberg and Sjöberg, 2004). A higher social anxiety level in the IGD population has also been reported by previous research (Yen et al., 2007). There is also supporting evidence for a positive correlation between IGD and shyness (Lavin et al., 2004), loneliness (Ceyhan and Ceyhan, 2009), and avoiding social relationships (Kraut et al., 1998). The results of the current study are in line with these previous findings showing the co-occurrence of Internet addiction and social anxiety (Lo et al., 2005; Vanzoelen and Caltabiano, 2016). Although a 2-year prospective study showed that social phobia predicted Internet addiction among female individuals, male adolescents were not vulnerable to the effects of depression and social phobia on Internet addiction (Ko et al., 2009). In contrast, Lemmens et al. (2011) revealed that loneliness was a consequence of pathological gaming, which suggested that pathological gaming behavior may deteriorate existing interpersonal relationships and increase gamers' loneliness. It is also possible that the level of social anxiety would increase with such increased feeling of loneliness. In addition, Strittmatter et al. (2015) found that gamers with pathological Internet use showed more peer problems. A huge amount of time spent on gaming might lead to deprivation of interaction with people in real life. They might feel less competent in social relationships and worried about their social abilities more often, resulting in more occurrences of mind-wandering. Most importantly, the ever-raising concern and the diagnosis of IGD in the contemporary social context might exert a negative impact on the self-construction of individuals involving online gaming behavior. Although Internet gamer is a relatively new social group, a stereotype considering them as unattractive, unpopular, and having poor social skills has already come into being (Kowert et al., 2012). As a member of the group, the perceived stereotype of Internet gamers would affect one's identity and behavior and would probably result in a higher level of social anxiety. Research in the future can explore how the perceived stereotype influences the association between gaming behavior and social anxiety.

The current study has several limitations. First, the current study was lacking in longitudinal data and could not confirm

potentially causal relationships among IGD, social anxiety, and mind-wandering. Therefore, further study is required to conclude a causal inference. Nevertheless, we first provided evidence for the possible correlation between IGD and mind-wandering and replicated the results with an independent sample. Second, the diagnosis of IGD was based only on questionnaires relaying on self-report, which could have resulted in a misclassification for some individuals. Third, the sample included a high proportion of college students, which may hamper some of the findings being generalized to other populations. Finally, the current study only used a simple Mind-Wandering Questionnaire with five items. Although it has been validated across college, high school, and middle school samples (Luo et al., 2016) and the questionnaire measuring mind-wandering was significantly correlated with task-unrelated thought captured by a thought sampling experiment (Mrazek et al., 2013b), further study is warranted to validate the results with multiple instruments to better characterize mind-wandering.

CONCLUSION

In conclusion, our study found a positive association between IGD and the level of mind-wandering, and the relationship was partially mediated by social anxiety. While preoccupation of gaming activity may directly increase the occurrence of mind-wandering, IGD may elevate mind-wandering through an indirect path involving social anxiety in which a negative public stereotype of addiction may play an important role. The detrimental consequences of mind-wandering deserve more attention in IGD studies in the future, especially when studying adolescents and young adults in an academic setting.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Research Ethics Review Board of Zhejiang University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JZ, YH, XS, and FG designed the study. JZ collected the data. JZ, ZH, and YH analyzed data. JZ and YH drafted the manuscript. FG, ZH, and XS revised the manuscript. All authors contributed to the article and approved the submitted version.

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Relationship Between Loneliness and Depression Among Chinese Junior High School Students: The Serial Mediating Roles of Internet Gaming Disorder, Social Network Use, and Generalized Pathological Internet Use

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This study aimed to explore the mediating effects of internet gaming disorder, social network use, and generalized pathological internet use (GPIU) on the association between loneliness and depression. A total of 2211 junior high school students completed questionnaires regarding loneliness, internet gaming disorder, social network use, GPIU, and depression (aged 10–16 years). The results of a structural equation model revealed that (a) the path coefficient of loneliness to depression was significantly positive, (b) loneliness could not predict depression through GPIU directly, but (c) loneliness could predict depression through internet gaming disorder to GPIU, (d) loneliness could predict depression through social network use to GPIU, and (e) loneliness could not predict depression through internet gaming disorder to social network use to GPIU. These results provided significant implications for the prevention and reduction of depression in Chinese junior high school students.

Keywords: loneliness, internet gaming disorder, social network use, depression, multiple mediating effects, generalized pathological internet use

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INTRODUCTION

Junior high school students are faced with such problems as high academic pressure and monotonous life, which may easily lead to loneliness, depression, and other mental health problems (Elizabeth and John, 2000; Zhang, 2000; Xu, 2012). In recent years, many studies have proved that depression is a mental illness with high prevalence, high chronic recurrence rate, high disease burden, and high suicide mortality (Birk et al., 2019), and there was a high correlation between loneliness and depression (Ren et al., 2020). Studies have demonstrated that adolescents with generalized pathological internet use (GPIU) usually suffer from loneliness (Sukenick, 2012) and depression (Zou et al., 2007). A number of studies have focused on the research of internet gaming disorder and social networking disorder (Bouna-Pyrrou et al., 2015; Wartberg et al., 2020).

This study aims at studying the mediating effects of internet gaming disorder, social network use, and GPIU on the association between loneliness and depression.

Depression

World Health Organization research worldwide shows that depression is affecting physical and mental health in the 21st century (Holden, 2000). From a psychological point of view, depression is the consequence of an ineffective response to life stress, and emotional disorders are the core characteristic, including worthlessness, helplessness and despair, and decreased levels of physical activity (Hammen, 1992). Depression affects emotions as well as thinking, motivation, attention, imagination, behavior, social relationships, and physical conditions, resulting in people feeling lonely and unwell (Jean-Paul et al., 2001; Garcia-Retamero et al., 2015). Junior high school students are in a critical period of physical and mental development and social maturity (Zhang, 2017). The contradiction between ideal and reality often leads to negative emotions, mainly manifested by depression and anxiety, which hinders the healthy development of junior high school students' mental and physical development (Emamjomeh and Bahrami, 2015). Studies have shown that adolescents' depressive symptoms increase significantly in frequency and generality (Lewinsohn et al., 1993; Yang et al., 2010; Ferguson, 2020). Many factors affect depression, including both external risk factors and individual susceptibility (Tao, 2006).

Loneliness and Depression

Clinical and related statistics have demonstrated that loneliness is a common issue of modern people (Huang, 2000; Naama et al., 2019). Adolescence is a particularly vulnerable stage for experiencing feelings of loneliness, which is a significant factor for adolescent health and quality of life (Carvajal-Carrasca and Caro-Castillo, 2009; Danneel et al., 2019). Peplau and Perlman (1979) pointed that loneliness occurred when a person's social network made him/her less satisfied than he/she expected. Some authors have reported that when social quality declines, the original network of relationships (loss or loss of loved ones, relocation) or lack of social skills (personality factors) could lead to strong loneliness (Vazquez and Garcia, 1997; Teunisse et al., 1999; Tijhuis et al., 1999; Huang, 2000; Van et al., 2017). Hence, loneliness is a subjective feeling of unpleasant suffering caused by social defects (Liu, 1995), and long-term or severe loneliness may trigger certain emotional disorders and reduce mental health (Naama et al., 2019).

Studies found that there was a high correlation between loneliness and depression (Cacioppo et al., 2006; Demir and Kutlu, 2016; Ren et al., 2020). On the one hand, among the negative effects of depression, loneliness is the most common (Ling, 2009). When individuals have negative emotions such as anxiety, pessimism, and disappointment, they tend to experience more feelings of loneliness, loss of help, and desire to be understood. However, on the other hand, loneliness is very detrimental to mental health; a high level of the feeling of loneliness is thought to stimulate depressive symptoms (Wei et al., 2005; Demir and Kutlu, 2016). Qualter et al. (2010) found that the interactive effect of loneliness at 5 and 9 years old predicted depressive symptoms at age 13. Cacioppo et al. (2010) published a recent 5-year longitudinal study that found that loneliness predicted an increase in depressive symptoms at yearly intervals, while depressive symptoms did not predict an increase in loneliness at the same time. A longitudinal study also found a gender-dependent impact of loneliness on depressive symptoms. For females, loneliness could significantly predict the increased depressive symptoms, while for males, loneliness could not (Liu et al., 2019). Therefore, our study will focus on the relationship between loneliness and depression. Based on the above literature discussion, we proposed the following Hypothesis 1: Loneliness could positively predict depression.

Mediating Roles of GPIU

Pathological internet use (PIU) refers to a phenomenon of obvious social and psychological damage caused by excessive use of the internet, which means people are unable to control their internet usage (Musetti and Corsano, 2018; Starcevic et al., 2018). Based on the literature, Davis (2001) proposed a cognitive behavioral model of PIU, which highlighted the important role of maladaptive cognition in the development of PIU. The cognitive–behavioral model provided a theoretical explanation for the origin and pathogenesis of GPIU and specific pathological internet use (SPIU) in identifying the etiology of PIU. Davis (2001) proposed two types of PIU (**Figure 1**): SPIU and GPIU. SPIU is a reliance on the special features of the internet, such as internet gaming disorder and social networks use; GPIU refers to the global set of online behaviors, which contains general, multifaceted internet overuse that perhaps includes no clear destination killing time online (Lopez-Fernandez, 2018). Davis (2001) believed that psychopathology was the distal necessary cause of GPIU/SPIU symptoms. The underlying psychopathology itself did not cause the symptoms of GPIU/SPIU, but it was a necessary factor in its etiology. The key factor in the occurrence of GPIU/SPIU was maladaptive cognition, which was its proximal and sufficient reason.

Generalized pathological internet use, characterized by excessive or compulsive internet use and a preoccupation with and loss of control over this use, results in negative personal, professional consequences (Davis, 2001; Caplan, 2002), and may be detrimental (Greenfield and Yan, 2006). Studies found that adolescents with GPIU usually suffered from loneliness (Young and Rogers, 1998; Engelberg and Sjoberg, 2004; Sukenick, 2012), depression (Jia, 2005; Zou et al., 2007), shyness (Eroglu et al., 2013), poor interpersonal relationships (Sanders et al., 2000; Odaci and Çikrikçi, 2014), cognitive distortion (Lu and Yeo, 2015), and other decreases in well-being (Liu et al., 2012). According to the cognitive behavioral model (Davis, 2001), pre-existing psychosocial problems (depression, or low levels of social support) predispose an individual to GPIU cognitions, behaviors, and negative outcomes. Therefore, investigating the detailed relationships of these variables and GPIU is necessary.

Internet addiction was positively associated with loneliness and depression (Kraut et al., 1998; Young and Rogers, 1998; McKenna and Bargh, 2000; Li et al., 2001; Nie et al., 2002; Young and Kimberly, 2007; Ko et al., 2009). Loneliness is more common among internet addicts (Fan and Yuan, 2018), and

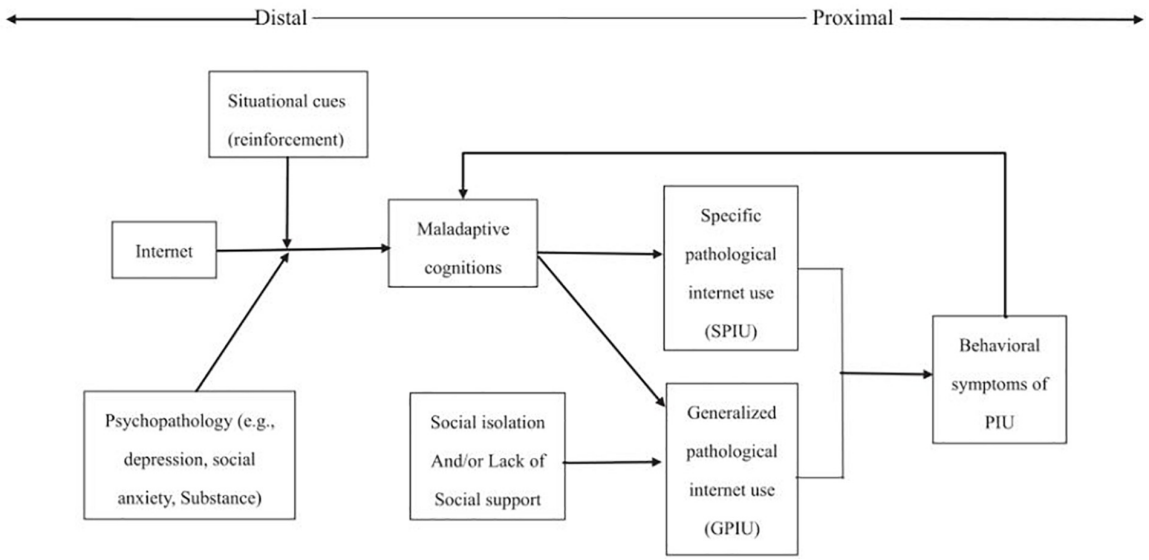

FIGURE 1 | Cognitive behavioral model of pathological internet use (PIU). Adapted from Davis (2001).

loneliness in children and adolescents is one of the predictors of internet addiction (Pontes et al., 2014). Tian et al. (2017) found that the association between loneliness and GPIU was dynamic and bidirectional, and Gao et al. (2018) found that loneliness could predicted GPIU. Then, Demir and Kutlu (2016) noted that loneliness was a significant predictor of internet addiction among college students at ages 17–31. In addition, a study found that teenagers in an internet addiction group had more experiences of online anxiety and depression (Jia, 2005; Zou et al., 2007). Akin and İskender (2011) pointed that if individuals could reduce their internet addiction, they would be able to reduce their depression level. Studies applying longitudinal designs pointed that the GPIU caused depression (Regina et al., 2011), and Park (2009) found that use of the internet tended to increase depression by a longitudinal study. Hence, we will focus on the mediating roles of GPIU between loneliness and depression. So, we proposed Hypothesis 2: Loneliness could predict depression through GPIU.

Mediating Role of Internet Gaming Disorder and Social Network Use Between Loneliness and GPIU

To improve prevention and intervention of GPIU, its inner working process must be explored, such as an investigation of the intermediary mechanism, which helps to explain how loneliness affects GPIU. The internet gaming disorder and problematic use of social networks belong to SPIU. Young and Kimberly (1998, 2007) conducted a series of studies on the behavioral characteristics of internet addicts. The results suggest that internet addicts tend to prefer online chat and online interactive games. Therefore, Young and Rogers (1998) posited that the internet was not addictive, but special network applications contributed to the occurrence of internet addiction. Gross (2004) research emphasized that the internet was very important for today's youth and that computer games and the internet communication may lead to social isolation by replacing friends of children or young people. Also, more internet-addicted students indulge in new and exciting online games and two-way interactive online chat (Yao and Yang, 2014; Zhang and Lei, 2015). In recent years, a number of studies have proposed that the concept of internet addiction lacks specificity and focused on the research of internet gaming disorder and social networking disorder (Bouna-Pyrrou et al., 2015; Wartberg et al., 2020).

First, we proposed social network use as a mediator between loneliness and GPIU. Morahan-Martin and Schumacher (2000) found that individuals with high loneliness were more likely to seek social satisfaction on the network to compensate for social deficiencies in real life. Doane (2008) also found individuals' loneliness experience was an important psychological factor that affected interpersonal communication, and individuals with high loneliness and social anxiety often cannot establish stable interpersonal relationships in real life and often search for alternatives through the network. Błachnio et al. (2016) also found that individuals with high loneliness used mobile social networks more often than individuals with low loneliness. In addition, some studies have asserted that online social networking can reduce more social cues and less direct evaluation by others than offline social networking. People prefer to self-present through social networks, establish and maintain their positive image, and reduce and avoid the level of anxiety that exists in real life (Lee et al., 2014). Thus, teenagers with loneliness are more likely to choose online socializing, which is manifested as pathological social network use.

Another mediator variable is internet gaming disorder. Internet games are a new form of entertainment combining traditional games with the internet, which have strong interactivity and virtuality, and will lead to many behavioral problems among teenagers (Chen and Fu, 2012), such as tired of

school, truancy, dropping out of school, and even cybercrime. The emotional deficiency of lonely individuals in real life can be satisfied through social activities and emotional communication through games in the virtual world (Griffiths et al., 2004), which will make lonely people spend more time on online games, and leads to internet gaming disorder. Bozoglan et al. (2013) pointed that loneliness, self-esteem, and life satisfaction were affirmed to account for 38% of the total variance in internet gaming addiction, and loneliness was the most important variable predicting internet addiction. Lee et al. (2019) also proposed the relationship between loneliness and online game addiction. So, we presented Hypothesis 3: Loneliness could predict depression through social network use to GPIU; and Hypothesis 4: Loneliness could predict depression through internet gaming disorder to GPIU.

What is more, at present, more and more people use internet games to socialize online, but there are few relevant studies. Therefore, this study will also explore the chain mediating effect of internet gaming disorder to social network use in loneliness to GPIU. So, we further put forward Hypothesis 5: Loneliness could predict depression through internet gaming disorder to social network use to GPIU.

MATERIALS AND METHODS

This study conformed to the code of ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans and was approved by the Ethics Committee of Shandong Normal University. Additionally, our research obtained written informed consent from the parents of the participants.

Participants

The participants were from a junior high school in Eastern China, which is an ordinary school and whose students are representative. Students in the first through third grades were included. After eliminating incomplete and repetitive questionnaires, a total of 2211 valid questionnaires were received. Overall, 1087 (49.2%) participants were male and 1124 (50.8%) were female. Their mean age was 13.04 years (aged 10–16 years, $M = 13.04$, $SD = 1.226$).

Procedures

We obtained informed consent from the school administrators and students before data collection. The paper questionnaire in Chinese was used in this study. To maintain the quality of the investigation, the junior high school students were gathered in a large assembly room to complete their questionnaires with the help of two researchers. The other grades finished the questionnaires with the help of two researchers during one full class period of 45 min.

Measures

UCLA Loneliness Scale

The UCLA Loneliness Scale comprises 20 items, for example, "I am unhappy doing so many things alone." The items were rated on a four-point scale for frequency (1 = often to 4 = never). The final score was calculated by the total score of all the items, and higher scores indicated greater levels of loneliness. We also conducted CFA, with $\chi^2/df = 3.846$, $RMSEA = 0.023$, and $CFI = 0.993$. Cronbach's alpha for the UCLA Loneliness Scale was 0.855.

Center for Epidemiologic Studies Depression Scale (CES-D)

The CES-D Scale was used to measure the students' depression, which was adapted to the Chinese language and culture and comprised 20 items, for example, "I felt that I could not shake off the blues even with help from my family or friends." The students rated each item on a four-point scale from 1 = rarely or none of the time (less than 1 day) to 4 = most or all of the time (5–7 days). To calculate the final CES-D score, the scores of all the items were added. A very high score meant severe depression. We also conducted CFA, with $\chi^2/df = 3.510$, $RMSEA = 0.022$, $CFI = 0.994$, and Cronbach's alpha was 0.894.

Generalized Pathological Internet Use Scale (GPIUS)

To measure the students' generalized pathological use of the internet, Patricia Gomez's GPIUS was adapted (Gómez et al., 2017). A total of 11 items were comprised in this version of the GPIUS, for example, "You connected to the internet even though you knew it could get you in trouble." The items on the GPIUS were rated on a seven-point Likert scale (1 = completely disagree to 7 = completely agree). In the end, the scores of all the items were added to obtain the total GPIUS score. The higher the score, the more serious the GPIU situation was. We also conducted CFA, with $\chi^2/df = 3.794$, $RMSEA = 0.023$, and $CFI = 0.998$. Cronbach's alpha for the GPIUS was 0.883.

Ten-Item Internet Gaming Disorder Test

The Ten-Item Internet Gaming Disorder Test (IGDT-10) comprised 10 items and assesses levels of IGD (Orsolya et al., 2017). In an attempt to operationalize IGD, this instrument used the nine DSM-5 criteria in a brief and simple manner and adopted clear, unambiguous wording for each item. The diagnostic criteria of IGD based on the DSM-5 were strictly followed while considering Petry et al. (2014) recommendations to increase content validity. Each criterion was operationalized using a single item, except for the last criterion, referring to "jeopardy or losing a significant relationship, job, or educational or career opportunity because of participation in internet games" (Orsolya et al., 2017). This criterion was operationalized through two items given its complexity and description of more than one construct. Response options for the 10 items were never, sometimes, and often instead of yes and no. Consequently, the composite score of IGDT-10 was from 0 to 9, and higher scores indicated more severe cases of IGD. The CFA demonstrates that the fitting index is acceptable: $\chi^2/df = 11.5$, $RMSEA = 0.045$, and $CFI = 0.994$. Cronbach's alpha of the scale was 0.68.

Social Network Use Intensity Scale

The original scale used the social strength website questionnaire compiled by Ellison, Steinfield, and Lampe to assess the intensity of youth social networking use (Ellison and Steinfield, 2006). The

questionnaire comprises eight items, and the first two items use a self-reporting method to measure the number of individual social networking friends and the average daily spending on social networking sites. The latter six items use the seven-point Likert review method to measure the emotional connection strength of individuals and social networking sites and the extent to which social networking sites integrate individual life. This questionnaire removes the first two items. This measure includes two self-reported assessments of the Chinese network tools QQ and WeChat. Twelve questions measure the intensity of QQ and WeChat use. Six questions are related to WeChat, and QQ is the same. One sample item is as follows: Social networking sites are part of my daily activities. Participants rated each item on a five-point scale, from 1 (I really disagree) to 5 (I very much agree). All scores were standardized and added together, which is the intensity score for social networking sites. The higher the score, the greater the intensity of social networking sites. We also conducted CFA, with $\chi^2/df = 35.99$, $RMSEA = 0.138$, CFI = 0.865, and Cronbach's alpha was 0.877.

Statistical Analysis

Liu pointed that the coefficient test results of normal distribution should be combined with the sample size. In large samples ($n \geq 200$), the influence of non-normal would be reduced; that is, the assumption of normal distribution in large samples could be slightly violated (Liu, 2019). In this study, the test of the normality of variables was carried out by means of graphic test (Q–Q graph). First of all, as shown in the **Figure 2**, the Q–Q graph was used to test the normality of each variable, and the variables basically presented a normal distribution. The missing values were replaced by means. To prevent measurement errors caused by common method bias, we used Harman single factor analysis (Podsakoff et al., 2003). Next, descriptive and correlation analyses were used. Subsequently, a structure equation model was used to evaluate a multiple mediation model for the roles of social network use, internet gaming disorder, and GPIU in the relationship between loneliness and depression.

Moreover, parceling strategy was adopted to improve the quality of the model fit and the indicators (Tian et al., 2017). Firstly, we executed a factor analysis. Then, we sorted the items of each observed variable from highest to lowest according to factor loading size (Rogers and Schmitt, 2004). We sequentially assigned the highest and lowest remaining items to each package in turn and alternated the package until all items were completed.

The fits of the model were assessed using the chi-square (χ^2) test, the RMSEA, the CFI, and the TLI. Considering the χ^2 test is easily affected by the size of samples, model fit indices were used as the major standard to assess the model fit (Gao et al., 2018). The CFI and TLI ranged from 0 to 1, with values above 0.90 representing sufficient model fit (Hoyle, 1995). A criterion of thumb for the RMSEA is that values $\geq$0.10 represent poor fit, values between 0.05 and 0.08 represent a reasonable error of approximation, and values $\leq$0.05 represent close approximation (Cudeck and Browne, 1992).

We used the structural equation model to investigate the relationship of these variables through Mplus 7.0. The bootstrapping method was conducted to test the mediation effects. According to the mediation effect test procedure, the direct effect of loneliness on depression was first tested, and then the significance of the path coefficient and the fitting of the model after the addition of the mediator variables social network use, internet gaming disorder, and GPIU were tested. From 1000 resamples of the data, this method produced 95% bias-corrected confidence intervals of these effects. When the confidence interval did not contain zero, it meant that there was a significant effect at $p < 0.05$.

We conducted the common variance analysis to measure whether common method biases existed in this study. The χ^2 test of Bartlett's test of sphericity was significant. Then, we extracted 12 eigenvalues greater than 1 after a principal component analysis. The first factor to explain the variance was 19.305%. The results were less than the critical standard of 40% (Podsakoff et al., 2003), indicating that these instruments had no problem with the common method biases.

RESULTS

Descriptive Statistics and Correlation Analysis

Table 1 shows the descriptive statistics and Pearson correlation of social network use, loneliness, internet gaming disorder, depression, and GPIU. The results indicated that loneliness had a weak negative correlation with social network use, and there was a significant positive correlation between other variables.

Testing for Multiple Mediating Roles of Social Network Use, Internet Gaming Disorder, and GPIU

First, the finding demonstrated that the path coefficient of loneliness to depression was significantly positive (**Figure 3**). The fits of this model were $\chi^2/df = 5.78$, $RMSEA = 0.051$, $NFI = 0.978$, $CFI = 0.975$, and $TLI = 0.968$, which indicated that the model was appropriate and acceptable.

Second, the indirect effects of internet gaming disorder, social network use, and GPIU between loneliness and depression were explored (**Figure 4**). The path coefficients of loneliness to internet gaming disorder/social network use, internet gaming disorder to social network use, internet gaming disorder/social network use to GPIU, and GPIU to depression were significantly positive. Specifically, the direct path coefficients of loneliness to GPIU were not significant.

Third, most of the mediated effects paths were significant (**Table 2**). Specifically, loneliness could predict depression through social network/internet gaming disorder to GPIU. However, loneliness could not predict depression through GPIU. The direct effect of loneliness on depression was significant, but path loneliness to GPIU was not significant after the addition of two mediator variables. What is more, loneliness could not predict depression through internet gaming disorder to social network use to GPIU.

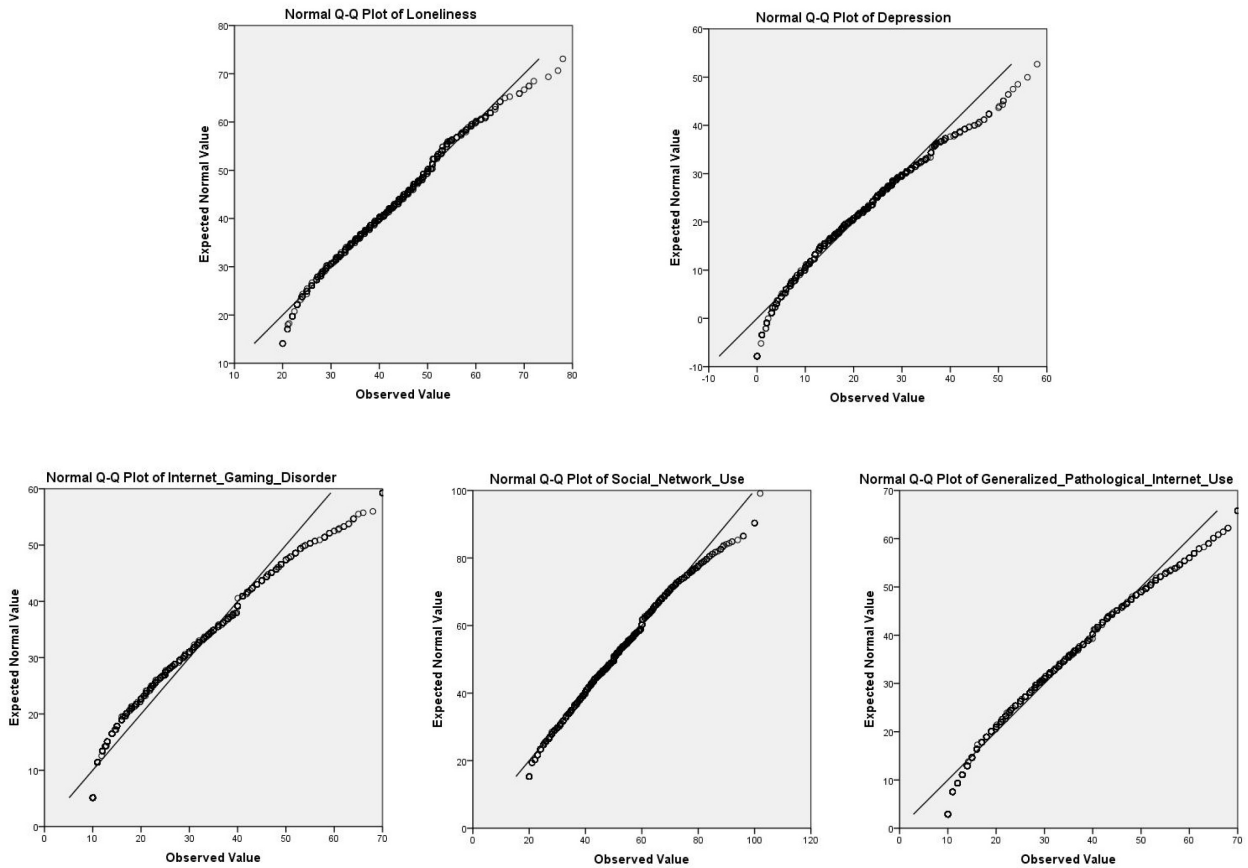

FIGURE 2 | The Q–Q graph of each variable.

DISCUSSION

The purpose of this study was to explore the relationship between loneliness and depression and the mediating effects of social network use, internet gaming disorder, and GPIU, in order to further explore the underlying mechanisms by which loneliness affects depression. The total effect model indicated that loneliness could positively predict depression, and Hypothesis 1 was supported. The multiple mediation model showed that loneliness did not affect depression through GPIU, which did not support Hypothesis 2. The model also indicated that the two mediators of internet gaming disorder and social network use parallel mediated the relationship between loneliness and depression through GPIU, which supported Hypotheses 3 and 4. However, the two mediator variables could not have a sequential relationship between loneliness and depression, which did not support Hypothesis 5.

Loneliness and Depression

The result showed that the path coefficients of loneliness to depression were significantly positive, which was consistent with previous studies (Wei et al., 2005; Wang et al., 2008; Cacioppo et al., 2010; Demir and Kutlu, 2016). Studies have shown that loneliness is still significantly associated with depressive symptoms after controlling for demographic information (including gender, age, financial income, marital status, etc.) and risk factors that jointly influence loneliness and depression (including hostility, social support, stressors, etc.) (Cacioppo et al., 2006; Demir and Kutlu, 2016; Ren et al., 2020). Loneliness is associated with personality disorders, psychiatric disorders, and suicide, which can also impair executive control and increase depressive symptoms (Richman and Sokolove, 1992; Neeleman and Power, 1994; Deniro and Dorothy, 1995; Cacioppo et al., 2006; Mushtaq et al., 2014).

Several reasons have been proposed to explain why loneliness is connected with the development of depression. First, lonely individuals always have negative perceptions of things, are susceptible to negative emotions, and often show hostility, and hostility is significantly related to depression (Doering et al., 2009; Li Y. L. et al., 2019). Second, students affected by short-term loneliness and long-term loneliness are more likely to be depressed and unwilling to communicate with others. If these students do not find a proper channel for catharsis, this situation may not improve and may be exacerbated (Van et al., 2017; Sun and Liu, 2018). In addition, De Jong-Giervald (1987) defined loneliness as a subjective social isolation, accompanied by personal perceptions, unacceptable painful experiences resulting from isolation or lack of contact with others, and long-term

TABLE 1 | Descriptive statistics and correlation matrix of all variables.

Variable	*M*	*SD*	1	2	3	4	5
Loneliness	41.42	9.16	1				
Social network use	49.83	14.23	−0.046*	1			
internet gaming disorder	24.76	12.99	0.199**	0.344**	1		
GPIU	31.02	12.73	0.221**	0.305**	0.616**	1	
Depression	17.34	10.14	0.626**	0.103**	0.318**	0.341**	1

*N = 2211. *p < 0.05, **p < 0.01.*

loneliness that has an adverse effect on the health of lonely patients and can cause emotional disorders such as depression. Long-term loneliness can have a negative impact on their blood pressure and immunity, leading to poor health and emotional disorders such as depression (Dai, 2017; Naama et al., 2019).

However, there is a co-existence between depression and loneliness (Cacioppo et al., 2006; Demir and Kutlu, 2016; Ren et al., 2020); people with depression are more likely to feel lonely due to actively avoiding people (Xue, 2017). What is more, individuals with depression tend to lack confidence and have low self-evaluation, which may lead to feelings of loneliness (Guo et al., 2016). Therefore, further longitudinal studies are needed to determine the causal relationship between loneliness and depression.

The Key Mediating Role of GPIU

Loneliness, internet gaming disorder, and social network use were significantly associated with GPIU, and GPIU was significantly related to depression. The results of this study supported the theory by Kraut et al. (1998), which pointed that when researchers controlled possible mediating variables, loneliness, depression, and daily stress were positively correlated with greater internet usage. The important finding was that further use of the internet was related to an increase in depression over a subsequent period of time (Kraut et al., 1998), which was found in more later studies (Jia, 2005; Zou et al., 2007; Park, 2009; Akin and İskender, 2011; Regina et al., 2011). Several studies have mentioned the theoretical basis for the link between loneliness, depression, and internet addiction (Davis, 2001; Chung, 2013).

This study found that loneliness was not directly related to depression through GPIU, which was not consistent with previous assumptions. Previous studies supported the idea that some people used the internet to cope with negative emotions such as sadness, anxiety, or loneliness (Scherer, 1997; Muñoz-Rivas et al., 2010; Zhou et al., 2017) or to escape psychological problems (Morahan-Martin and Schumacher, 2000). Affected by Davis (2001) cognitive behavioral model, Caplan (2002) argued that people with psychological problems were more likely to choose to communicate online than face to face in order to compensate for their social skills. However, if people use the internet excessively or inappropriately, it will have a bad effect on body and mind (Li, 2020).

The possible reason about this study result is that loneliness could actually affect depression through GPIU, but as a result of SPIU (internet gaming disorder and pathological social network use) as a mediation variable in the model, the direct effect of loneliness on GPIU is weakened. According to Davis' cognitive behavior model of PIU (Davis, 2001), SPIU and GPIU have a side-by-side relationship, but based on the literature (Bouna-Pyrrou et al., 2015; Wartberg et al., 2020), we speculate that psychopathology and maladaptive cognition could directly lead to SPIU (e.g., internet gaming disorder and pathological social network use) in some cases and then lead to GPIU. The key to the occurrence of PIU is the emergence of social network use and internet gaming disorder, which is a sufficient cause of PIU symptoms, and which ultimately leads to the development of PIU symptoms, such as depression. Previous studies revealed that pathologic internet use could be associated with depression, substance-related disorders, obsessive–compulsive symptoms, low self-esteem, and attention deficits (Shapira et al., 2000; Tsai and Lin, 2003; Kim et al., 2006). What is more, Liang et al. (2016) pointed that in female adolescents, internet addiction was found to significantly predict subsequent depression, indicating that internet addiction leads to depression and supporting the social displacement hypothesis. The possible reason is that teenagers with internet addiction are addicted to the virtual world, which interferes with their interpersonal relationship in the real world, resulting in the lack of face-to-face communication with others and lack of social support in the real world, so they are prone to become depressed (Kraut et al., 1998; Yang, 2016).

Mediating Roles of Social Network Use and Internet Gaming Disorder

In the mediation process of loneliness to internet gaming disorder/social network use to GPIU to depression, the results of this research were consistent with other related research (Morahan-Martin and Schumacher, 2000; Yan, 2009). A possible reason for this similarity is that loneliness is a factor that has been frequently associated with GPIU (Morahan-Martin and Schumacher, 2000; Davis, 2001; Caplan, 2007; Ceyhan and Ceyhan, 2008; Kim et al., 2009; Dowling and Brown, 2010; Odaci and Kalkan, 2010; Ang et al., 2012; Barthakur and Sharma, 2012). Additionally, social network use and internet gaming disorder are two important forms of internet addiction, and people maintain social connections through these two forms. Loneliness occurs when social connections are cut off (Blazer, 1983; Lv, 2016), and the emergence of loneliness makes people try to reconnect or establish new connections (Weiss and Bowlby, 1975; Cagan, 2009). Social networking chat and internet gaming are critical ways for interpersonal interactions and relaxation (Li, 2015). It is worth noting that it is wise to distinguish between GPIU and specific network-related behavior in question. Research on specific behaviors that individuals engage in on the internet shows that individuals are not addicted to the internet media itself but to the specific behaviors or content they engage in or access (Starcevic, 2013; Brand et al., 2016).

Social networks are an emerging network of communication media used primarily to maintain existing relationships (Antheunis et al., 2010; Boyd and Ellison, 2010). Notably, supplementations to offline interpersonal communication are important (Kujath, 2011). Behavioral experiments have also shown that social site status updates have become an

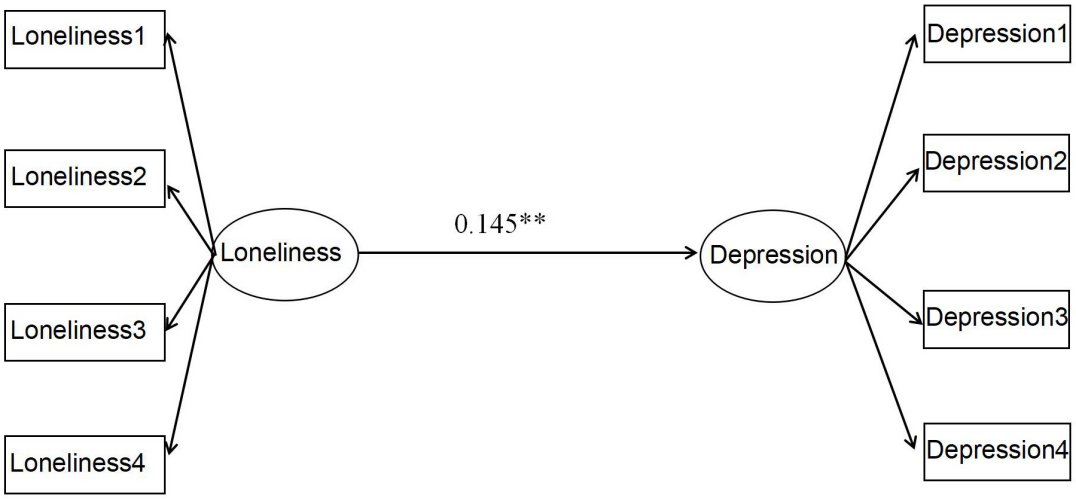

FIGURE 3 | Total effect model. Path values are the path coefficients. $^{**}p < 0.01$. The latent variables loneliness and depression were divided into four packages through the packaging strategy.

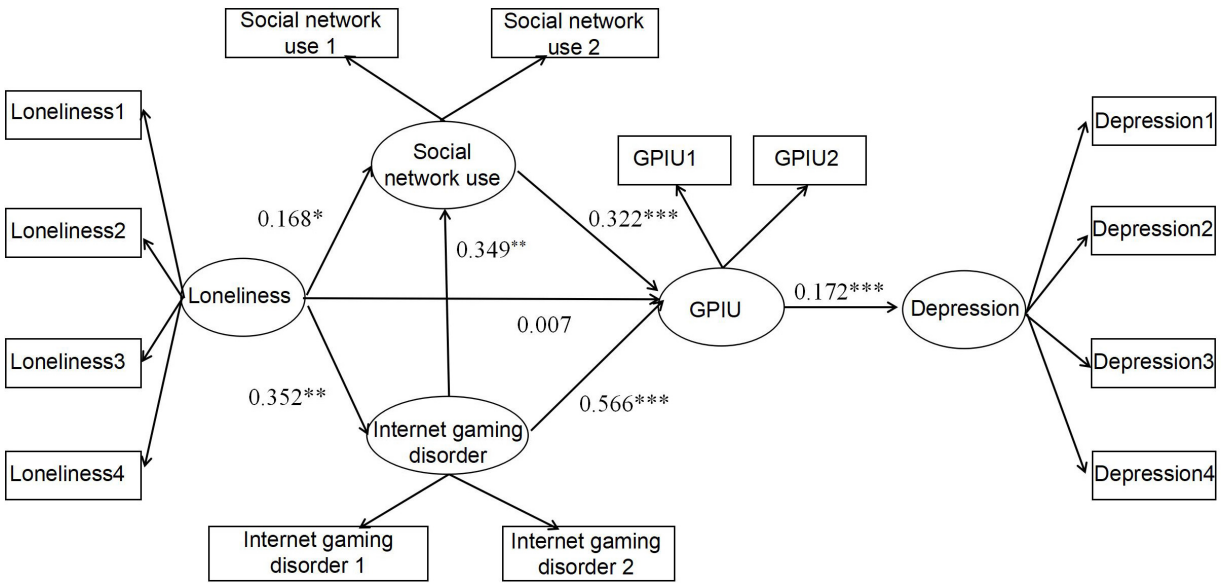

FIGURE 4 | Multiple mediation model. $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$. The latent variables loneliness and depression were divided into four packages through the packaging strategy, and the latent variables social network use, internet gaming disorder, and GPIU were divided into two packages through the packaging strategy.

important aspect of social networking sites, and lonely people can significantly reduce the loneliness of personal experiences through social networking sites (Deters and Mehl, 2013). Positive online feedback may be one of the reasons why social network use reduces individual loneliness. Social networks based on acquaintances make it easier for individuals to obtain supportive feedback from, for example, friends and classmates. From a theoretical point of view, Social compensation model theory believes that individuals with less social connections may use the internet to obtain compensation for interpersonal interactions, to meet the psychological needs that are lacking in real life, and to obtain satisfactory social relationships (Kraut et al., 1998). In addition, Suler (1999) found that the need for social interaction is one of the needs of internet addiction. When the satisfaction brought by the internet to the lonely individual is stronger than the satisfaction in real life, the lonely individual may be addicted to the internet, which is consistent with the satisfaction theory. However, if the lonely individual relies too much on network compensation and without restraint, it may become a PIU (Zhang et al., 2017). What is more, the model of the poor becoming rich is derived from the theory of social compensation, which believes that the network can enhance

TABLE 2 | Test of the total effect model and mediation effect model.

Path	Standardized path coefficient	95% confidence interval	
		Lower	Upper
a. Total effect model			
Loneliness → depression	0.044**	0.012	0.078
b. Multiple mediation model			
Loneliness → GPIU → depression	0.001	−0.020	0.023
Loneliness → internet gaming disorder → GPIU → depression	0.034**	0.015	0.054
Loneliness → social network use → GPIU → depression	0.009*	0.002	0.017
Loneliness → internet game disorder → social network use → GPIU → depression	0.005	−0.003	0.011

*N = 2211. *p < 0.05, **p < 0.01.*

the connection between individuals and others and promote the formation of intimate relationships (Tan, 2015). The social lack of lonely individuals in real life can be satisfied through the interactive nature of online games and supportive interpersonal communication (Valkenburg et al., 2005).

What is more, the concealment of the network and the irritability of internet games greatly satisfy the self-demand that they cannot achieve in reality. Internet games have also become a passive lazy escape response to problems. According to the reinforcement theory (Villere and Hartman, 1991), the increasing use and reinforcement of technology are the elements of internet gaming disorder. The improvement of game technology will make individuals psychologically satisfied and thereby escape and eliminate the discomfort brought to them by real life sense. Through continuous learning and upgrading skills in the game, teenagers show their extraordinary wisdom through superb technology, win the attention of all players, and enjoy the sense of accomplishment brought by self-realization (Kuang, 2017). Due to lack of social support, lonely individuals are more likely to produce negative self-awareness, such as self-denial and inferiority (Hou, 2013). The improvement of technology in online games will help lonely people to generate positive self-evaluation and achieve a sense of accomplishment, which in turn increases their dependence on online games, leading to addictive behaviors (Bozoglan et al., 2013; Lee et al., 2019).

Implications for Prevention of Depression

The results of this study were of great significance to depression prevention and intervention strategies for Chinese students. First of all, junior high school students under great study pressure and housing pressure were very prone to depression. Therefore, depressed students deserve more attention from teachers and parents. Teachers and school doctors are required to improve their quality, pay attention to the psychological status of students, and treat students with a positive attitude. Parents should also strive to provide good parenting for their children. Through appropriate expectations and a harmonious family environment, parents can provide children a benign stimulus so that they can adopt a positive coping style to apply to various contradictions and prevent the formation of adverse emotions (Zhu et al., 2003; Li T. H. et al., 2019). Furthermore, two strategies can help students cope with depression. One strategy is to overcome the behavioral symptoms of internet addiction, starting with reducing the use of social networking and internet gaming disorder (SPIU). In this regard, the cognitive behavior model is useful (Davis, 2001). Moreover, other interventions could focus on initial variables such as loneliness because loneliness is very unfavorable to mental health and promotes depression (Wei et al., 2005). Thus, regular group counseling activities should be organized for junior high school students to promote interaction among students and reduce loneliness, SPIU, GPIU, and depression, respectively.

Limitations and Future Directions

Although this study was conducive to understanding the relationship between loneliness and depression in Chinese students, there were still some limitations. First, this study was a cross-sectional study, and its results could not provide a causal relationship. Therefore, further research could explore the causal relationship between these variables through experiments or longitudinal studies, such as loneliness and depression. Another limitation was that the questionnaire survey used in this study may cause some errors. For example, self-reported questionnaires were influenced by social desirability. Hence, further research may apply more professional surveys (e.g., Survey Monkey or Google Forums) to directly record time spent, eliminating coding data errors and controlling the answers at random. In addition, the convenience sampling may limit the generalizability of the result, so if there is an opportunity, we will expand the sample and increase the randomization level of the sample. What is more, other mediators of the relationship between loneliness and depression (such as meditation), as well as how social network use and internet gaming disorders predict depression, and how the two-way relationship needs to be explored. Last but not least, this study was conducted in the context of Chinese culture, so the cross-cultural applicability of the conclusions must be further verified.

CONCLUSION

In this study, we discussed the mediating effects of internet gaming disorder, social network use, and GPIU on loneliness and depression, and the conclusions were as follows: (a) loneliness

could positively predict depression; (b) loneliness could not predict depression through GPIU directly; (c) loneliness could predict depression through internet gaming disorder to GPIU; (d) loneliness could predict depression through social network use to GPIU; and (e) loneliness could not predict depression through internet gaming disorder to social network use to GPIU.

DATA AVAILABILITY STATEMENT

The datasets for this manuscript are not publicly available because the datasets are used only for the team of this article by the permission of the guardians. Requests to access the datasets should be directed to PW, 122394108@qq.com.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of Shandong Normal University. The guardians of the participants provided written informed consent to let them participate in this study.

AUTHOR CONTRIBUTIONS

PW was the research designer. JW and YY were in charge of writing. XZ and YT participated in the discussion and offered suggestions. YS was the corresponding author. All authors contributed to the article and approved the submitted version.

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Study of the Influencing Factors of Cyberbullying Among Chinese College Students Incorporated With Digital Citizenship: From the Perspective of Individual Students

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Understanding the influencing factors of cyberbullying is key to effectively curbing cyberbullying. Among the various factors, this study focused on the personal level of individual students and categorized the influencing factors of cyberbullying among college students into five sublevels, i.e., background, Internet use and social network habits, personality, emotion, and literacy related to digital citizenship. Then a questionnaire survey was applied to 947 Chinese college students. The results show that cyberbullying among Chinese college students are generally at a low level. There are many factors influence cyberbullying. Specifically, at the personal background level, gender has a significant impact on cyberbullying and being cyberbullied. In terms of personal Internet use and social network habits, students' average daily online time has no significant correlation with cyberbullying and being cyberbullied; however, the proportion of online non-learning time has a significantly positive correlation with cyberbullying, and the proportion of online learning/work time has a significant impact on being cyberbullied. At the personality level, the Big Five personality traits have varying degrees of correlation with and influence on cyberbullying and being cyberbullied. At the personal emotions level, students' life satisfaction has a significantly negative correlation with cyberbullying and being cyberbullied while it only has a significant impact on being cyberbullied; the personal stress and empathetic concern aspects of empathy have a significantly positive correlation with cyberbullying and being cyberbullied among female students. At the literacy related to digital citizenship level, students' understanding of and compliance with Internet etiquette have significantly negative impacts on cyberbullying; the ability to communicate and collaborate online and Internet addiction have significantly positive impacts on cyberbullying and being cyberbullied; the understanding of and compliance with relevant digital laws and regulations have significantly negative correlations with cyberbullying and being cyberbullied. Overall, college students' digital citizenship level has a significantly negative correlation with

cyberbullying but no significant correlation with being cyberbullied. Finally, analysis and suggestions were provided according to these statistical results and the effects of these factors on cyberbullying and being cyberbullied among college students, so as to help solve this problem and provide a new perspective for research in this field.

Keywords: cyberbullying, college student, influencing factors, digital citizenship, individual students

INTRODUCTION

Currently, the Internet has penetrated into all aspects of people's lives. While providing various conveniences, the Internet has also caused a series of social problems such as spam, Internet addiction, and Internet crime. In recent years, cyberbullying, as a representative of abnormal Internet behaviors, has been prominent in many countries (e.g., the United States, Japan, and Australia), in which countermeasures and preventive measures against cyberbullying have been formulated. Instagram, a well-known social platform, began developing automated cyberbullying filtering tools in 2019. In his book, Ivester (2011) maintains that social media is evolving into an alternative mechanism of communication and contact among people and is continuously in fashion among students, greatly increasing the likelihood of cyberbullying on college campuses (Washington, 2015). This is especially true for Chinese college students. Statistical results show that Internet users aged 10–19 and 20–29 accounted for 14.8 and 19.9% of the whole population in China (China Internet Network Information Center, 2020), and 87.8% of college students love to use social communication applications (iiMedia Research, 2018). Partly because Chinese college students have much free time and are curious about the outside world, which, coupled with the absence of parental supervision, has led to college students being the major Internet users among the adolescent population. However, negative information is becoming more common in digital society. Being inexperienced and immature emotionally and intellectually, without having established the "Three Views"[1], college students are more inclined to be inadvertently involved in cyberbullying (as a perpetrator or a victim) and exert adverse influences on others and society as a whole.

Under this circumstance, it is necessary to know the current situation of cyberbullying among Chinese college students and reveal potential influencing factors to help cub it effectively. However, the literature survey of the China National Knowledge Infrastructure (CNKI) indicated that as of July 2020, there has been only 13 publications on "cyberbullying" and "influencing factors," all published after 2015, accounting for 3.8% of all 337 articles with the subject "cyberbullying." The lack of studies on the influencing factors of cyberbullying makes relevant prevention strategies and containment mechanisms ineffective and impertinent. Additionally, in terms of research objects, most of the previous studies in China have focused on cyberbullying among youth, with only 32 articles on college students and none on influencing factors. In fact, college life is the most critical time before an individual enters society and thus a critical period for the formation and establishment of personality, morals, and the "Three Views." Being deeply involved in the Internet and digital society, college students should be guided to keep away from cyberbullying. Therefore, understanding the influencing factors of cyberbullying among them and developing targeted prevention strategies are very important for effectively addressing the problem. In this regard, based on discovering the current situation of college student cyberbullying in China, this paper examined its influencing factors from the perspective of individual students to provide suggestions for the intervention and prevention of cyberbullying.

LITERATURE REVIEW AND HYPOTHESES

Literature Review

Literature review showed that the existing studies mainly focused on individual students, families, schools, society, and the environment. Specifically, in terms of individual students, Li (2007), Kowalski et al. (2012b), Topcu and Erdur-Baker (2012) and many other investigators revealed that cyberbullying is gender related. Hsu and Wang (2010) found that personality traits are predictive of cyberbullying, and Gibb and Devereux (2014) and Goodboy and Martin (2015) showed that the dark personality theory can describe the common characteristics of cyberbullies: self-righteous, ruthless, and aggressive. From the psychological perspective, Sun and Deng (2016) found that both perpetrators and victims of cyberbullying have more negative emotions; Liu and Xu (2019) found that the psychological factors related to cyberbullying include empathy, narcissism, self-esteem, depression, and anxiety; Gini and Pozzoli (2009) and Renati et al. (2012) found that cyberbullying is associated with an individual's empathy; cyberbullying perpetrators often lack empathy and have emotional difficulties (Weaver and Lewis, 2012; Barlińska et al., 2013). Zhao and Wang (2019) demonstrated that college students' perception of well-being is closely correlated with their Internet usage, and Li (2007), You (2013), Hayton (2017), and Nurlita et al. (2018) showed that the frequencies of Internet use and social media use have an important impact on cyberbullying.

In terms of family factors, Ybarra and Mitchell (2004) found that cyberbullying is closely related to the relationship between

[1] View of world: The fundamental cognitive orientation of an individual or society encompassing the whole of the individual's or society's knowledge and point of view. View of life: The general and fundamental view of the purpose and meaning of life, the path of life and the way of life formed by people in practice. It determines the goal of people's practical activities, the direction of life, and also the value orientation of people's behavior choices and their attitude toward life. View of value: Cognitions, understandings, judgments, or choices made based on people's certain thinking and senses. That is, a kind of thinking or orientation by which people recognize things and distinguish right from wrong.

family members; Wang et al. (2012), Bayraktar et al. (2015), and Elsaesser et al. (2017) confirmed the connection between cyberbullying behavior and a lack of parental support; and Pillay (2012) and Park et al. (2014) found that cyberbullying is associated with individuals' family socioeconomic status to some extent. In addition, some studies revealed that parental supervision is also a factor affecting cyberbullying (Ybarra and Mitchell, 2004; Chen and Astor, 2012; Kowalski et al., 2012a; Low and Espelage, 2013).

Regarding school factors, Bevilacqua et al. (2017) showed that the degree of cyberbullying varies with school type and quality, and organizational/management factors within a school affect students' behavior; Guarini et al. (2012) found that students' negative relationship with teachers and low recognition of the school are risk factors for cyberbullying; and Calvete et al. (2010) and Souza et al. (2018) found that cyberbullying is related to school atmosphere and environment. Moreover, school culture (Monks et al., 2016), safety (Bottino et al., 2015) and regulatory measures (Song, 2015), sense of belonging (Baldry et al., 2015; Chen et al., 2016), and education and training on mental health and cybersecurity (Gao, 2018; Liang, 2019) are also important factors affecting cyberbullying.

With respect to social and environmental factors, Huang and Chou (2010) argued that cyberbullying behaviors, in various countries, are highly dependent on the environment and are affected by the education system, school environment, cultural norms, and interpersonal relationships. Markward et al. (2001) found that various factors, such as herd mentality, traditional bullying influence, and cultural background differences, affect cyberbullying behavior. In addition, workplace stress (Vranjes et al., 2017) and peer factors (Liu and Xu, 2019) are also related to the risk of cyberbullying among youth, which is also affected by the characteristics of the Internet (Kiesler et al., 1985; Holland, 2012).

In recent years, digital citizenship education has gradually attracted widespread attention from scholars around the world. With the aim of cultivating qualified digital citizens in the information age, digital citizenship education requires digital citizens to acquire global awareness, legal awareness as well as digital citizenship awareness so that technology is used in a safe, responsible, and ethical way (Yang et al., 2016). However, the rise and spread of cyberbullying are inextricably linked to each digital citizen: current Internet users are mostly digital natives who have acquired the ability to use information technology but still lack the corresponding technical ethics and responsibilities. In other words, the occurrence of many cyberbullying incidents is the outcome of weak cyber legal and moral awareness among these digital natives. That's exactly the core of digital citizenship education (Ivester, 2011; Zheng et al., 2020). Therefore, while providing a new perspective for the study of cyberbullying, digital citizenship education is an important means to control cyberbullying (Lin, 2017; Zheng et al., 2020). In this regard, digital citizenship, in conjunction with the relevant digital citizenship education content were investigated in this study to conduct an in-depth examination on the influencing factors of cyberbullying at the personal level.

The above literature review and analysis categorizes the influencing factors of cyberbullying into four levels: (1) Personal level, including gender, age, personality traits, well-being, empathy, length or frequency of Internet uses, social behavior type, and digital citizenship; (2) Family level, including relationship between family members, parental support, family socioeconomic status, and parental supervision; (3) School level, including school type and teaching quality, school management, teacher-student relationship, school climate and environment, school culture, school safety and supervision, and education and training on mental health and Internet security; (4) Social and environmental level, including national education system, cultural norms, community influence (herd mentality), cultural differences, interpersonal (peer) relationship, work pressure, and Internet characteristics.

Among the above-described influencing factors, those at students' personal level have a direct impact on students' cyberbullying behavior, and are the basis for investigating and analyzing the influencing factors of cyberbullying at other levels. So it sounds reasonable to start from the perspective of individual students. Nevertheless, previous studies have focused on students' personal variables (e.g., gender, age or grade, and personality traits) and Internet usage (e.g., hours online and frequency per day), without considering students' literacy related to digital citizenship. Therefore, in this study, personal influencing factors of cyberbullying among college students were categorized into five sublevels, i.e., (1) Background (including gender, age, and time to start using the Internet), (2) Internet use and social network habits (including average daily time online, the proportion of online learning/non-learning time, the number of online social communities joined, and social behavior type), (3) Personality [including five personality traits, i.e., openness, neuroticism, extroversion, agreeableness, and conscientiousness (Howard et al., 1996)], (4) Emotion (including subjective well-being and empathy), and (5) Literacy related to digital citizenship [including digital identity and dignity, digital citizenship awareness and accountability, the understanding of and compliance with Internet etiquette, digital communication and collaboration capabilities, degree of Internet addiction, and the understanding of and compliance with relevant laws and regulations (Ribble, 2015; Zheng et al., 2020)].

Hypotheses

In order to explore the impact of personal factors on cyberbullying, this study inspected these variables one by one, as illustrated in the following hypotheses:

> Hypothesis 1: The degree of cyberbullying among Chinese college students is affected by students' personal background. Specifically, college students of different genders and with different ages to start using the Internet have significantly different scores regarding the degree of cyberbullying. This hypothesis corresponds to exploring the influence of individual background (sublevel 1) on cyberbullying.
>
> Hypothesis 2: The degree of cyberbullying among Chinese college students is affected by students' use of the Internet

and social network habits. Specifically, cyberbullying among college students has a significantly positive correlation with students' length of time online and the proportion of online non-learning time, and students who show different social network habits differ significantly regarding cyberbullying. This hypothesis corresponds to exploring the influence of individual Internet use and social network habits (sublevel 2) on cyberbullying.

Hypothesis 3: The degree of cyberbullying among Chinese college students is affected by students' personality traits. Specifically, the degree of cyberbullying has a significantly positive correlation with neuroticism and openness but a significantly negative correlation with extroversion, agreeableness, and conscientiousness. This hypothesis corresponds to exploring the influence of individual personality (sublevel 3) on cyberbullying.

Hypothesis 4: The degree of cyberbullying among Chinese college students is affected by students' emotions. Specifically, the degree of cyberbullying has a significantly negative correlation with their life satisfaction and empathy. This hypothesis corresponds to exploring the influence of individual emotion (sublevel 4) on cyberbullying.

Hypothesis 5: The degree of cyberbullying among Chinese college students is affected by students' level of digital citizenship and has a significantly positive correlation with their degree of Internet addiction and a significantly negative correlation with their digital identity and dignity, digital citizenship awareness and accountability, understanding of and compliance with Internet etiquette, digital communication and collaboration skills, and understanding of and compliance with relevant laws and regulations. This hypothesis corresponds to exploring the influence of individual literacy related to digital citizenship (sublevel 5) on cyberbullying.

RESEARCH DESIGN AND IMPLEMENTATION

Research Subjects and Process

In this study, through random sampling, college students and graduate students of different cities in China took part in this online survey anonymously. Specifically, a text message and a questionnaire link were first sent to the students of South China Normal University randomly via social communication software (e.g., WeChat groups, QQ groups), then they were asked to forward the message to their classmates or ex-classmates (e.g., their high school classmates but now learning in different universities). Gradually the survey was spread out in a non-linear way. Each student was asked to provide responses to the survey within a specified time. Since ethical review and approval is not required for the study on human participants in accordance with the local legislation and institutional requirements of China, an instruction about the purpose of this survey and how the data will be used later was provided at the beginning of the questionnaire, so that the participants had a total understanding of the survey. Eventually a total of 1,188 online questionnaires were collected, of which 947 were valid, for an effective rate of 79.7%.

Questionnaire Design

The questionnaire consisted of five parts:

(1) Questions regarding students' personal background, Internet use and social network habits, including students' gender, age, time to start using the Internet, average daily time online, proportion of online learning/non-learning time, number of online social communities joined, and types of social behavior, in a total of seven items. In China, students mainly use popular social networking platforms such as Sina Microblog, Tencent Microblog, QQ Groups, WeChat Groups, Tianya social community, Zhihu social community, and the like. Of course, some of them may use Facebook, Instagram, Twitter or similar platforms. They will all be considered by default when it comes to statistical analysis of one's online social networking experience. This instruction was also provided in the questionnaire to make students clearly understand.

(2) A personality questionnaire, i.e., The Big Five Personality Test, compiled by Howard et al. (1996) and used to measure the personality inclination of college students, in a total of 25 items. This questionnaire has been widely used in many studies, with high reliability and validity [$0.736 <$ Cronbach's $\alpha < 0.904$ and KMO = 0.806 (Hee, 2014)].

(3) Emotion questionnaires to analyze subjective well-being and empathy, measured, respectively, with the Life Satisfaction Scale developed by Diener et al. (1985) and the Interpersonal Reactivity Index scale compiled by Davis (1980). Both scales have been tested and have good reliability and validity [Cronbach's $\alpha = 0.86$ and KMO = 0.84 for the Life Satisfaction Scale (Silva et al., 2015) and Cronbach's $\alpha = 0.75$ and KMO = 0.833 for the Interpersonal Reactivity Index Scale (Zhang et al., 2010)]. There are totally 27 items in this part.

(4) A digital citizenship questionnaire that measures, using 35 questions answered with a five-point Likert scale, digital identity and dignity, digital citizenship awareness and accountability, the understanding of and compliance with Internet etiquette, digital communication and collaboration capabilities, degree of Internet addiction, and the understanding of and compliance with relevant laws and regulations. Among them, the Internet Addiction Scale was derived from the simplified version of Young's Internet Addiction Test with high reliability and validity [Cronbach's $\alpha = 0.848$ and KMO = 0.924 (Pawlikowski et al., 2013)], the scales for the rest variables were modified from or developed based on, respectively, the self-esteem scale for the assessment of adolescents' self-worth and self-acceptance by Rosenberg (1965), the digital citizenship scale (Al-Zahrani, 2015), the monograph on digital citizenship education by Ribble (2015) and the content decomposition of digital citizenship by Zheng et al. (2020). The whole questionnaire in this part was tested in this study

and found to have good reliability and validity (Cronbach's α = 0.789 and KMO = 0.671).

(5) A cyberbullying questionnaire derived from Topcu and Erdur-Baker's (2010) Cyberbullying Scale that measures the degree to which college students act as perpetrators or victims of cyberbullying. The questionnaire uses 14 items for 14 cyberbullying behaviors, with another 14 for being cyberbullied behaviors. So totally there are 28 items, with high reliability and validity [Cronbach's α = 0.818 and KMO = 0.873 (Murwani, 2019)]. In order to get a better understanding of how personal factors have influence on cyberbullying among college students, the questionnaire limits cyberbullying experience (commit or suffer) to be within the recent one or 2 years. In other words, students will be asked if they have had these experiences (14 cyberbullying behaviors and 14 being cyberbullied behaviors) recently.

RESULTS

Descriptive Statistics

Figure 1 shows the geographical distribution of the respondents. It's clear that the participants were mostly from big and modern cities of China, such as Guangzhou, Beijing, Zhengzhou, and Shenzhen, where Internet access is easier and faster, and social network application is more popular as well.

The respondents' demographic information, Internet use and social network habits are shown in **Table 1**. They were young people with an average age of 20.71 (SD = 2.234). Two-thirds of them were female, indicating that in China girls showed more willingness to help others academically than boys. Over one-half of the respondents (53.9%) started their online experience prior to middle school; on average, 45.2% of the students spent 3–6 h online daily, and one-third of the students spent over 6 h online daily. College students spent an average of 66.63% of time online on social networks and doing other activities unrelated to learning. When using social networks, 54.1% of the students joined at least three online communities while 65.3% did not participate in any online discussions.

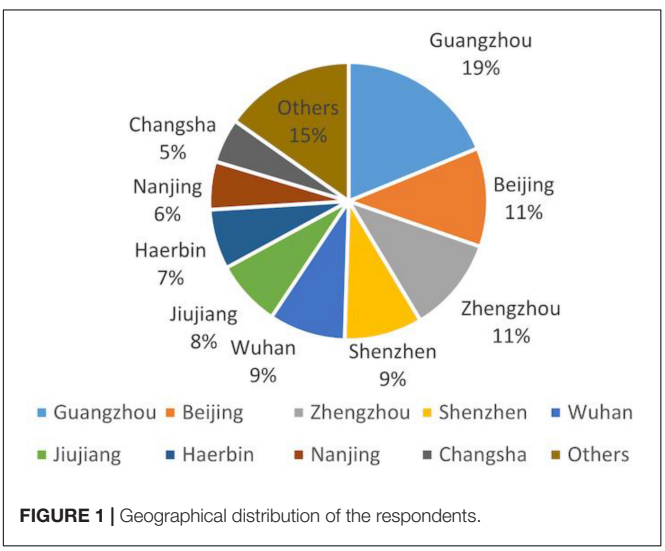

FIGURE 1 | Geographical distribution of the respondents.

TABLE 1 | Statistics for college students' background information, Internet use and social network habits.

Category	Level	Frequency	Percentage (%)
Gender	Male	305	32.2
	Female	642	67.8
Age	19 years or younger	254	26.8
	20 years	264	27.9
	21 years	170	18.0
	22 years	105	11.1
	23 years or older	154	16.3
Time to start using the Internet	Pre-school	34	3.6
	Elementary school	476	50.3
	Middle school	324	34.2
	College	102	10.8
	Other	11	1.2
Average daily time online	Less than 1 h	12	1.3
	1–3 h	179	18.9
	3–6 h	428	45.2
	6–10 h	258	27.2
	Over 10 h	70	7.4
Number of online communities joined	0	117	12.4
	1–3	317	33.5
	3–6	231	24.4
	7–10	95	10.0
	Over 10	187	19.7
Types of online social behavior	Self-expressive	46	4.9
	Socially active	160	16.9
	Participates in discussions	123	13.0
	Does not participate in discussions	618	65.3

TABLE 2 | Statistics for cyberbullying among college students.

	Range	Min.	Max.	*M*	SD
Cyberbullying	23	14	37	17.14	3.431
Being cyberbullied	36	14	50	19.93	6.239

Current Situation of Cyberbullying Among College Students

According to Topcu and Erdur-Baker's (2010) Cyberbullying Scale, the total score ranges from 14 to 56 points. The higher the score is, the higher the level of cyberbullying or being cyberbullied. As shown in **Table 2**, overall, the average cyberbullying score for the 947 college students was 17.14,

indicating a low cyberbullying level; the average score for being a victim of cyberbullying was 19.93, which is low but higher than that for cyberbullying. Among the 14 cyberbullying behaviors, "Making fun of comments in online forums" appeared most frequently in both situations (M = 2.20 and SD = 1.319 for cyberbullying, and M = 1.88 and SD = 1.201 for being cyberbullied), while "Excluding others by blocking or moving their comments" (M = 1.87 and SD = 1.077) and "Stealing email access (usernames and passwords) and blocking true owner's access" (M = 1.84 and SD = 0.999) ranked second in frequently appeared forms of cyberbullying and being cyberbullied, respectively.

According to Brack and Caltabiano (2014), when committing (suffering) any of the 14 behaviors two or more times, an individual can be deemed as a cyberbullying perpetrator (victim). Those with a dual identity of cyberbullying perpetrator and victim must meet the standards for a cyberbullying perpetrator and victim simultaneously while those who are deemed as non-participants either never committed or experienced any cyberbullying or experienced one incident, at most, of cyberbullying or being cyberbullied. According to these criteria, the proportion of college students who are cyberbullying victims (58.6%) is a bit higher than that of students who are cyberbullying perpetrators (51.2%), and more than 40% of them have a dual identity as both a victim and perpetrator (41.6%); approximately one-third of the students have never experienced cyberbullying (31.8%). Though results show high percentages of cyberbullying and being cyberbullied (over 50%), the most frequent form of both cyberbullying and being cyberbullied is making fun of comments on forums (it's very common in this era), and the average scores are 17.14 and 19.93 (out of 56), respectively, with SD less than 2. Therefore, it is believed that cyberbullying is generally at a relatively low level among Chinese college students, so is being cyberbullied.

TABLE 3 | Significance tests for gender differences in cyberbullying.

	Cyberbullying		Being cyberbullied	
Gender	**Male**	**Female**	**Male**	**Female**
Number of cases	305	642	305	642
Average score	18.36	16.56	22.25	18.83
Mann–Whitney *U* statistics	70550.000		68003.500	
Sig. (progressive significance)	0.000		0.000	

Influencing Factors of Cyberbullying Among College Students

Effect of Personal Background on Cyberbullying

Gender

Gender differences in cyberbullying were examined through the two independent samples non-parametric test. As shown in **Table 3**, the progressive significance values are lower than 0.05, indicating that gender differences in cyberbullying is significant. The scores for male students are significantly higher than those for female students, indicating that male students are more likely to cyberbully others or be cyberbullied by others than are female students.

Time to start using the Internet

The relationship between the time to start using the Internet and cyberbullying was examined through the two independent samples non-parametric test. As shown in **Table 4**, the progressive significance values are lower than 0.05, indicating that students with different ages to start using the Internet differ significantly regarding cyberbullying.

Effect of Internet Use and Social Network Habits on Cyberbullying

Internet use

The correlation between the degree of cyberbullying and daily average time online or daily average non-learning time online was analyzed using the Spearman correlation method. As shown in **Table 5**, daily average time online is not significantly correlated to cyberbullying while daily non-learning time online is significantly positively correlated with the degree of cyberbullying but is not significantly correlated with the degree of being cyberbullied.

Social network behavior

The effect of social behavior type on the degrees of cyberbullying and being cyberbullied was analyzed through variance analysis. As shown in **Table 6**, the significance values are all lower than 0.05, indicating that different social behaviors have significant effects on cyberbullying among college students.

Effect of Personality Traits on Cyberbullying

The relationship between the personality traits of college students and cyberbullying behavior was examined through the Big Five Personality Test and Spearman correlation analysis. As shown in **Table 7**, the degree of cyberbullying is significantly positively correlated with openness and significantly negatively correlated

TABLE 4 | Significance tests for time to start using the Internet in cyberbullying.

	Cyberbullying					Being cyberbullied				
Time to start using the Internet	**1[a]**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Number of cases	34	476	324	102	11	34	476	324	102	11
Average score	18.62	17.58	16.46	16.64	18.00	23.76	20.46	18.79	19.74	20.73
$\chi 2$			30.699					24.036		
Sig.			0.000					0.000		

[a]*Kruskal–Wallis test. 1 = Pre-school, 2 = Elementary school, 3 = Middle school, 4 = College, 5 = Other.*

TABLE 5 | Correlation between Internet use and cyberbullying.

		Cyberbullying	Being cyberbullied
Daily average time online	Spearman correlation coefficient	0.062	0.038
	Sig. (two-tailed)	0.058	0.248
	Number of cases	947	947
Proportion of daily non-learning time online	Spearman correlation coefficient	0.073*	−0.025
	Sig. (two-tailed)	0.025	0.440
	Number of cases	947	947

$p < 0.05$; the same below.

with neuroticism, agreeableness and conscientiousness. The degree of being cyberbullied is significantly positively correlated with openness, and significantly negatively correlated with neuroticism and conscientiousness.

Effect of Emotions on Cyberbullying

Life satisfaction

The results of the Spearman correlation between life satisfaction and cyberbullying/being cyberbullied are shown in **Table 8**, indicating that students' life satisfaction is negatively correlated with the degree of cyberbullying as well as with the degree of being cyberbullied.

Empathy

Given the gender differences in empathy, the samples were grouped based on two genders, and Spearman correlation between empathy and cyberbullying was conducted for the two groups, respectively. As shown in **Table 9**, the correlation between each of the empathy variables and cyberbullying (or being cyberbullied) is non-significant in the male student group while the personal distress and empathetic concern variables of empathy are significantly positively correlated with both cyberbullying and being cyberbullied in the female student group.

Effect of Digital Citizenship on Cyberbullying

The effect of digital citizenship on cyberbullying among college students was examined through the Spearman correlation of cyberbullying with students' digital identity and dignity, digital citizenship awareness and accountability, understanding of and compliance with Internet etiquette, digital communication and collaboration capabilities, and understanding of and compliance with relevant laws and regulations. As shown in **Table 10**, the average scores for all variables related to college students' digital citizenship (except Internet addiction) are higher than 10; that for students' understanding of and compliance with relevant laws and regulations is the highest, and that for students' digital communication and collaboration capabilities is the lowest. The correlation analysis results showed that the degrees of cyberbullying and being cyberbullied are significantly positively correlated with students' digital communication and collaboration capabilities, and are

TABLE 7 | Correlation between Big Five personality traits and cyberbullying.

			Cyberbullying	Being cyberbullied
Spearman's rho	Neuroticism	Correlation coefficient	−0.157**	−0.129**
		Sig. (two-tailed)	0.000	0.000
		N	947	947
	Extroversion	Correlation coefficient	−0.018	−0.011
		Sig. (two-tailed)	0.588	0.730
		N	947	947
	Openness	Correlation coefficient	0.139**	0.080*
		Sig. (two-tailed)	0.000	0.014
		N	947	947
	Agreeableness	Correlation coefficient	−0.094**	−0.035
		Sig. (two-tailed)	0.004	0.278
		N	947	947
	Conscientiousness	Correlation coefficient	−0.175**	−0.109**
		Sig. (two-tailed)	0.000	0.001
		N	947	947

*$p < 0.05$; **$p < 0.01$.*

TABLE 8 | Correlation between life satisfaction and cyberbullying.

			Cyberbullying	Being cyberbullied
Spearman's rho	Life satisfaction	Correlation coefficient	−0.106**	−0.090**
		Sig. (two-tailed)	0.001	0.005
		N	947	947

**$p < 0.01$.*

TABLE 6 | Variance analysis results for the effect of social behavior type on cyberbullying.

Types of social behavior	Cyberbullying			Being cyberbullied		
	M	SD	Sig.	*M*	SD	Sig.
Self-expressive	17.91	3.681	0.000	22.04	7.800	0.002
Socially active	17.67	3.469		20.65	6.736	
Participates in discussions	18.02	3.540		20.93	6.542	
Does not participate in discussions	16.77	3.326		19.39	5.841	

TABLE 9 | Correlation between empathy and cyberbullying.

	Spearman		Cyberbullying	Being cyberbullied
Male	Empathy-personal distress	Correlation coefficient	0.082	0.029
		Sig. (two-tailed)	0.152	0.478
		N	305	305
	Empathy-perspective taking	Correlation coefficient	−0.076	0.011
		Sig. (two-tailed)	0.185	0.781
		N	305	305
	Empathy-fantasy	Correlation coefficient	0.002	0.072
		Sig. (two-tailed)	0.970	0.084
		N	305	305
	Empathy-Empathetic concern	Correlation coefficient	−0.019	0.038
		Sig. (two-tailed)	0.745	0.361
		N	305	305
Female	Empathy-personal distress	Correlation coefficient	0.113**	0.100**
		Sig. (two-tailed)	0.004	0.001
		N	642	642
	Empathy-perspective taking	Correlation coefficient	−0.057	−0.022
		Sig. (two-tailed)	0.150	0.452
		N	642	642
	Empathy-fantasy	Correlation coefficient	0.042	0.043
		Sig. (two-tailed)	0.293	0.138
		N	642	642
	Empathy-Empathetic concern	Correlation coefficient	0.083*	0.066*
		Sig. (two-tailed)	0.035	0.024
		N	642	642

*$p < 0.05$; **$p < 0.01$.

TABLE 10 | Statistics for students' digital citizenship and correlations between students' digital citizenship and cyberbullying.

Variable	Range	Min.	Max.	*M*	SD	Correlation with cyberbullying		Correlation with being cyberbullied	
						Correlation coefficient	Sig. (Two-tailed)	Correlation coefficient	Sig. (Two-tailed)
Digital communication and collaboration capabilities	10	7	17	11.56	1.760	0.191**	0.000	0.174**	0.000
Digital identity and dignity	16	4	20	17.10	2.376	0.026	0.420	−0.027	0.398
Digital citizenship awareness and accountability	12	8	20	15.91	1.623	−0.027	0.398	−0.007	0.827
Understanding of and compliance with Internet etiquette	16	4	20	16.99	2.320	−0.156**	0.000	−0.042	0.200
Understanding of and compliance with relevant laws and regulations	19	6	25	20.32	2.397	−0.127**	0.000	−0.076*	0.020
Digital citizenship level	45.89	18	63.89	51.10	5.754	−0.138**	0.000	−0.052	0.112

*$p < 0.05$; **$p < 0.01$.

significantly negatively correlated with students' understanding of and compliance with relevant laws and regulations; whereas only the degree of cyberbullying is significantly negatively correlated with students' understanding of and compliance with Internet etiquette. In general, students' level of digital citizenship is significantly negatively correlated with the degree of cyberbullying but is not significantly correlated with the degree of being cyberbullied.

In order to reveal the relationship between Internet addiction and cyberbullying, the Internet addiction status of Chinese college students was first analyzed, then followed by the correlation between Internet addiction and cyberbullying/being

TABLE 11 | Internet addiction among college students.

	Total score		Frequency		Percentage
Internet addiction	<40 (no Internet addiction)		764		80.7
	>40 (Internet addiction)	40–60 (mild)	182	183	19.3
		60–80 (moderate)	1		
		80–100 (severe)	0		
	M			32.97	
	SD			7.518	

TABLE 12 | Correlation between Internet addiction and cyberbullying among college students.

		Cyberbullying	Being cyberbullied
Internet addiction	Pearson correlation	0.217**	1**
	Sig. (two-tailed)	0.000	0.000
	Number of cases	947	947

$^{**}p < 0.01$.

cyberbullied through Pearson correlation analysis. For the Internet Addiction Scale, the higher the score is, the higher the degree of Internet addiction; a score above 40 indicates an Internet addiction. As shown in **Tables 11**, **12**, 19.3% of the students are addicted to the Internet, and the students' Internet addiction is significantly positively correlated with the degree of cyberbullying or being cyberbullied, indicating that the higher the degree of a student's Internet addiction, the more likely that student is to commit cyberbullying or be cyberbullied.

Multivariate Regression Analysis of Influencing Factors of Cyberbullying

To further examine the joint effects of these personal factors on cyberbullying among college students, multivariate regression analyses were conducted using the above variables as independent variables and the degrees of cyberbullying and being cyberbullied as dependent variables; the samples were grouped based on social behavior type, with the socially active group as the reference group and students who do not participate in discussions (accounting for 65.3% of the total sample) as an example in the analysis.

As shown in **Table 13**, after excluding several non-significant variables based on the *F*-test, nine predictors remained in the regression equation for cyberbullying factors, each having a tolerance greater than 0.4 and a VIF value below 5, indicating that these nine predictors retained in the regression equation do not have a multicollinearity problem. The significance of the *F* value (sig.) is lower than 0.001, indicating that these predictors have a significant linear relationship with the degree of cyberbullying. Specifically, at the personal background level, gender has a significant impact on the degree of cyberbullying. At the Internet use and social network habits level, social behavior type and the number of online communities joined have significant impacts on the degree of cyberbullying. At the personality trait level, only conscientiousness has a significantly positive impact on the degree of cyberbullying, while other traits were eliminated in the stepwise linear regression, indicating that other aspects of the Big Five personality traits have no significant linear relationships with the degree of cyberbullying. At the digital citizenship level, Internet addiction, digital communication and collaboration capabilities, and digital citizenship awareness and accountability have significantly positive impacts on the degree of cyberbullying, while students' understanding of and compliance with Internet etiquette has a significantly negative impact on the degree of cyberbullying.

In the stepwise multivariate regression equation for factors influencing the degree of being cyberbullied, ten predictors remained in the equation, each having a tolerance greater than 0.4 and a VIF value below 5, showing no multicollinearity problem between the variables. The significance of the *F* value (sig.) is lower than 0.001, indicating that these predictors have a significant linear relationship with the degree of being cyberbullied. As shown in **Table 14**, at the personal background level, gender has a significant impact on the degree of being cyberbullied. At the Internet use and social network habits level, the number of online communities joined and online learning/work time has significant impacts on the degree of being cyberbullied. At the emotion level, life satisfaction has a significantly negative impact on the degree of being cyberbullied. At the personality level, conscientiousness has a significantly positive impact on the degree of being cyberbullied. At the digital citizenship level, the degree of Internet addiction, digital communication and collaboration capabilities, and digital identity and dignity have significantly positive impacts on the degree of being cyberbullied.

DISCUSSION

This study randomly selected 947 college students in China as survey subjects to investigate the current situation of cyberbullying and conducted an in-depth analysis on the impact of students' personal background, Internet use and social network habits, personality traits, emotions and literacy related to digital citizenship on the degrees of cyberbullying and being cyberbullied. Further analysis and discussions are presented as follows.

Effect of Student's Personal Background on Cyberbullying Among College Students

Regarding gender, the male students' total scores for cyberbullying and being cyberbullied were significantly higher

TABLE 13 | Results of the multivariate regression analysis of factors influencing the degree of cyberbullying in students who do not participate in online discussions.

Model	Unstandardized coefficient		Standardized coefficient	*t*	Significance	Collinearity statistics	
	B	SE	Beta			Tolerance	VIF
(Constant)	11.151	1.393		8.003	0.000		
Gender (reference group: male)	−1.610	0.223	−0.219	−7.223	0.000	0.938	1.066
Time to start using the Internet (reference group: before middle school)	0.909	0.944	0.028	0.963	0.336	0.995	1.005
Social behavior type (reference group: socially active)	−0.515	0.222	−0.072	−2.325	0.020	0.914	1.095
Number of online communities joined	0.237	0.080	0.091	2.979	0.003	0.938	1.066
Conscientiousness	0.133	0.036	0.114	3.743	0.000	0.925	1.081
Internet addiction level	0.088	0.014	0.193	6.279	0.000	0.917	1.091
Digital communication and collaboration capabilities	0.259	0.060	0.133	4.302	0.000	0.909	1.101
Understanding of and compliance with Internet etiquette	−0.213	0.049	−0.144	−4.333	0.000	0.783	1.278
Digital citizenship awareness and accountability	0.177	0.070	0.084	2.536	0.011	0.799	1.252

$R = 0.434$; $R^2 = 0.189$; adjusted $R^2 = 0.181$; $F = 24.220$; Sig. < 0.001.

TABLE 14 | Results of the multivariate regression analysis of factors influencing the degree of being cyberbullied in students who do not participate in online discussions.

Model	Unstandardized coefficient		Standardized coefficient	*t*	Significance	Collinearity statistics	
	B	SE	Beta			Tolerance	VIF
(Constant)	6.197	2.183		2.839	0.005		
Gender (reference group: male)	−3.317	0.407	−0.249	−8.152	0.000	0.961	1.041
Time to start using the Internet (reference group: before middle school)	0.986	1.747	0.017	0.565	0.572	0.992	1.008
Social behavior type (reference group: socially active)	0.585	0.411	0.045	1.422	0.155	0.905	1.105
Number of online communities joined	0.319	0.147	0.067	2.171	0.030	0.942	1.061
Online learning/work time	0.032	0.011	0.087	2.814	0.005	0.934	1.070
Life satisfaction	−0.092	0.034	−0.086	−2.670	0.008	0.868	1.152
Conscientiousness	0.149	0.067	0.070	2.230	0.026	0.898	1.114
Internet addiction level	0.148	0.027	0.178	5.549	0.000	0.871	1.148
Digital communication and collaboration capabilities	0.507	0.111	0.143	4.548	0.000	0.905	1.105
Digital identity and dignity	0.181	0.081	0.069	2.238	0.025	0.941	1.063

$R = 0.405$; $R^2 = 0.164$; adjusted $R^2 = 0.155$; $F = 18.324$; Sig. < 0.001.

than those for the female students, indicating that males are more likely to cyberbully others or be cyberbullied by others than are females, which is consistent with the results of some previous studies (Calvete et al., 2010; Huang and Chou, 2010; Ozden and Icellioglu, 2014; Safaria, 2016; Beyazit et al., 2017) but contrary to those of others (Smith et al., 2008; Ortega et al., 2009; Sourander et al., 2010; Giménez-Gualdo et al., 2015), likely because in different countries, regions or schools, the understanding and identification of cyberbullying differ, and there are many measurement scales in this field, in which certain behaviors deemed as cyberbullying are controversial. On the other hand, the Internet use awareness and online behavior of different survey subjects vary and are closely related to their education and experience from childhood onward. In addition, the methods for cyberbullying commonly used by male and female students also differ (Slonje and Smith, 2008; Wong et al., 2014). Therefore, there are three different conclusions regarding the effect of gender on cyberbullying: more males commit cyberbullying, more females commit cyberbullying, and both genders commit cyberbullying equally (Hinduja and Patchin, 2008; Guarini et al., 2012; Pillay, 2012; Gibb and Devereux, 2014). Therefore, this remains an open question. In regard to the participants in this study, male students had stronger personalities and were more volatile than female students and thus more inclined to have conflicts with others, leading to cyberbullying (Zhu et al., 2016).

In addition, time to start using the Internet is significantly correlated with students' cyberbullying or being cyberbullied, but the two showed no regression relationship, which is likely related to the students' Internet awareness, skills and experience. Early exposure to the Internet allows students to have stronger Internet use awareness, more Internet skills and richer Internet experience, making these students more adept to cyberspace and prone to bully newbies intentionally or unintentionally. On the other hand, the participation of college students have been growing in various online forums and communities, which, in the early stage, were relatively open and laden with all kinds of information for which effective supervision and reporting mechanisms lacked; therefore, the longer a student has had access to the Internet (i.e., the earlier the time to start using the Internet), the more cyberbullying the student would have suffered.

These results confirm Hypothesis 1 listed in section "Hypotheses," suggesting that in cyberbullying intervention and governance processes, it is necessary to pay close attention to the social behavior of male students, especially those with an early age to start using the Internet.

Effect of Students' Internet Use and Social Network Habits on Cyberbullying

Regarding average daily time online, though daily time online is not correlated with cyberbullying, daily non-learning time online is significantly positively correlated (but no regression relationship) with the degree of cyberbullying, and the proportion of learning/work time online has a significant regression relationship with the degree of being cyberbullied. In other words, the longer the daily non-learning time a student spends online, the more likely he/she is to become a perpetrator of cyberbullying; the longer the daily learning/work time a student spends online, the more likely he/she is to become a cyberbullying victim. In previous studies, time online was not divided into learning and non-learning hours, but cyberbullying usually occurs in non-learning situations, such as social interactions, games, and entertainment; therefore, the conclusions of this study can be considered consistent with those of previous studies (Hinduja and Patchin, 2008; Sticca et al., 2013; Zhu et al., 2016). This result indicates that students with different purposes and uses for the Internet have different effects on others. Lingering on social network and leisure sites makes these students more susceptible to disinformation or misinformation, prompting them to use offensive and threatening language, send tasteless pictures that violate others' privacy, or place blame on teammates when playing online games, thereby cyberbullying others.

In terms of social behavior, different types of online behavior are significantly correlated with cyberbullying or being cyberbullied. Regarding average cyberbullying scores, students who are self-expressive and participate in discussions are more inclined to cyberbully others. Students with these two behaviors belong to active social network types and are prone to voice their views and follow suit when participating in debates; when questioned or refuted or when questioning or debating others, these students are liable to have conflict with others and even engage in cyber-stalking and violate the privacy of others, thereby cyberbullying others. Regarding average scores for being cyberbullied, students who are self-expressive had significantly higher scores than those of students with other behaviors, indicating that those who like to voice their opinions and ideas online are more likely to be cyberbullied, especially when their opinions or views are not accepted by others.

These results mostly confirm Hypothesis 2, suggesting that in the cyberbullying intervention and governance processes, it is necessary to strictly control the non-learning/work hours of college students and treat those with different social behaviors differently, so that targeted measures can be taken to prevent cyberbullying.

Effect of College Students' Personality on Cyberbullying

First, the personality trait "openness" is significantly positively correlated with cyberbullying and being cyberbullied, i.e., college students with a high level of openness are more likely to cyberbully others or be cyberbullied, which is consistent (Hsu and Wang, 2010; You, 2013; Peluchette et al., 2015) or partially consistent (Celik et al., 2012) with the results reported in other studies, indicating that these students are curious about the outside world, fond of trying new things and thus more prone to be involved in Internet events or comment on others' opinions, leading to online conflicts. Moreover, students with a high degree of openness have more Internet interactions on a wider range of topics and thus are more prone to be exposed to misinformation or disinformation while fully exposing their own information on the Internet, making them more susceptible to cyberbullying.

Second, neuroticism and conscientiousness are significantly negatively correlated with students' cyberbullying and being cyberbullied, i.e., college students with strong neuroticism and those who are conscientious are less likely to cyberbully others or be cyberbullied, which is consistent (Festl and Quandt, 2013; You, 2013) or partially consistent (Celik et al., 2012) with the results of other studies, indicating that college students who can more effectively balance emotions, such as anxiety and hostility, maintain emotional stability and are more organized, with a greater sense of responsibility and self-control, are less likely to exhibit cyberbullying behaviors and be cyberbullied.

Third, agreeableness is significantly negatively correlated with cyberbullying, i.e., college students with a high level of agreeableness are less likely to cyberbully others, which is consistent with the result of a previous study (Celik et al., 2012). Students with a high level of agreeableness give priority to others, get along with others well and interact with others more harmoniously and thus are popular among others; they are often friendly and considerate and rarely bully others online. However, agreeableness is not significantly correlated with being cyberbullied, which is inconsistent with the findings of other studies (Celik et al., 2012; You, 2013; Semerci, 2017), likely because students with a high level of agreeableness are always ready to help others and friendly to others; therefore, they are less likely to become a target of bullying by others.

These results partly confirm Hypothesis 3, suggesting that in cyberbullying intervention and governance processes, it is necessary to first determine a student's personality traits and propose specific measures for college students with different personalities, and if conditions permit, big data and data mining techniques can be employed to determine their personality traits and predict cyberbullying behavior more accurately.

Effect of Students' Emotions on Cyberbullying

Students' life satisfaction is significantly negatively correlated with cyberbullying and being cyberbullied and has a significant impact on being cyberbullied, indicating that the higher the level of students' life satisfaction, the less likely the students will bully others or be bullied, which is consistent with the results of a previous study (Zhu et al., 2016) but different from those of another study (Pillay, 2012); this inconsistency is likely due to the differences between college students in China and other countries when perceiving happiness and the aspects different assessment scales focusing on.

In terms of empathy, personal stress, and empathic concern are significantly positively correlated with cyberbullying and being cyberbullied among female students; however, this correlation is absent among male students, indicating that gender plays a mediating role in the effect of empathy on cyberbullying, which is consistent with the results of some early studies (Topcu and Erdur-Baker, 2012; Baldry et al., 2015; Del Rey et al., 2016) but contrary to those of other studies (Renati et al., 2012; Brewer and Kerslake, 2015; Peterson and Densley, 2017). These inconsistent results are likely due to the differences in the active areas of male and female brains regarding displaying empathy (Schulte-Rüther et al., 2008); the emotional awareness of females is stronger, making them more inclined to sympathize and emphasize with others' stress and perceive and understand others by taking the position of others, ultimately resulting in "being involved too deeply to be able to disengage" and thus being more susceptible to being cyberbullied. They may also turn empathy into vengeance and condemn those who they consider perpetrators through inappropriate ways, such as breeching privacy, verbal abuse and insults, turning a self-righteous act into cyberbullying.

These results mostly confirm Hypothesis 4, suggesting that in cyberbullying intervention and governance processes, it is necessary to pay attention to students' life satisfaction as well as the emotional stability of female students and integrate Internet supervision mechanism to dynamically display students' emotional data so that cyberbullying behaviors can be accurately monitored and prevented.

Effect of College Students' Literacy Related to Digital Citizenship on Cyberbullying

In the first place, students' understanding of and compliance with Internet etiquette has a significantly negative impact on cyberbullying, indicating that college students' understanding and recognition of digital ethics, such as Internet etiquette and technical etiquette, actively practicing positive ethics and codes of conduct in the digital space, and regulating their behaviors in digital society through etiquette in real society can allow the vast majority of people to enjoy the convenience and joy brought by digital technology and effectively reduce the probability of cyberbullying. Therefore, it is advisable to fully acknowledge the advantages of school, family and community education, improve college students' awareness of Internet etiquette, expand the Internet etiquette knowledge base, and cultivate relevant operational skills and norms in all life aspects through supplementation with various lifelong education models, coupled with related online and offline promotion to effectively improve college students' understanding of and compliance with Internet etiquette, so as to effectively prevent cyberbullying.

In the second place, college students' digital communication and collaboration capabilities have a significantly positive impact on cyberbullying and being cyberbullied. Cyberbullying mainly manifests as verbal abuse with insulting and offensive language, or privacy disclosures. The results showed that college students who are more able to skillfully select appropriate means of communication and collaboration with others online are more adept at mastering a variety of communication means and skills; once their emotions are out of control, they are prone to voice some inappropriate opinions or disclose the privacy of others, thus resulting in cyberbullying. On the other hand, college students with digital communication and collaboration capabilities are more likely to join more online communities, have richer online social networks or collaboration experience and spend longer amounts of time online, increasing their likelihood of being cyberbullied. Therefore, it is necessary to supervise and control the time and space of communication and collaboration;

in particular, schools and families should pay special attention to those students with strong digital communication and collaboration capabilities, and when necessary, administrative and technical means should be used to strictly manage their social networks and collaborations to prevent cyberbullying incidents.

In the third place, college students' degree of Internet addiction has a significantly positive impact on cyberbullying and being cyberbullied, indicating that students who are more addicted to the Internet are more dependent on the Internet, resulting in higher probabilities of cyberbullying others and being cyberbullied, which is consistent with the results of earlier studies (Floros et al., 2013; Chang et al., 2015; Hou, 2017). College students are not fully mature mentally, are profoundly affected by emotions and have not yet formed the "Three Views"; when lingering online for too long, they are vulnerable to mental, emotional, and moral erosion through misinformation and disinformation on the Internet and thus develop negative behaviors, intentionally or unintentionally cyberbullying others or being cyberbullied by others. Therefore, it is necessary to pay attention to their digital health and wellness; in schools and families, when necessary, administrative and technical means should be utilized to strictly monitor and control their online time, establish an early warning mechanism for excessive Internet use and take various anti-addiction measures to prevent Internet addiction, encouraging them to find a balance between online and offline life.

In the fourth place, college students' understanding of and compliance with relevant digital laws and regulations are significantly negatively correlated with cyberbullying and being cyberbullied, indicating that the understanding of and compliance with laws and policies on technology use, especially rules related to Internet ethics, digital rights and responsibilities in the form of legal regulations (e.g., copyright protection for intellectual property), are particularly important for college students' online behavior. These laws and regulations restrict and regulate the online behaviors, allowing them to clearly know which behaviors are illegal in digital society so that they can strictly abide by them, which helps to significantly reduce the probability of cyberbullying and being cyberbullied. Therefore, it is necessary to strengthen college students' knowledge and understanding of relevant digital laws and regulations through education at schools, in families and in the community, guiding them to use information technology legally and regulating their words and actions online to avoid cyberbullying and being cyberbullied.

In general, the level of digital citizenship is significantly negatively correlated with the degree of cyberbullying but is not significantly correlated with the degree of being cyberbullied, indicating that improving college students' digital citizenship level can help significantly reduce their likelihood of cyberbullying others, which mostly confirms Hypothesis 5. Digital citizenship is about the values, necessary qualities, key abilities, and behavior habits for using technology safely, legally, and ethically (Hao, 2014; Zheng et al., 2020). Improving college students' literacy related to digital citizenship will definitely lead to their mastery of knowing how to use technology legally and ethically in daily learning and life, so that the probability of cyberbullying and being cyberbullied among college students can be reduced, and the harm to individuals' body and mind as well as to society can be avoided, which will ultimately purify cyberspace to a certain extent and prompt the formation of a healthy cyber civilization. Education departments and schools should emphasize and strengthen college students' digital citizenship education to enhance their digital citizenship in all aspects, thereby ensuring better survival and development in the digital world.

CONCLUSION

While bringing convenience to people's interactions, the Internet also causes an obscuration of values and a deficiency in subjectivity (Hao, 2014). It has been well established that cyberbullying has become one of the increasingly serious social problems in the Internet era. Preventing cyberbullying not only relies on means that emphasize "blocking" approaches, such as traditional Internet monitoring, regulations, and legislation, but also requires the adoption of "dredging" approaches to guide youth to correct online behaviors and improve their digital citizenship level, which is also one of the main objectives of digital citizenship education (Lin, 2017; Zheng et al., 2020). Incorporated with digital citizenship, this study conducted a questionnaire survey to assess the current situation of cyberbullying among Chinese college students and examined the effect of students' personal background, Internet use and social network habits, personality traits, emotions, and digital citizenship on cyberbullying from the perspective of individual students. The results showed that cyberbullying among college students is generally at a low level but still requires attention. At the personal background level, gender has a significant impact on college students' cyberbullying and being cyberbullied, and the time to start using the Internet is significantly correlated to cyberbullying and being cyberbullied but has no significant impact on them. At the personal Internet use and social network habits level, the students' average daily time online is not significantly correlated with cyberbullying and being cyberbullied; however, the proportion of online non-learning time is significantly positively correlated with cyberbullying, and the proportion of online learning/work time has a significant influence on students' being cyberbullied. At the personality trait level, different Big Five personality traits have different correlations with and impacts on cyberbullying and being cyberbullied: openness is significantly positively correlated with cyberbullying and being cyberbullied; neuroticism and conscientiousness are significantly negatively correlated with cyberbullying and being cyberbullied; and agreeableness is significantly negatively correlated with cyberbullying. At the personal emotion level, life satisfaction is significantly negatively correlated with cyberbullying and being cyberbullied and has a significant impact on being cyberbullied; the personal stress and empathetic concern aspects of empathy are significantly positively correlated with cyberbullying and being cyberbullied among female students. At the personal digital citizenship level, students' understanding of and compliance with Internet etiquette has a significant negative impact on cyberbullying, and digital communication and collaboration

capabilities and Internet addiction have significantly positive impacts on cyberbullying and being cyberbullied; furthermore, their understanding of and compliance with digital laws and regulations is significantly negatively correlated with cyberbullying and being cyberbullied. Overall, college students' digital citizenship level is significantly negatively correlated with cyberbullying but is not significantly correlated with being cyberbullied.

In this study, an attempt was made to explore the influencing factors of cyberbullying among college students, not only enriching the theory and practice of cyberbullying among students but also providing a new perspective for research in this field. Limited by several conditions, this paper only surveyed a small group of college students from modern cities in China. In a follow-up study, the sample size should be expanded as much as possible to provide more rational and reliable data support for drawing conclusions with a higher reference value. Furthermore, the effect of other levels such as the family, school, society, and the environment on cyberbullying should be taken into account so that comprehensive measures and governance processes can be developed to effectively curb cyberbullying among college students.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

AUTHOR CONTRIBUTIONS

JZ: literature search, methodology, questionnaire survey, data analysis, and writing–review and editing. YZ: supervision, conceptualization, writing–original draft preparation, and review and editing. XH: literature search, questionnaire survey, and data analysis. DM and JG: literature search and questionnaire survey. ML: questionnaire survey and data analysis. JH: methodology and writing–revision and editing. All authors have read and agreed to the published version of the manuscript.

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Cyberbullying Among School Adolescents in an Urban Setting of a Developing Country: Experience, Coping Strategies, and Mediating Effects of Different Support on Psychological Well-Being

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Background: This study examined the cyberbullying experience and coping manners of adolescents in urban Vietnam and explored the mediating effect of different support to the associations between cyberbullying and mental health issues.

Methods: A cross-sectional study was performed on 484 students at four secondary schools. Cyberbullying experience, coping strategies, psychological problems, and family, peer, and teacher support were obtained. Structural equation modeling was utilized to determine the mediating effects of different support on associations between cyberbullying and psychological problems.

Results: There were 11.6 and 28.3% of students who reported that they experienced and observed at least one cyberbullying act in the last 3 months, respectively. Among the victims, only 48.2% tried to stop the perpetrators. Meanwhile, the majority of observers belonged to the "Intervene" group who tried to report cyberbullying acts or help victims. Family support was found to partially mediate associations between cyberbullying experience and observation with levels of psychological problems among adolescents.

Conclusion: The 3-month rate of cyberbullying experience and observation among urban adolescents aged 11–14 was low. However, current coping strategies against cyberbullying were not sufficient. Family support is an important factor that should be considered for designing interventions to mitigating the impacts of cyberbullying on the mental health of adolescents.

Keywords: cyberbullying, social support, psychological health, structural equation modeling, adolescent

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INTRODUCTION

Cyberbullying has been well-documented as a global public health problem. Cyberbullying includes acts such as posting publicly available information on the Internet, being called or receiving messages that threaten or being harassed on the Internet, and others (Patchin and Hinduja, 2006). Compared with traditional bullying, cyberbullying can occur every time and everywhere, and the identity of the perpetrator may not be disclosed (Patchin and Hinduja, 2006). Therefore, cyberbullying may be more frequent and have more serious consequences for the victim. Studies show that cyberbullying significantly affects adolescents, such as increasing the risk of depression, anxiety, and suicidal ideation (Klomek et al., 2010; Schneider et al., 2012; Nixon, 2014; Fahy et al., 2016; Pabian and Vandebosch, 2016; Yuchang et al., 2019), as well as causing physical and psychosomatic problems such as difficulty sleeping, headache, and loss of appetite (Beckman et al., 2012; Schneider et al., 2012; Schultze-Krumbholz et al., 2012; Kowalski and Limber, 2013). Cyberbullying is also associated with the onset of substance use, traditional and cyberbullying perpetration, and delinquency (Mitchell et al., 2007; Wong et al., 2014; Chan and Wong, 2020; Estévez et al., 2020). These consequences have been observed in all perpetrators, victims, and observers of cyberbullying (Beckman et al., 2012; Wong et al., 2014; Panumaporn et al., 2020).

Cyberbullying among adolescents is a prevalent phenomenon across nations. A prior systematic review showed that 20 to 40% of adolescents experienced cyberbullying at least once in their lifetime (Aboujaoude et al., 2015), and this rate tends to increase with increasing Internet and social media accessibility (Hamm et al., 2015). In the United States, the rate of adolescents who were victims of cyberbullying was from 3 to 72% (Selkie et al., 2016). A study conducted in seven European countries showed that 13.3–37.3% of adolescents aged 14–17 years were victims of cyberbullying (Athanasiou et al., 2018). In the Asian region, a review in Chinese populations revealed different prevalence of cyberbullying victimization in adolescents, ranging at 14–57% in mainland China, 13–35% in Taiwan, and 12–72% in Hong Kong (Chan and Wong, 2015). In Korea, 14.6% adolescents were cyberbullying victims (Lee and Shin, 2017). Coping strategies when having cyberbullying experience may vary and can be classified into four groups: (1) directly reacting against cyberbullying acts (such as retaliation or constructive feedback); (2) ignoring the cyberbullying behaviors (such as avoidance or doing nothing), (3) seeking support from other sources (such as parents, friends, or teachers), and (4) utilizing technological solutions (such as blocking senders; Perren et al., 2012). A study in Hong Kong indicated that older male adolescents were more likely to have an active approach to cope with cyberbullying such as informing to adults, parents, or teachers; while adolescents, having limited experience with their schools, tended to have avoid (e.g., ignore the cyberbullying behaviors) approaches (Chan and Wong, 2017). Another study in Czech adolescents found that technological strategies were the most common, following by avoidance and finding support (Machackova et al., 2013).

The proliferation of cyberbullying requires accelerating efforts to explore approaches to prevent and mitigate its consequences. Global studies showed that social support is an essential component in protecting adolescents from the consequences of traditional bullying (Kochenderfer-Ladd and Skinner, 2002; Davidson and Demaray, 2007; Rothon et al., 2011). Social support refers to instrumental support (such as providing the victim with helpful solutions or resources) or emotional support (such as spiritual encouragement, belongingness, or value recognition; House et al., 1988; Kerres Malecki and Kilpatrick Demaray, 2002). In literature, many studies have shown that family and friends support can play an important role in protecting adolescents from becoming victims of cyberbullying (Price and Dalgleish, 2010; Fanti et al., 2012; Hellfeldt et al., 2019). In addition, adolescents who are of school age can get help from teachers. Previous research has shown that victims and perpetrators of cyber-violence possibly knew each other at school, and parents, friends, and teachers are important sources of information and support for teens dealing with cyberbullying (Slonje and Smith, 2008).

Although many studies showed that social support helps to prevent cyberbullying among adolescents, its effectiveness in minimizing the psychological consequences of cyberbullying among victims or observers has been in debate. An earlier study found that support from friends alone was effective in reducing psychological problems among victims of cyberbullying (Holt and Espelage, 2007). Another research found that both support from family and friends played an important role in preventing victims from the mental consequences of cyberbullying (Rothon et al., 2011). These results concluded that social support held the potential for minimizing the cyberbullying-related psychological problems in youths. However, the evidence for this effect in different population groups (such as victims, perpetrators, or observers) is limited.

In Vietnam, evidence about cyberbullying among adolescents as well as the impact of social support on cyberbullying is currently limited. Only one previous study was conducted on 215 adolescents and youths aged 13–18 in Hanoi, Vietnam, to measure the cyberbullying experience in these groups (Chi et al., 2020). By using the modified Patchin and Hinduja's scale, this study found that 45.1% of sample had experienced cyberbullying at least once, with being called by names as the most typical form (Chi et al., 2020). The common responses to cyberbullies included ignoring cyberbullying behaviors and not telling family or teacher (Chi et al., 2020). To date, none of the studies were conducted about the mediation effect of social support on mental disorders in adolescents who were victims or observers of cyberbullying. Therefore, our study was conducted to examine the experience of adolescents aged 11–14 in urban Vietnam, determine how they coped with this issue, and explore the preventive mediation effect of social support to the associations between cyberbullying and mental health issues.

MATERIALS AND METHODS

Theoretical Framework

In this study, we employed stress buffering hypothesis (Cohen and Wills, 1985), which perceived social support that could mediate the relationship between stressors (i.e., cyberbullying in

this case) and their negative consequences (i.e., mental problems). In other words, a higher level of social support could more weaken this relationship. Cohen and Wills in their study suggested that social support could diminish people's perceptions about the threat of given stressors, or offer coping options or other necessary resources to individuals against the stressors (Cohen and Wills, 1985). *Via* literature review, we hypothesized that support from family, peers, and teachers might play a buffering role in mediating the effect of cyberbullying experience on the mental health of adolescents (Holt and Espelage, 2007; Rothon et al., 2011). Therefore, we examined the direct effect of cyberbullying experience on adolescents' mental health, as well as the indirect effect of social support in buffering relationships between cyberbullying and mental health.

Study Design

Data of this paper were collected through a cross-sectional study conducted in Hanoi, Vietnam, from January to September 2020. Four secondary schools were randomly selected in this study from a list of secondary schools in Hanoi. The school principal and teachers were approached by the research team and informed of the research content. The questionnaire used in this study was submitted to them for approval before implementing data collection.

Participants included students aged 11–14 years, attending four selected secondary schools; and they, as well as their parents and teachers, agreed to be enrolled in the study. This study used a formula to estimate a population proportion with specified relative precision to calculate the essential sample, with $p = 0.45$ (according to previous research in Hanoi, Vietnam; Chi et al., 2020); confidence level $\alpha = 0.05$; relative precision $\varepsilon = 0.2$. The sample size needed for a school was 118 students or 472 students/4 schools. An additional 10% sample size was added to prevent participants from dropout or nonresponse, resulting in 520 students (or 130 students per school) being invited to respond to questions about cyberbullying.

A multi-stage sampling method was applied. First, the research team randomly selected two classes in each grade of each school, resulting in 32 classes being selected for the sample. Next, in these 32 classes, 520 students were randomly selected to participate in the cyberbullying survey. There were 36 students who did not agree to participate, leading to a total of 484 students (response rate of 93.1%). These students, along with their parents or guardians, were provided written informed consent with brief information about research objectives, eligible criteria, research process, and benefits and requirements during study participation. This research protocol has been approved by the institutional review board of Hanoi Medical University (Code 22NCS17/HDDDDHYHN).

Data Collection and Measurement

Students participating in this study were asked to complete an anonymous survey questionnaire. The research team directly distributed the questionnaires to students. During the survey, parents, teachers, and unselected students did not present at the site of the survey to avoid their influence on the participants' responses. Each student spent 15–20 min completing the questionnaire. A structured questionnaire was used for this study. The content of the questionnaire was developed under the guidance of child violence experts. The questionnaires were pretested on 10 adolescents to ensure understandability, expression, and logic, which aimed to avoid misunderstanding or confusion to study participants.

Variables

Cyberbullying Experience/Bystander and Coping Strategies

In this study, we used the Cyberbullying Test instrument to identify the individual's experience and observation of cyberbullying (Garaigordobil, 2017). Originally, this tool asked participants to answer 45 items about 15 cyberbullying acts in three roles (15 items per role): perpetrators, victims, and observers. Examples of items in the instrument included the following: "Have they ever sent you offensive and insulting messages by cellphone or Internet?" "Have you ever received offensive and insulting calls on your cellphone or by Internet (Skype …)?" "Have you ever been assaulted to tape the assault and hang it on the Internet?" Each question had four options about from 0 "never" to 3 "always." In this study, we used only two parts of the instrument: for victims and observers (or bystanders). Moreover, in the pilot, we observed that it was difficult for our participants (i.e., secondary school students) to respond to the questions with these four options. Thus, we decided to ask them a series of yes/no questions to determine whether they experienced cyberbullying acts as victims and observers in the last 3 months. This recall duration was applied to minimize the potential recall bias. Participants were categorized into "Cyberbullying experience" or "Cyberbullying observation" if they reported "yes" for at least one cyberbullying act. The Cronbach alpha values of "Cyberbullying experience" and "Cyberbullying observation" items were 0.8830 and 0.8993, respectively.

In this study, for people experiencing cyberbullying, we asked them to recall the impacts of these cyberbullying acts, coping strategies against cyberbullying, supporters when facing cyberbullying, and reasons for not reporting cyberbullying experience. Meanwhile, for those ever observing cyberbullying acts, participants were asked to report their reactions toward these behaviors. These reactions were classified into three groups: "Intervene," "Ignore," and "Join in."

- "Intervene" included (1) "oppose acts of cyberbullying," (2) "try to help or comfort the victim," and (3) "report online violence to people able to help the victim (e.g., teachers and parents)."
- "Ignore" included "leaving cyberspace."
- "Join in" included "Encouraging cyberbullying behaviors" and "Enjoys cyberbullying acts, and wants to learn more, but does not participate or promote publicly."

In addition, we asked them to explain the reasons if they did not report the observed cyberbullying acts. We also asked all participants to express their attitude toward cyberbullying by asking them a question: "What extend do you agree or

disagree with cyberbullying?" The students rated their attitude with an 11-point Likert scale from 0 "Totally agree" to 10 "Total disagree."

Psychological Problems

To evaluate the psychological problems, the Depression, Anxiety, and Stress Scale—21 Items (DASS-21) was utilized. This instrument included 21 items regarding depression (seven items, range score 0–21), anxiety (seven items, range score 0–21), and stress symptoms (seven items, range score 0–21) in the last 7 days (Le et al., 2017). Examples of items in the instrument included the following: "I found it hard to wind down" (stress domain), "I was aware of dryness of my mouth" (anxiety domain), and "I could not seem to experience any positive feeling at all" (depression domain; Lovibond and Lovibond, 1996). Participants responded to each item on a four-point Likert scale from 0 "Did not apply to me at all" to 3 "Applied to me very much or most of the time" (Le et al., 2017). A higher score in each part indicated a higher severity of this psychological problem. The Vietnamese version of this instrument had been validated elsewhere (Le et al., 2017). The Cronbach alpha of this instrument was 0.8523.

Social Support

Support from family (two items), peer (two items), and teacher (three items) was measured by using seven items, as below:

1. My parents do not understand me or care about my feelings.
2. My parents do not listen to me or do not pay attention to the problems I have.
3. My classmates are very friendly.
4. My classmates respect me and listen to my opinion.
5. My teachers help me when I'm sad or having problems.
6. My teachers take care of me and support me in achieving the best results.
7. My teachers respect me and listen to me.

Students rated each item on a five-point Likert scale from 1 "Totally disagree" to 5 "Totally agree." The score of each domain was computed by dividing the total scores of items in this domain by the number of items. Scores of questions 1 and 2 were reversed before computing the score of parental support. The score of each domain was from 1 to 5, with a greater score meaning a higher level of support. The Cronbach alpha of this instrument was 0.8205.

Sociodemographic Characteristics

In this part, we collected data about age, gender (male/female), and type of family (nuclear/multi-generations/others).

Statistical Analysis

A p-value of <0.05 was used to detect a statistical significance. Stata 16.0 software was used for analyzing data. A listwise deletion approach was applied to handle missing data. Descriptive statistics were performed for all variables of interest. Statistical tests including chi-square and Mann-Whitney tests were used to examine the difference between sociodemographic characteristics, social support, cyberbullying attitude, and psychological problems between cyberbullying experience/non-experience and cyberbullying observation/non-observation. Multivariate logistic regression models were used to identify the factors associated with cyberbullying experience (yes = 1/no = 0, model 1) and cyberbullying observation (yes = 1/no = 0, model 2). Independent variables included sociodemographic characteristics (age, gender, and types of the family), support from family/peer/teachers, cyberbullying attitude, cyberbullying experience (for model 2), and cyberbullying observation (for model 1). Moreover, among those ever observing cyberbullying acts in the last 3 months (n = 136), we performed the multivariate logistic regression models to determine factors that were related to "Intervene" (yes = 1/no = 0, model 3) or "Ignore" (yes = 1/no = 0, model 4) behaviors. Independent variables for models 3 and 4 included sociodemographic characteristics (age, gender, and types of the family), support from family/peer/teachers, cyberbullying attitude, and cyberbullying experience. We did not perform the regression analysis for the "Join in" outcome because only nine students had these behaviors, which might not be a large enough sample size for the analysis.

Finally, structural equation modeling (SEM) was used to examine the mediation effects of family, peer, and teacher support on the relationships between cyberbullying experience/observation and psychological problems. The roles of cyberbullying (cyberbullying experience and observation) were coded as binary variables (yes = 1, no = 0), while the depression, anxiety, and stress variables were treated as continuous variables. The mean- and variance-adjusted maximum likelihood test statistic (MLMV) was performed for the SEM, given its robustness for data with non-normal distribution (Maydeu-Olivares, 2017). Multiple goodness-of-fit indices, including the root-mean-square error of approximation (RMSEA), the comparative fit index (CFI), and the standardized root mean square residual (SRMR) were examined. RMSEA lower than 0.08, SRMR lower than 0.08, and CFI higher than 0.09 were considered acceptable model fits (Kline, 2015).

Ethical Approval

Given highly sensitive information collected from adolescents, we performed the following actions to ensure the rights and benefits of participants. First, we provided an information package to students and their parents/guardians before the survey implementation. This package had detailed information about the purposes of the study, study designs, eligible criteria, rights, and benefits of study participants. It was also emphasized in the information package that the participation of students was voluntary and that relationships between the students and teachers/schools would not be affected in any way if they did not participate in the survey. No individual data were collected to protect students' privacy; thus, it was impossible to re-identify the participants based on the current dataset. Students and their caregivers were also informed that they could skip any questions that they felt uncomfortable or they could withdraw from the study at any time. We offered the helpline in the

information package for students who needed help to address cyberbullying-related issues. Contacts of the principal investigators and coordinators of this study were provided to answer all questions raised about the study.

RESULTS

The characteristics of participants are presented in **Table 1**. Among 484 secondary school students, the mean age was 12.6 (SD = 1.2) years. There were 11.6 and 28.3% of students reporting that they experienced and observed at least one cyberbullying act in the last 3 months, respectively. No difference was observed regarding gender, age, and type of family between those with and without cyberbullying experience ($p > 0.05$). Meanwhile, the rate of females in the cyberbullying observation group (68.6%) was significantly higher than that in the non-cyberbullying observation (56.2%). A significant age difference was also found between these two groups ($p < 0.001$).

Table 1 also reveals that people who experienced cyberbullying showed significantly lower levels of attitude against cyberbullying ($p = 0.022$) and lower levels of perceived family ($p < 0.001$) and teachers support ($p = 0.007$), but a higher level of perceived peer support ($p = 0.005$) and higher depression ($p < 0.001$), anxiety ($p < 0.001$), and stress scores ($p < 0.001$) than did those not experiencing cyberbullying. These differences were also observed between participants with and without cyberbullying observation ($p < 0.05$), except for the level of cyberbullying attitude.

Figure 1 illustrates the 3-month rate of each cyberbullying behavior in terms of experience and observation. "Stole password to prevent access to blog/email" was the most common behavior when 6.6 and 18.4% of participants ever experienced and observed this behavior, respectively. "Received offensive & insulting messages on cellphone/by Internet" and "Slandered through the Internet, telling lies or spread rumors" were the second and third most common acts.

Among participants experiencing cyberbullying as victims, **Table 2** indicates that 26.8% of students felt anxiety and fear and did not want to be close to anyone. Over 21% of victims had reduced study performance, 12.5% had suicidal ideation, and even 10.7% had suicidal attempts. However, only 48.2% tried to stop the perpetrators, and 35.7% told this experience to their friends. None of them told teachers, parents, or relatives. "Try to cope by myself," "I think my parents, teachers or adults do not understand or believe me," and "I think there's nothing my parents, teachers or adults can do to help me" were the three most common reasons for not reporting cyberbullying acts among victims.

TABLE 1 | Cyberbullying experienced and observation according to sociodemographic levels of support and mental problems (n = 484).

Characteristics	Cyberbullying					
	Experienced			Observation		
	Yes	No	*p*-value	Yes	No	*p*-value
	n (%)	*n* (%)		*n* (%)	*n* (%)	
Total	56 (11.6)	428 (88.4)		137 (28.3)	347 (71.7)	
Gender						
Male	26 (46.4)	169 (39.5)	0.319	43 (31.4)	152 (43.8)	0.012
Female	30 (53.6)	259 (60.5)		94 (68.6)	195 (56.2)	
Age (years)						
11	13 (23.2)	133 (31.1)	0.499	16 (11.7)	130 (37.5)	<0.001
12	5 (8.9)	50 (11.7)		16 (11.7)	39 (11.2)	
13	21 (37.5)	130 (30.4)		57 (41.6)	94 (27.1)	
14	17 (30.4)	115 (26.9)		48 (35.0)	84 (24.2)	
Type of family						
Nuclear	30 (53.6)	279 (65.2)	0.220	82 (59.9)	227 (65.4)	0.513
Multiple generations	25 (44.6)	141 (32.9)		52 (38.0)	114 (32.9)	
Others	1 (1.8)	8 (1.9)		3 (2.2)	6 (1.7)	
	Mean (*SD*)	Mean (*SD*)	*p*-value	Mean (*SD*)	Mean (*SD*)	*p*-value
Age (years)	12.8 (1.1)	12.5 (1.2)	0.213	13.0 (1.0)	12.4 (1.2)	<0.001
Cyberbullying attitude (1–10)	9.2 (2.2)	9.7 (1.5)	0.022	9.6 (1.6)	9.6 (1.6)	0.211
Support from family (1–5)	3.5 (1.1)	4.0 (1.0)	<0.001	3.7 (1.0)	4.0 (1.1)	<0.001
Support from peer (1–5)	2.4 (1.1)	2.0 (1.0)	0.005	2.2 (1.0)	2.0 (1.1)	0.001
Support from teachers (1–5)	2.2 (1.2)	1.8 (1.1)	0.007	2.0 (1.1)	1.8 (1.1)	0.023
DASS-21 Depression score	5.6 (4.2)	3.5 (4.1)	<0.001	4.9 (4.6)	3.3 (3.9)	<0.01
DASS-21 Anxiety score	5.7 (3.2)	3.9 (3.3)	<0.001	4.8 (3.3)	3.9 (3.4)	0.002
DASS-21 Stress score	8.7 (4.1)	5.9 (4.3)	<0.001	7.2 (4.1)	5.8 (4.4)	<0.01

DASS-21, Depression, anxiety, and stress scale—21 Items.

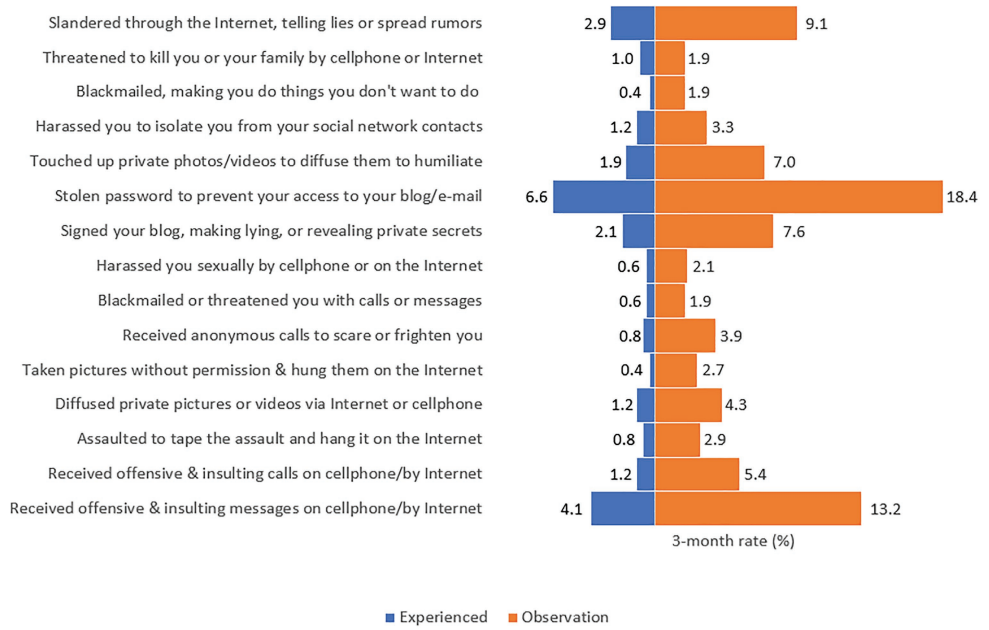

FIGURE 1 | The 3-month rates of different cyberbullying behaviors in the study population (n = 484).

Meanwhile, among observers, 111 students (81%) were grouped into the "Intervene" category; 56 students (40.9%) and nine students (6.6%) were classified into "Ignore" and "Join in" categories, respectively (one student could do more than one act toward cyberbullying observation). Being afraid of having limited use of the Internet if they reported cyberbullying behaviors, thinking that adults did not understand or believe, and thinking that adults could not do anything for victims were the three most popular reasons for not reporting the cyberbullying behaviors among observers (**Table 3**).

Table 4 shows associated factors with cyberbullying experience and observation. Cyberbullying experience was only found to be associated with cyberbullying observation (OR = 5.86, 95% *CI* = 3.06–11.21). Meanwhile, being female and of higher age were positively related to cyberbullying observation, whereas having a higher level of support from family (OR = 0.76, 95% *CI* = 0.61–0.94) was negatively associated with the cyberbullying observation.

In regression analysis, only cyberbullying attitude was found to be associated with "intervene" behaviors (OR = 1.53, 95% *CI* = 1.10–2.12). Participants having a higher level of peer support were more likely to ignore the cyberbullying acts (OR = 1.78, 95% *CI* = 1.08–2.93), while those having a higher level of teacher support were less likely to ignore these acts (OR = 0.64, 95% *CI* = 0.42–0.98; **Table 5**).

The SEM is illustrated in **Figure 2**. The goodness-of-fit indices were acceptable with RMSEA = 0.052, CFI = 0.983, and SRMR = 0.026. The model shows that only cyberbullying experience showed a significantly positive direct effect on psychological problems. The cyberbullying experience group was significantly related to family and peer support, while the cyberbullying observation group was only significantly associated with family support. Only family support showed to be negatively associated with psychological problems, whereas peer and teacher support showed positive relations with psychological problems.

Table 6 determines the mediation or indirect effects of different types of support. For both cyberbullying experience and observation, only family support was found to partially mediate associations between cyberbullying experience and observation with levels of psychological problems among our participants. Regarding cyberbullying experience, the indirect effect of family support accounted for 18.3% of the total effect and 22.4% of the direct effect. Meanwhile, regarding cyberbullying observation, this indirect effect accounted for 32.5% of the total effect and 48.1% of the direct effect.

DISCUSSION

Our study contributed to the current literature about the experience and coping strategies of adolescents toward cyberbullying and the potential effects of different support to mitigate the psychological consequence of cyberbullying. Our study suggested a low rate of cyberbullying experience and observation in secondary school students, as well as a high risk of psychological problems among those experiencing cyberbullying. Moreover, family support was an important protective source and helped mediate the relationship between cyberbullying and psychological problems.

The rate of adolescents involving in cyberbullying as victims over the past 3 months in our study was low, according to the self-report information from the participants. This rate was much lower than previous research in Hanoi, Vietnam, which showed that 45.1% of adolescents aged 13–18 were

TABLE 2 | Impacts, reactions, supporters, and reasons for not reporting cyberbullying experience (n = 56).

Characteristics	*n*	%
Impacts		
Decrease academic performance	12	21.4
Drop out of school	5	8.9
Start to substance use	2	3.6
Anxiety and fear	15	26.8
Not want to be close to anyone	15	26.8
Having suicidal ideation	7	12.5
Trying to self-harm or suicidal attempt	6	10.7
Reactions against cyberbullying		
None	4	7.1
Tell person performing online harassing, intimidating, or bullying to stop	27	48.2
Log out or leave cyberspace/not use Internet	19	33.9
Tell teachers, parents, or relatives	0	0.0
Tell your friends	20	35.7
Repeating cyberbullying behaviors against other people on the Internet	0	0.0
Performing bullying behaviors in real-life	0	0.0
Reasons for not reporting cyberbullying experience		
I think my parents, teachers, or adults do not understand or believe me.	8	14.3
I think there's nothing my parents, teachers, or adults can do to help me.	8	14.3
If I tell my parents, teachers, or the adults, those who bully me online might get revenge and make things worse.	4	7.1
If I notify my parents, teachers, or adults, they may try to limit or prohibit me from accessing the Internet or other technology devices.	9	16.1
Others will laugh at me if I tell my parents, teachers, or adults.	4	7.1
I want to learn how to cope and deal with cyberbullying by myself.	11	19.6
There's nothing serious about harassing, intimidating, or being bullied online. Everyone soon forgets, and no one will notice it anymore.	7	12.5

TABLE 3 | Reactions and reasons for not reporting among cyberbullying observation (n = 137).

Characteristics	*n*	%
Reactions*		
Intervene	111	81.0
Ignore	56	40.9
Join in	9	6.6
Reasons for not reporting cyberbullying acts		
I think my parents, teachers, or adults do not understand or believe me.	43	31.4
I think there's nothing my parents, teachers, or adults can do to help victims.	34	24.8
I'm afraid of getting into trouble because I'm also at fault for my friends being bullied online.	19	13.9
I'm afraid of getting into trouble because people who bully my friends online might get revenge on me.	31	22.6
I am afraid that if my parents and adults know about cyber-violence, my parents will try to limit or prevent me from using phones, the Internet, or other technology devices.	46	33.6
There is nothing serious about being bullied online. Everyone will also quickly forget.	12	8.8
The fact that my friends are bullied on the Internet is not related to me, so I have no responsibility to report.	9	6.6

**Intervene included (1) "oppose acts of cyberbullying"; (2) "try to help or comfort the victim"; and (3) "report online violence to people able to help the victim (e.g., teachers and parents)." Ignore included "leaving cyberspace"; and Join in included "Encouraging cyberbullying behaviors" and "Enjoys cyberbullying acts, and wants to learn more, but does not participate or promote publicly."*

TABLE 4 | Associated factors with cyberbullying experience and observation.

Characteristics	Cyberbullying experience		Cyberbullying observation	
	OR	95% CI	OR	95% CI
Gender (female vs. male[a])	0.63	0.34–1.18	1.95**	1.22–3.12
Age (vs. 11 years[a])				
12 years	0.74	0.22–2.44	3.72**	1.61–8.58
13 years	0.91	0.38–2.17	5.10**	2.59–10.03
14 years	0.89	0.36–2.15	4.58**	2.31–9.08
Type of family (vs. nuclear[a])				
Multiple generations	1.58	0.85–2.95	1.27	0.80–2.03
Others	1.35	0.15–12.42	1.19	0.25–5.62
Support from family (per score)	0.79	0.59–1.05	0.76*	0.61–0.94
Support from peers (per score)	1.24	0.89–1.72	1.19	0.94–1.51
Support from teachers (per score)	1.03	0.76–1.40	0.86	0.68–1.09
Cyberbullying attitude (per score)	0.93	0.80–1.09	1.00	0.87–1.15
Cyberbullying experience (yes vs. no[a])			5.86**	3.05–11.25
Cyberbullying observation (yes vs. no[a])	5.86**	3.06–11.21		

[a]Reference group.
**$p < 0.05$; **$p < 0.01$.*

victims of cyberbullying in the past 12 months (Chi et al., 2020). Our result was equivalent to a previous study in the United States with 11% of adolescents who studied grades 6 to 8 being bullied online in the past 2 months (Kowalski and Limber, 2007). Overall, the estimated prevalence of cyberbullying varied significantly between different studies and countries due to the difference of cyberbullying definition, time frame, and methods of measurement (Berne et al., 2013; Selkie et al., 2016; Brochado et al., 2017), which results in the problematic study comparisons. Indeed, using the Cyberbullying Test, which was a valid scale to measure cyberbullying (Garaigordobil, 2017), was advantageous to our study compared with other prior research. This measure contains 15 cyberbullying behaviors, enabling us to capture more comprehensive aspects that participants might suffer or observe during the recall period than other previous studies (Hellfeldt et al., 2019; Livazović and Ham, 2019; Chi et al., 2020; Panumaporn et al., 2020).

Notably, our results showed that though the impact of cyberbullying was significant, the proportion of participants taking specific actions against cyberbullying was not high. In addition to the impact on academic performance, there was a high proportion of individuals who experienced cyberbullying suffering the negative psychological effects such as anxiety, fear, and even suicidal thoughts. This was similar to previous studies showing the serious consequences of cyberbullying on the lives of victims (Schneider et al., 2012; Nixon, 2014). Nonetheless, the findings showed that only nearly 50% of the victims tried to stop this act of the perpetration, and 33.9%

tried to leave cyberspace. We also observed that victims only shared with friends about the issue of cyberbullying but did not share it with parents or teachers. The most common reasons for not sharing with parents or teachers were because the adolescents were afraid that the adults did not believe or the adults will not be able to do anything for the adolescents. Another reason was that the victims wanted to solve this problem themselves. In a previous study in Vietnam, it was found that ignoring this behavior and blocking the perpetrator's account were the two most common measures (58.8 and 54.6%, respectively; Chi et al., 2020). However, problems caused by cyberbullying were not easy to deal with because these behaviors can occur at any time and can reach large numbers of audiences in a short period of time (Patchin and Hinduja, 2006), causing a feeling of stigma and isolation among victims (Bossler et al., 2012; Burton et al., 2013) and, in turn, worsening the consequences of cyberbullying. Therefore, equipping adolescents with appropriate coping strategies against cyberbullying is essential and should be prioritized in school and family.

Our study also examined the rate of cyberbullying observers among adolescents and identified how they reacted to cyberbullying behaviors. As expected, we found that the majority of observers were in the group "Intervene" who responded to the cyberbullying acts by reporting these behaviors or helping victims. This result was similar to the study in Thailand showing that most observers belonged to the "Intervene" group (Panumaporn et al., 2020). However, our study was different from study results in Belgium, where the authors show that most adolescents belonged to the "Ignore" group when observing cyberbullying behaviors (Van Cleemput et al., 2014). We assumed that the cultural factors might be attributable to this difference. While the Western culture highlighted individualism, the Asian culture emphasized the role of collectivism, which might motivate them to help others when they faced problems (Sittichai and Smith, 2015). On the other hand, similar to the victim group, the main reasons that participants in the observer group did not report violent cyber behavior included (1) being afraid of limited Internet use and (2) believing that adults were unable to address this issue. This result suggested a huge gap in the relationships between parent-teacher and adolescents, especially among cyberbullying victims or observers. Interestingly, results of the multivariate models indicated an opposite trend between peer and teacher support, when higher peer and teacher support were associated with higher and lower likelihoods of being "Ignore" people. This phenomenon could be justified that adolescents' peers might not perceive this issue as a problem as adults did (i.e., parents and teachers; Slonje and Smith, 2008).

TABLE 5 | Associated factors with different types of cyberbullying observation.

Characteristics	Intervene		Ignore	
	OR	95% CI	OR	95% CI
Gender (female vs. male[a])	0.71	0.24–2.10	0.67	0.29–1.53
Age (vs. 11 years[a])				
12 years	1.39	0.16–11.69	0.95	0.20–4.40
13 years	0.87	0.17–4.44	0.80	0.23–2.75
14 years	0.56	0.11–2.92	1.10	0.32–3.85
Type of family (vs. nuclear[a])				
Multiple generations	1.14	0.42–3.13	0.96	0.44–2.12
Others			2.73	0.22–34.09
Support from family (per score)	0.94	0.59–1.48	0.72	0.50–1.05
Support from peers (per score)	0.97	0.55–1.69	1.78*	1.08–2.93
Support from teachers (per score)	0.99	0.61–1.61	0.64*	0.42–0.98
Cyberbullying attitude (per score)	1.53*	1.10–2.12	1.64	0.96–2.81
Cyberbullying experience (yes vs. no[a])	1.07	0.34–3.31	0.81	0.34–1.94

[a]*Reference group.*
*$p < 0.05$.

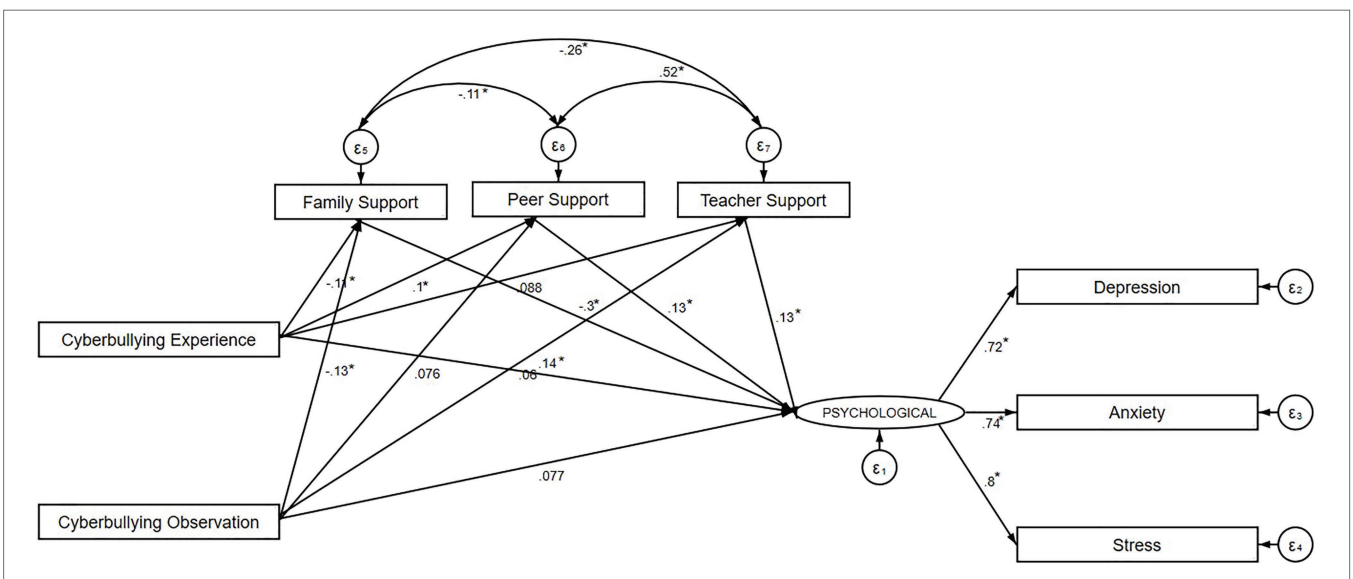

FIGURE 2 | Mediation model of cyberbullying experience and observation on psychological health *via* social support. The model shows the standardized estimates for direct effects, the covariance between mediators, and dependent variables. *$p < 0.05$.

TABLE 6 | Standardized indirect effects of cyberbullying experience and observation on psychological well-being outcomes *via* social support.

Pathways	Indirect effect	95% CI	Total effect/% total effect	Direct effect/% direct effect
Cyberbullying experience/family/ psychological problems	0.032*	0.003/0.060	0.173/18.3%	0.142/22.4%
Cyberbullying experience/peer/ psychological problems	0.014	–0.003/0.031	0.156/9.0%	0.142/9.9%
Cyberbullying experience/school/ psychological problems	0.012	–0.0040.027	0.153/8.0%	0.142/8.0%
Cyberbullying observation/family/ psychological problems	0.037*	0.008/0.066	0.114/32.5%	0.077/48.1%
Cyberbullying observation/peer/ psychological problems	0.010	–0.005/0.025	0.087/11.7%	0.077/13.2%
Cyberbullying observation/ school/ psychological problems	0.008	–0.006/0.022	0.085/9.2%	0.077/10.2%

*$p < 0.05$.

Moreover, even when youth perceived the impacts of cyberbullying, they could not provide adequate support due to the lack of knowledge and resource needed. Therefore, instead of recommending interventions on the issue, they were more likely to advise to ignore cyberbullying behaviors. It should be noted that the attitude against cyberbullying played an important role among adolescents in the "Intervene" group. This finding was consistent with previous studies on both cyberbullying and traditional bullying (Yang and Kim, 2017; Panumaporn et al., 2020). Therefore, campaigns to motivate adolescents to intervene in cyberbullying are critical to diminish this behavior and its impacts.

The findings of this study echoed previous evidence showing that cyberbullying experience was associated with psychological problems (Beckman et al., 2012; Schneider et al., 2012; Nixon, 2014; Wong et al., 2014; Panumaporn et al., 2020). Moreover, our study underlined the protective mediation effects of family support on the association between cyberbullying experience and observation with psychological issues. Unlike traditional bullying where parent, friend, and teacher support helped to mitigate the impact of bullying acts on victims' lives and mental health (Price and Dalgleish, 2010; Fanti et al., 2012; Hellfeldt et al., 2019), in our study, friend and teacher support did not buffer against the psychological problems among cyberbullying victims and/or observers. In literature, adolescents are concerned that sharing their experience with the teacher was an ineffective strategy (Price and Dalgleish, 2010), and reporting the problem to their parents could hinder their freedom in Internet use (Hoff Dianne and Mitchell Sidney, 2009). However, in a previous survey in Sweden, parent and teacher support was found to buffer against depressive and anxiety symptoms in cyberbullying victims and bully victims (Hellfeldt et al., 2019). Another longitudinal study found that adolescents who were victims of cyberbullying had lower levels of depressive symptoms if they had family support (Machmutow et al., 2012). As discussed above, we believed that parents could offer appropriate emotional support to help adolescents in controlling the psychological distress caused by cyberbullying behaviors (Livazović and Ham, 2019). Moreover, they may be more likely to perceive accurately the problem of cyberbullying, while friends might not fully recognize the trouble of cyberbullying involvement, resulting in the provision of inadequate support (Slonje and Smith, 2008). This result is critical since most of the victims in our study sought help from friends rather than their parents. Thus, parents should be proactive in building a strong bond with their children (Nixon, 2014; Slonje et al., 2017). On the other hand, our finding partially affirmed that peer support might not be the best focus to address cyberbullying and its consequence (Hellfeldt et al., 2019). However, further longitudinal studies should be performed to test the effect of peer support on buffering the relationship between cyberbullying and psychological impairment in different contexts.

The current study indicated several implications. First, educational campaigns should be performed to raise adolescents, parents, and teachers' awareness and attitude toward cyberbullying, motivating them to become involved to intervene and prevent cyberbullying behaviors. The contents of these interventions should include knowledge and practices on cyberbullying, communication and Internet use skills, and prosocial behaviors, empathy, and coping strategies with cyberbullying (Hutson et al., 2018). Regular training sessions should be performed to help adolescents in acquiring skills and abilities to actively cope with cyberbullying, help other victims, and prevent them from joining in cyberbullying. Previous studies found that active strategies to cope with cyberbullying victimization were effective to address the cyberbullying-related issues (Ybarra et al., 2007; Riebel et al., 2009; Chan and Wong, 2017). Second, according to the study, leaders in schools and communities should implement activities that increase parents' roles in addressing cyberbullying and its consequences among adolescents. Positive parent-children relationships could encourage adolescents to find support when dealing with difficult situations (Chan and Chui, 2015; Chan and Wong, 2017). Finally, given that cyberbullying is an emerging problem but school regulations for this issue do not exist in Vietnam, current policies should consider this type of bullying and its impact, especially among adolescents.

Interpretation of the study results should be done cautiously with the following limitations. First, given that cyberbullying is a sensitive issue, relying on only self-reports from participants may underestimate the actual rates of cyberbullying in adolescents. In literature, approaches that used information from multiple sources such as peers and teachers would be recommended (Brochado et al., 2017). Further studies that involve multiple reporters to measure the prevalence of

cyberbullying should be taken into account. Second, we used the cross-sectional design, which limited our ability to establish the causal associations. Thus, conclusions about the associations and effects in this study cannot be definitely drawn. Future studies should use longitudinal designs to investigate the influence of cyberbullying and social support on psychological well-being in middle school adolescents. Third, the rate of cyberbullying experience and observation was low, resulting in a small sample size for statistical tests. Moreover, we used a modified instrument to measure cyberbullying experience rather than use the original one, which might underestimate or overestimate the rate of cyberbullying victimization and observation. Finally, other characteristics such as traditional bullying exposure, the Internet or social media use, and cyberbullying perpetration were not fully investigated. These factors were found to be associated with cyberbullying victimization in previous work (Beckman et al., 2012; Athanasiou et al., 2018; Chi et al., 2020). Hence, further studies should be elucidated to measure these relationships between these factors and cyberbullying experience.

CONCLUSION

Our study suggested that the 3-month rate of cyberbullying experience and observation among urban adolescents aged 11–14 in Vietnam was low. However, current coping strategies against cyberbullying in this group were not sufficient. Family support is an important factor that should be considered for designing interventions to mitigate the impacts of cyberbullying on the mental health of adolescents.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Hanoi Medical University. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

AN, AT, BT, LN, MH, and TrN: conceptualization. AN, AT, BT, TrN, LD, and GV: methodology. AN, AT, LN, MH, and GV: formal analysis and investigation. AN, AT, BT, LN, MH, TrN, LD, GV, TuN, HD, CL, RH, and CH: writing—original draft preparation, and review and editing. BT, CL, RH, and CH: supervision. All authors contributed to the article and approved the submitted version.

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Validation of the Revised Olweus Bully/Victim Questionnaire (OBVQ-R) Among Adolescents in Chile

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Bullying is a phenomenon that affects children and adolescents worldwide, and it has major consequences for all participants involved in these situations. In Chile, researchers have validated several instruments used to investigate aggression between peers and school violence, but there is a lack of validation of instruments to investigate bullying. The purpose of this study was to provide evidence of the validity and reliability of the Olweus Bully/Victim Questionnaire—Revised version (OBVQ-R) in the Chilean context. The participants were 2,775 students from schools of low, medium, and high socioeconomic status. OBVQ-R is a self-report questionnaire with 42 items, which has been used in different countries, and has adequate psychometric properties to assess the prevalence of victimization and aggression and various forms of bullying worldwide. Results confirmed the two-factor structure of the OBVQ-R (victimization and perpetration subscales) and good reliability ($\omega = 0.81$ and $\omega = 0.75$, respectively). These dimensions seem to be correlated. Comparison between OBVQ-R with the School Violence between Peers Questionnaire and the Internet Experiences Questionnaire showed some degree of agreement. The Item Response Theory analysis showed that the item about verbal bullying, in both subscales, had the lowest-severity parameters, meaning that these forms of bullying were the most prevalent. The higher-severity parameter in the victimization scale was the cyberbullying item, and the sexual bullying item showed higher severity in the perpetration subscale. The differential item functioning analysis by gender showed a trend in which boys responded with lower-severity parameters than girls. In the victimization scale, the exception was the item about spreading rumors, and in the perpetration subscale, it was the item about racial bullying. We have provided evidence of the validation of OBVQ-R among school-age children and adolescents in Chile. This study is part of a trial registered at ClinicalTrials.gov, number NCT02898324.

Keywords: validity, reliability, bullying, OBVQ-R, questionnaire, children, adolescents, Chile

INTRODUCTION

Bullying is a major educational and public health problem (Menesini and Salmivalli, 2017). Bullying has been defined as intentional aggressive behaviors that repeatedly occur over time and in the context of a power imbalance between the victim/s and the perpetrator/s (Olweus, 1978; Menesini and Salmivalli, 2017). Bullying behavior may take different forms, such as physical (e.g., hitting, kicking, pushing), verbal (e.g., insults and telling mean names), and social or relational aggression (e.g., social exclusion, spreading rumors, or online attacks) (National Academies of Sciences, Engineering, and Medicine, 2016).

Studies show that the prevalence of bullying varies across countries and studies. This may be due to the use of different instruments, and the definitions and operationalization of the bullying concept (Menesini and Salmivalli, 2017). Nonetheless, the prevalence rates are high. For example, in a recent systematic review of studies conducted in Australia, the lifetime prevalence of bullying victimization was 25.1% and perpetration was 11.6%. For cyberbullying, the estimates were less common, 7% for victimization and 3.5% for perpetration (Jadambaa et al., 2019). Another recent meta-analysis of youth between 12 and 18 years old (n = 335,519) showed that 35% of students were involved in traditional bullying and 15% in cyberbullying (Modecki et al., 2014). Very few studies have been carried out in Latin-American countries. For instance, in Brazil, in a study conducted among 60,973 students exploring a 30-day prevalence of bullying, 5.4% reported that they had been continually bullied and 25.4% reported rarely being bullied (Malta et al., 2010). In Argentina, Resett (2016) found the following prevalence: victims 13%, bullies 6%, bully/victims 5%, and non-involved students 73%.

Regarding gender, differences between boys and girls in traditional bullying appear to be consistent. For instance, males seem to be more frequent perpetrators and victims in traditional bullying (Smith et al., 2019). However, there is a considerable variation between countries (Smith et al., 2019). Less consistent results appear in cyberbullying, where some studies report no gender differences (Brown et al., 2014), while others have found a higher proportion of females as victims (Kowalski and Limber, 2007).

There is a less clear association between socioeconomic status (SES) and bullying. In a recent systematic review and meta-analysis including 28 studies, mostly from Europe and North America, victimization and bully-victim status were positively but weakly associated with low SES, while bullying perpetration was the most weakly related (Tippett and Wolke, 2014). Further research exploring this association in middle- and low-income countries is needed.

Bullying has negative consequences in all children and adolescents involved, and some of these effects can last until adulthood (Salmivalli and Peets, 2018). For instance, victims of bullying exhibit more depressive, anxious, and somatic symptoms, lower self-esteem, lower academic performance, and suicidal ideation, among other problems (Skapinakis et al., 2011; Heerde and Hemphill, 2019). On the other hand, bullies have a higher risk for externalizing symptoms such as delinquent behaviors, substance misuse, impulsive behavior, and lower anger regulation compared with non-perpetrator students (Haynie et al., 2001). Children and adolescents who identified themselves as bully victims share the psychological consequences of both groups, and research has shown that they are the most maladjusted group (Haynie et al., 2001; Rivers, 2011). Some studies show that there are also negative consequences for bystanders, such as a higher risk of substance use than students not involved in bullying situations (Polanin et al., 2012; Gaete et al., 2017).

There are some gender differences regarding the consequences of bullying. Consistent results have been found regarding female victims having a higher risk for internalizing symptoms such depression and suicidal ideation (Fredrick and Demaray, 2018; Cao et al., 2020). Similarly, girls report higher negative psychological symptoms and suicidal behavior than boys (Rey et al., 2019). On the other hand, externalizing problems after being bullied are also present, especially among boys (McDougall and Vaillancourt, 2015).

Bullying Assessment

The self-report questionnaire is the most common methodology used for data collection to assess bullying (Ronan et al., 2013; Nelson et al., 2018). This method has several advantages: it takes a relatively short time to administer, is generally easy to answer, is relatively inexpensive (e.g., one evaluator can assess many students), and is efficient (e.g., many students can be evaluated at the same time). Additionally, the same questionnaire can be used by different research teams internationally, therefore allowing cross-country comparisons of prevalence and associated factors (Solberg and Olweus, 2003; Crothers and Levinson, 2004). However, there are also some disadvantages: students may give biased responses to maintain social desirability, especially among perpetrators who can underreport their behavior. It is also challenging to obtain in-depth information about bullying experiences, especially when compared with data gathered by interviews (Crothers and Levinson, 2004). Nonetheless, self-reported questionnaires are still the best option for assessing large populations and evaluating the effectiveness of bullying prevention programs.

Additionally, Evans et al. (2014) reviewed 32 articles about the effectiveness of bullying programs and stressed the importance of using an explicit definition of bullying to help responders to have a clear and shared concept of bullying, distinguishing it from other forms of aggression.

The Olweus Bully/Victim Questionnaire

The Olweus Bully/Victim Questionnaire (OBVQ) is one of the most widely used instruments to measure the prevalence of bullying worldwide (Green et al., 2013; Smith et al., 2016). This questionnaire provides students with a clear definition of bullying that includes the three essential characteristics: (1) intent to cause harm to another person; (2) repetitive conduct; and (3) power imbalance between the victim and the perpetrator (Olweus, 1978; Salmivalli and Peets, 2018). The original version of the OBVQ was developed in 1983 (with 36 items), and in 1996 Dan Olweus put forward the revised questionnaire (OBVQ-R) and increased the number of items to

42 (Kyriakides et al., 2006). Additional questions about different bullying types were included in the revised version, such as sexual bullying and cyberbullying. Additionally, the revised version has a more specific criterion of frequency: the response option "sometimes" in the original version was changed to "2 or 3 times a month" (Solberg and Olweus, 2003).

Several studies have shown evidence of the validity of the OBVQ using different methodological approaches (Solberg and Olweus, 2003; Vessey et al., 2014; Breivik and Olweus, 2015). For instance, Kyriakides et al. (2006) studied the OBVQ-R using Rash modeling in a sample of 335 Greek Cypriot students. The results supported the validity and reliability of the OBVQ-R, showing that there are two main factors (being bullied and bullying others) and that it addresses the typology of indirect, verbal, and physical bullying. Bevans et al. (2013) evaluated the OBVQ victimization scale using Item Response Theory (IRT) in a sample of 17,198 United States students. They found that the questionnaire has a reliable scale (Cronbach's alpha full scale 0.84) using ten items from the victim dimension. The researchers also concluded that the victimization factor has two subdimensions (direct and indirect types of victimization), and it has a better fit when stratifying by gender. Breivik and Olweus (2015) used IRT modeling and studied the psychometric properties of the OBVQ in a sample of 48,926 students in Norway. They found an optimal scale using eight items (they did not include the item about cyberbullying nor the item about *other forms* of bullying) in which bullying others corresponds to one factor, and the items that had the highest-severity parameters were taking money from others, spreading false rumors, and threatening others.

In Latin America, the OBVQ-R has been used in a few studies, showing satisfactory psychometric properties. In Argentina, two studies have evaluated the psychometric properties of the OBVQ-R. Resett (2011) administered the OBVQ-R to 84 Argentinean students to assess internal consistency. In the victim subscale, the Cronbach's alpha for the victimization scale was 0.9, with the cyberbullying item having a relatively low item-total correlation (r = 0.15). The perpetration scale had a Cronbach's alpha of 0.81, and the lowest item-total correlation was for threatening others (r = 0.16). In another study with 1,222 Argentinean students, a good fit for the two-factor model of the OBVQ-R (being bullied and bullying others) using confirmatory factorial analysis (CFA) was found (Resett et al., 2015). Additionally, the study found differences in the perpetrator subscale between genders, observing that boys identified themselves as harming others by physical aggression, and girls by relational aggression (e.g., lying, spreading rumors). Gonçalves et al. (2016) studied the OBVQ-R in a sample of 713 Brazilian students, from 5th to 9th grade, using IRT modeling. The study showed satisfactory reliability for the victim subscale (Cronbach's alpha 0.85) and the perpetrator subscale (Cronbach's alpha 0.87). In this study, the IRT model showed that the direct forms of bullying (e.g., threats, hurtful comments) had a high power to distinguish between victims and bullies. Finally, in another study with 409 Brazilian students, researchers found good internal consistency of the OBVQ (Cronbach's alpha 0.75) (Zequinão et al., 2016).

No previous study has assessed the validity and reliability of the OBVQ-R in Chile. Having a validated instrument will help to determine the prevalence of bullying, allow cross-country comparisons, and evaluate preventive school-based interventions. We used the Spanish version of the 42-item OBVQ-R.

This study aimed to determine the validity and reliability of the OBVQ-R in a sample of adolescents in Chile. The specific objectives were (1) to study the dimensionality and reliability of the Spanish version of the OBVQ-R in Chilean students; (2) to describe the psychometric features of the questionnaire; (3) to study the concurrent validity of this scale, comparing the OBVQ-R with the School Violence between Peers Questionnaire (MIAP) and Internet Experiences Questionnaire; (4) to study the internal structure of the OBVQ-R using the IRT Rach Model; and (5) to analyze the differential item functioning regarding gender and socioeconomic status.

MATERIALS AND METHODS

Study Design and Participants

This study was an analytical cross-sectional survey using self-reported information. The participants were students attending 4th to 8th grades, in mixed schools located in two central regions in Chile: Metropolitan and Valparaíso regions. The students were between 9 and 16 years old (mean 11.5, SD = 1.6), and 57.1% were female. See **Table 1**.

Considering differences according to household incomes (OECD, 2015), 32 schools were invited to participate, representing high, medium, and low SES. The SES was obtained

TABLE 1 | Descriptive Variables.

Variables	*n*	% or Mean	[95%IC] or (SD)		
Gender					
Female	1582	57.1	[55.3	-	59.0]
Male	1187	42.9	[41.0	-	44.7]
Class Level					
4th	538	19.4	[17.9	-	20.9]
5th	545	19.6	[18.2	-	21.1]
6th	551	19.9	[18.4	-	21.3]
7th	572	20.6	[19.1	-	22.1]
8th	569	20.5	[19.0	-	22.0]
SES					
Low	773	27.9	[26.2	-	29.5]
Medium	967	34.8	[33.1	-	36.6]
High	1035	37.3	[35.5	-	39.1]
Type of school					
Public	488	17.6	[16.2	-	19.0]
Subsidized	1252	45.1	[43.3	-	47.0]
Private	1035	37.3	[35.5	-	39.1]
Age by class level					
4th	534	9.4	(0.6)		
5th	543	10.1	(0.6)		
6th	548	11.4	(0.6)		
7th	570	12.4	(0.6)		
8th	568	13.4	(0.7)		

from the Education Quality Measurement System (*Sistema de Medición que la Agencia de Calidad de la Educación*, SIMCE), a measure used in Chile to evaluate different aspects of the school curricula and sociodemographic information from students and their families. Nine of the schools agreed to participate: three of low SES (representing 37.3% of students), four of Medium SES (34.8% of students), and two of high SES (27.9% of students).

Procedure

The research team obtained authorization from the schools' authorities. Then, the team asked for informed and written consent from parents/main caregivers. A total of 3,363 parents/main caregivers were contacted, and 99.1% (N = 3060) of them consented to their children's participation. The Ethical Committee of the University of the Andes of Chile approved the study protocol (January 18th, 2016). The study followed the Helsinki Convention norms.

The study was undertaken between June and August 2016, including the recruitment of schools and the evaluation of the students. The questionnaire was administered to the whole class, in the classroom, or in another suitable place in school. Trained research assistants carried out the administration on two different days, 1 week apart, for each class during the school hours (60 min each): on the first day, the students responded to the OBVQ-R, and 1 week later, they answered the MIAP Questionnaire and the Internet Experiences Questionnaire (IEQ).

Before administering the questionnaire, a research assistant asked the students to sign an informed assent to ensure voluntary participation, and a total of 2,775 students agreed to participate. Then, the assistant asked the students to fill in their sociodemographic information. In all grades, the research assistant read out the definition of bullying. In the 4th and 5th grades, the whole questionnaire was read out by the research assistant, but for 6th to 8th grades, the students answered it independently. The research assistants responded to doubts and questions from students. After the students completed the questionnaire, the research assistant put the returned questionnaires in sealed envelopes to ensure confidentiality. Research assistants entered the data in a predesigned database using computers exclusively dedicated to the research. Once the data were entered, the research field coordinator reviewed and cleaned the data. Finally, all personal information (name, school, class) was codified and encrypted, producing a final database without personal information. Only the principal investigator (JG) had access to the data using a password. This procedure allowed us to guarantee confidentiality and anonymity.

Measures

Sociodemographic Variables

The following sociodemographic variables were included in the analysis: gender, school grade, type of dependence, and SES of the educational establishment.

Administering the Revised Olweus Bully/Victim Questionnaire

The OBVQ-R is a 42-item self-report questionnaire that assesses events related to bullying behaviors between peers at school using a referential period of 2 months. It also includes questions about attitudes toward bullying and school climate (Solberg and Olweus, 2003) (see **Supplementary Material**).

Before administering the questionnaire, a definition of bullying was read out aloud for students. After general demographic questions (gender, school grade), the questionnaire started with two global questions where students could identify themselves as victims or bullies: "How often have you been bullied at school in the past couple of months?" (victims), and a similar question for harming others (perpetrators). It also asked about nine types of bullying, which included (1) calling mean names or teasing; (2) exclusion; (3) hitting, kicking, and pushing; (4) spreading rumors; (5) taking money or damaging belongings; (6) threatening; (7) making racial comments; (8) making sexual remarks or gestures; and (9) cyberbullying. It also asked if the children or adolescents had suffered any other form of bullying that was not mentioned (Solberg and Olweus, 2003). Another group of nine questions asked about characteristics of the bullying situations (e.g., the bullies' grade level, number of bullies, the length of time the student has been suffering from bullying, and the location where it took place). The questionnaire also included nine questions about actions that have been taken in school by teachers or parents to stop bullying. Finally, two questions asked about what students think of teachers' and parents' opinions about bullying (Solberg and Olweus, 2003; Vessey et al., 2014).

The answers were coded into a five-point scale from 0 to 4 (0 = *it hasn't happened to me in the last two months*,

TABLE 2A | Indicators of adjustment of victimization and aggression subscales.

Indicator	Estimator Victimization	Estimator Aggression	Correlated	Uncorrelated	Good fit	Acceptable fit
RMSEA	0.03	0.02	0.02	0.10	≤0.05	≤0.08
SRMR	0.05	0.08	0.06	0.23	≤0.1	≤0.1
NFI	0.95	0.94	0.98	0.78	≥0.95	≥0.90
NNFI	0.96	0.95	0.99	0.76	≥0.97	≥0.95
CFI	0.97	0.96	0.99	0.79	≥0.97	≥0.95
GFI	0.99	0.99	1.00	0.96	>0.95	>0.90
AGFI	0.99	0.98	0.99	0.93	>0.90	>0.85

RMSEA, Root Mean Square Error of Approximation; SRMR, Standardized Root Mean square Residual; NFI, Normed Fit Index; NNFI, Non-normed Fit Index; CFI, Comparative Fit Index; GFI, Goodness of Fit Index; AGFI, Adjusted Goodness of Fit Index.

TABLE 2B | Comparison between the correlated and uncorrelated models of victimization and aggression subscales.

Test	Estimator Victimization	Estimator Aggression	Correlated	Uncorrelated	χ^2	P value
CHISQ	98.85	92.72	350.6	4801.5	$\chi^2(1) = 4450.9$	<0.000

CHISQ, Chi-squared.

1 = *it happened to me only once or twice in the last two months*, 2 = *it happened to me 2 to 3 times a month*, 3 = *it happened to me once a week*, 4 = *it happened to me several times a week*) (Solberg and Olweus, 2003). The psychometric properties of the OBVQ-R have been studied elsewhere, as mentioned above, and internal consistencies range from 0.8 to 0.9 (Breivik and Olweus, 2015).

Violence Between Peers

MIAP was used to assess aggressive behaviors among students (Lecannelier et al., 2011). This questionnaire is a self-report instrument containing 13 multiple-choice questions. The questions gather information about aggression and its frequency using a 4-point scale: 1 = *never*, 2 = *sometimes*, 3 = *often*, and 4 = *always*. This instrument was adapted and validated for the Chilean population by Lecannelier et al. (2011), showing an overall Cronbach's alpha of 0.89. It distinguishes different roles, such as victim, bully, bully/victim, and bystander. This scale does not assess explicit bullying nor does it use a definition of bullying; however, it does evaluate violence in the schools, identifying several roles. The answers from this questionnaire and the OBVQ-R should be similar to assess the concurrent validity of the OBVQ-R. In our sample, the Cronbach's alpha was 0.94, and the ω was 0.89 for the victimization factor, and the Cronbach's alpha was 0.95, and the ω was 0.82 for the perpetration factor.

Cyberbullying

The IEQ is a self-report questionnaire with 28 questions. It evaluates different forms of traditional bullying and cyberbullying happening during the current school year. The questionnaire assesses if the respondent was a victim or a bully, the number of times bullying took place, and if the victim knew who was responsible (Raskauskas and Stoltz, 2007). This instrument was adapted and validated for the Chilean population, showing a Cronbach's alpha of 0.62 for the full scale (Lecannelier et al., 2010). There were three questions closely related to the cyberbullying item included in the OBVQ-R: Have you been a victim of bullying through text messages (using cellphone or WhatsApp)?; Have you been a victim of bullying through internet (messages posted on a website or blog); and Have you been a victim of bullying through using pictures or videos of you without your permission? Similar questions were constructed for evaluating aggression. All these questions were answered using a 6-point scale: 0 = *never*, 1 = *once or twice a year*, 2 = *3–5 times a year*, 3 = *6–10 times a year*, 4 = *11–15 times a year*, and 5 = *16 or more times a year*. It was decided to compare the cyberbullying item included in the OBVQ-R with the question in the IEQ instrument for which the same student had the highest score. We assessed the concurrent validity of the OBVQ-R with these questions.

Data Analysis

The descriptive statistics are reported as percentages with 95% confidence intervals (CI 95%) for gender, class level, socioeconomic status, type of school, and age reported as mean (standard deviation) by class level.

Dimensionality and Reliability

A CFA was conducted to study the dimensionality and reliability of the OBVQ-R. We used the weighted least squares (WLS) of the polychoric matrix, which is considered more robust than other methods (Browne, 1984; Muthén, 1984). Polychoric correlations are advised for factor analysis when the distributions of items are ordinals (Flora and Curran, 2004). CFA is part of the measurement model that examines relationships between variables and the observed factors. It was important to determine if the questionnaire had two subscales (victimization and perpetration) and if these subscales were independent of each other (uncorrelated) or were related. Therefore, we assessed the goodness of fit of different models: (1) two independent models of victimization and perpetration subscales (see **Figures 1**, **2**), (2) a model with two factors correlated for victimization and perpetration subscales (see **Figure 3**), and (3) a model with two factors uncorrelated for victimization and perpetration subscales (see **Figure 4**). We used multiple goodness-of-fit indices to judge whether the proposed model is consistent with the empirical data, and we used the chi-square test (CHISQ) to compare both models. The following indices were calculated to determine if the adjustment was at least acceptable: (1) Root Mean Square Error of Approximation (RMSEA), (2) Standardized Root Mean Square Residual (SRMR), (3) Normed Fit Index (NFI), (4) Non-normed Fit Index (NNFI), (5) Comparative Fit Index (CFI), (6) Goodness-of-Fit Index (GFI), and (7) Adjusted Goodness-of-Fit Index (AGFI) (**Table 2**). It was considered a good fit for RMSEA if values were less than or equal to 0.05, and values between 0.05 and 0.08 were considered adequate (Bollen and Long, 1993). SRMR values less than 0.05 indicated a good fit, while values less than 0.10 were interpreted as acceptable (Hu and Bentler, 1995). NFI greater than or equal to 0.95 indicated a good fit, while values higher than 0.90 indicated an acceptable adjustment (Schumacker and Lomax, 2012). NNFI greater than or equal to 0.97 indicated a good fit, and 0.95 was an acceptable fit (Jöreskog and Sörbom, 1993). CFI has the same criteria as NNFI (Bollen, 1990; Hu and Bentler, 1999). GFI of 0.95 indicated a good fit, and values greater than 0.90, an acceptable fit (Schumacker and Lomax, 2012). Finally, AGFI 0.90 was indicative of a good fit, and values greater than 0.85 indicated an acceptable fit.

Additionally, the instrument's reliability was evaluated through the omega coefficient; an acceptable reliability value

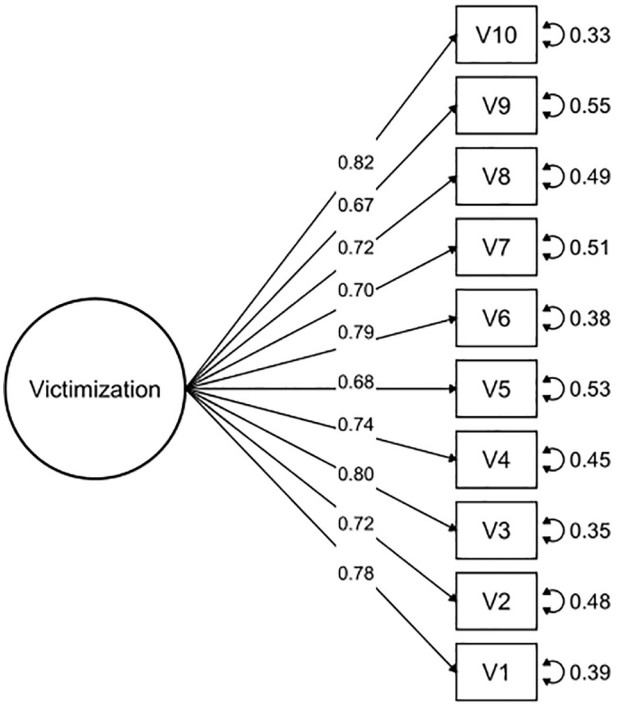

FIGURE 1 | Confirmatory factor analysis of the victimization subscale.

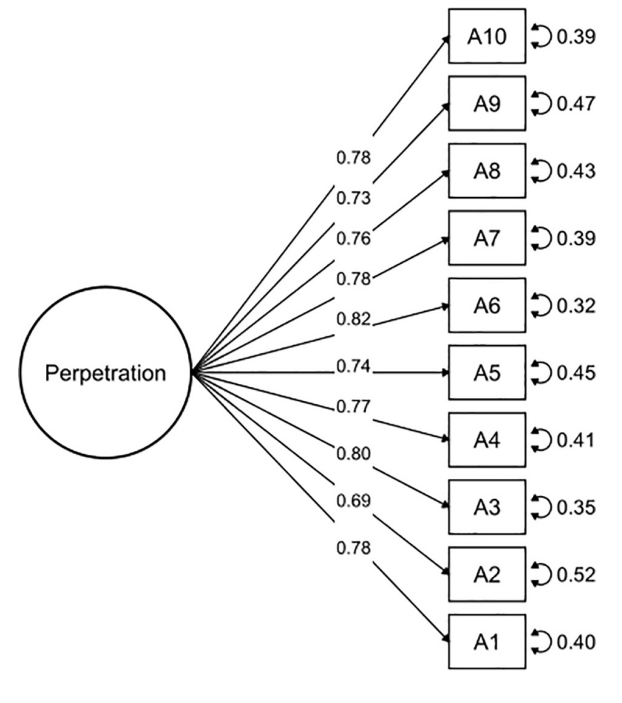

FIGURE 2 | Confirmatory factor analysis of the prepetration subscale.

is 0.65 or more (McDonald, 2013). Also, the average variance extracted was calculated; it was acceptable at a value of at least 0.5 (Fornell and Larcker, 1981).

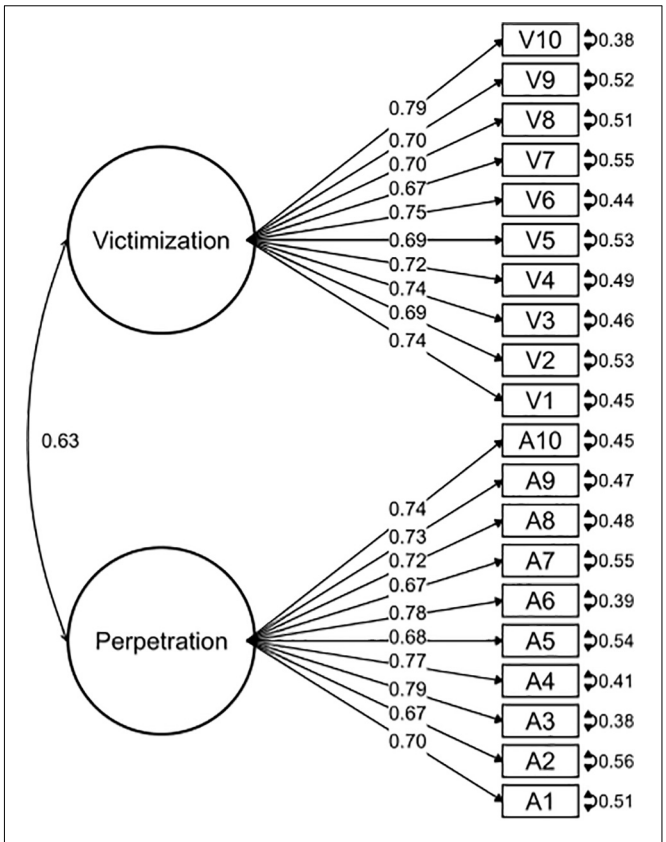

FIGURE 3 | Confirmatory factor analysis of the model with two factors correlated for victimization and perpetration subscales.

Descriptive Features of the Questionnaire

The items were described by mean, standard deviation, median, skewness and kurtosis coefficients, and the quartiles 1 and 3. These last two parameters are presented in intervals [Q1–Q3], as a robust measure of dispersion. The same analyses were conducted when comparing the psychometric properties of subscales of victimization and perpetration between girls and boys and different socioeconomic statuses.

IRT Analysis

The analysis of the psychometric properties of the OBVQ-R was done using IRT for the graded response model (Samejima, 1969) for each of the 10 items included in each subscale. The response alternatives were collapsed into three answer categories: 0 is "never in the last two months at school" (0 = 1), 1 is "it has happened once or twice in the last two months" (1 = 2), and 2 includes the responses "2 or 3 times a month in the last two months," "about once a week in the last two months" and "several times a week in the last two months" (2 = 3,4,5).

The IRT model estimated three parameters: Alpha, Beta1, and Beta2. Alpha is a discrimination parameter, representing the degree to which the answer categories differentiate between levels of the trait. It remains constant for all the thresholds of the categories of the same item. This discrimination parameter alpha was interpreted according to the following scale: 0 = "no

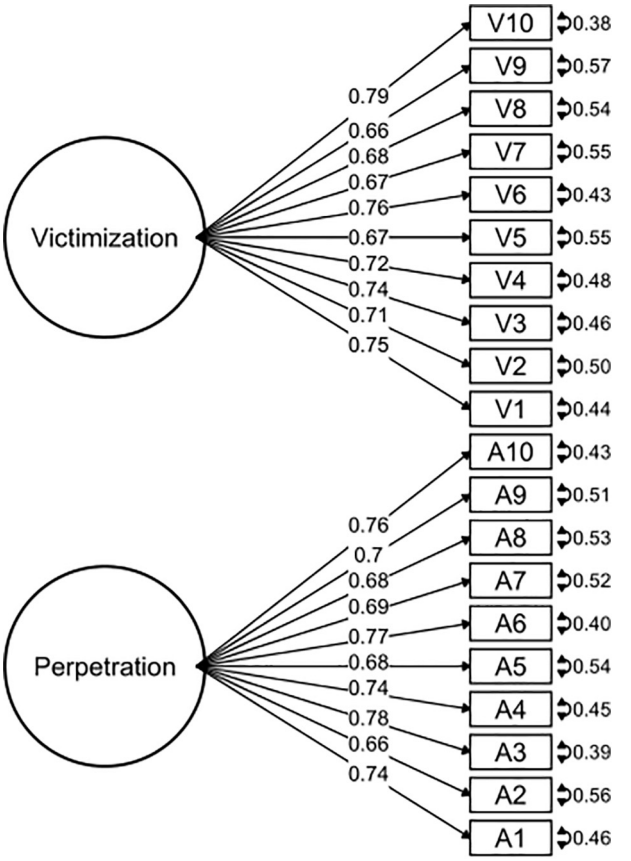

FIGURE 4 | Confirmatory factor analysis of the model with two factors uncorrelated for victimization and perpetration subscales.

discrimination," 0.01–0.34 = "very low," 0.35–0.64 = "low," 0.65–1.34 = "moderate," 1.35–1.69 = "high," and greater than or equal to 1.7 = "very high" (Baker, 2001). On the other hand, Beta1 represents the latent trait needed for the student to pass the threshold from answering 0 (never happened to me in the last two months at school) to 1 (it has happened once or twice in the last two months). In other words, Beta1 refers to the minimum value of the necessary trait to obtain a probability higher than 0.5 in answering option 1. Moreover, Beta2, similar to Beta1, represents the threshold for passing from the answer category of 1 (it has happened once or twice in the last two months) to 2 (it has happened to me 2 or 3 times a month or more in the last two months). With the estimation of these severity parameters, we can order the questions according to their degree of severity; when the threshold is high, the degree of severity will be higher.

Differential Item Functioning (DIF) by Gender and SES

We determined if there were items with differential functioning for subgroups. If so, this implies that respondents from different subgroups with the same latent trait level do not have the same probability of responding positively to an item category (Chalmers, 2012). The items can have a different relationship with the principal construct by subgroups (Reise et al., 2005). We evaluated DIF associated with gender and SES independently.

All data analyses were conducted using R 3.5.0. CFA and IRT were performed using lavaan (Rosseel, 2012) and mirt package (Chalmers, 2012), respectively.

Concurrent Validity

It was evaluated by analyzing the concordance of seven items of the victimization subscale and seven items of perpetration subscale with similar items in the MIAP. The cyberbullying item of the OBVQ-R was compared to the IEQ, since the MIAP does not include cyberbullying items.

To assess the agreement between each instrument's questions, we used Cohen's kappa statistic and its confidence intervals, as well as a hypothesis test in which the null hypothesis proposes that the degree of agreement between the items is random (Landis and Koch, 1977). The degree of agreement between the questions will be interpreted in the following way: if kappa is less than 0, there is "no agreement," if 0–0.2, "slight agreement," if 0.2–0.4, "fair agreement," if 0.4–0.6, "moderate agreement," if 0.6–0.8, "substantial agreement," and if 0.8–1.0, "almost perfect agreement" (Landis and Koch, 1977).

RESULTS

Dimensionality and Reliability

The OBVQ-R had good parameters of adjustment indicators in both subscales separately (see **Table 2A**). The unidimensional characteristic of both subscales (victimization and perpetration) was corroborated (see **Table 2A**). Additionally, the model of the two subscales correlated presented a better fit than the uncorrelated model (see **Tables 2A,B**, and **Figures 1–4**).

Finally, the victimization and perpetration subscales have good internal reliability (Cronbach's alpha = 0.91, $\omega = 0.81$, and Cronbach's alpha = 0.92, $\omega = 0.76$, respectively), and the average variance extracted was 0.51 and 0.52, respectively.

Descriptive Features of the Questionnaire

Descriptive statistics of all items of victimization and perpetration subscales are shown in **Table 3**. All items of victimization and perpetration subscales were mostly comprised of items with asymmetric responses and a high degree of kurtosis. Additionally, results from the factorial analysis showed that the item "I was bullied with mean names, comments, or gestures with a sexual meaning" had the lowest load (0.65) in the victimization subscale, while the lowest load in the perpetration subscale was 0.66, for the item "I called another student(s) mean names, made fun of, or teased him/her in a hurtful way."

Item Response Theory analysis

Table 4 shows the descriptive statistics (median and interquartile range) for each question from the victimization and perpetration subscales. Additionally, it presents estimated parameters through IRT (Alpha, Beta1, and Beta2).

TABLE 3 | Descriptive Statistics and factor loading.

	Original items							
Questions	***n***	**Median**	**[Q1 – Q3]**	**Mean**	***SD**	**Kurtosis**	**Skewness**	**Factor loading**
Victimization								
1. I was called mean names, was made fun of, or teased in a hurtful way.	2762	0	[0–1]	0.49	0.99	7.91	2.35	0.75
2. Other students left me out of things on purpose, excluded from their group of friends, or completely ignored me.	2756	0	[0–0]	0.33	0.78	12.43	2.98	0.69
3. I was hit, kicked, pushed, shoved around, or locked indoors.	2751	0	[0–0]	0.13	0.51	32.18	5.08	0.75
4. Other students told lies or spread rumors about me and tried to make others dislike me.	2753	0	[0–1]	0.39	0.84	10.54	2.69	0.72
5. I had money or things taken away from me or damaged.	2755	0	[0–0]	0.18	0.57	21.80	4.07	0.67
6. I was threatened or forced to do things I didn't want to do.	2755	0	[0–0]	0.15	0.57	28.87	4.85	0.76
7. I was bullied with mean names or comments about my race or color.	2754	0	[0–0]	0.16	0.58	26.95	4.65	0.67
8. I was bullied with mean names, comments, or gestures with a sexual meaning.	2748	0	[0–0]	0.18	0.65	23.55	4.42	0.69
9. I was bullied with cruel messages or hurtful photographs using a cellphone or Internet.	2744	0	[0–0]	0.09	0.40	49.21	6.21	0.65
10. I was bullied in other forms that weren't mentioned.	2742	0	[0–0]	0.20	0.66	20.80	4.08	0.79
Aggression								
1. I called another student(s) mean names, made fun of, or teased him/her in a hurtful way.	2740	0	[0–0]	0.25	0.64	15.95	3.32	0.74
2. I kept him/her out of things on purpose, excluded him or her from my group of friends, or completely ignored him or her.	2737	0	[0–0]	0.17	0.54	25.74	4.34	0.68
3. I hit, kicked, pushed, and shoved him or her around or locked him or her indoors.	2734	0	[0–0]	0.09	0.41	45.64	5.99	0.78
4. I spread false rumors about him/her and tried to make others dislike him/her.	2730	0	[0–0]	0.08	0.38	56.84	6.70	0.74
5. I took money or things from him or her or damaged his/her belongings.	2733	0	[0–0]	0.05	0.28	75.99	7.64	0.67
6. I threatened or forced him/her to do things he/she didn't want to do.	2730	0	[0–0]	0.03	0.27	129.22	10.37	0.77
7. I bullied him/her with mean names or comments about his/her race or color.	2729	0	[0–0]	0.08	0.38	48.10	6.06	0.67
8. I bullied him/her with mean names, comments, or gestures with sexual meaning.	2726	0	[0–0]	0.04	0.26	71.13	7.43	0.66
9. I bullied him/hers with cruel messages or hurtful photographs using a cellphone or Internet.	2717	0	[0–0]	0.04	0.29	104.07	9.18	0.70
10. I bullied others using other forms that weren't mentioned.	2707	0	[0–0]	0.07	0.35	60.20	6.74	0.74

**SD, Standard Deviation.*

TABLE 4 | Item Response Theory parameter estimates of the OBVQ-R.

Questions	Items in new categorization*		Alpha	Beta1	Beta2
	Median	[Q1 – Q3]			
Victimization					
1. I was called mean names, was made fun of, or teased in a hurtful way.	0	[0 – 1]	2.06	0.82	1.65
2. Other students left me out of things on purpose, excluded from their group of friends, or completely ignored me.	0	[0 – 0]	1.8	1.09	2.19
3. I was hit, kicked, pushed, shoved around, or locked indoors.	0	[0 – 0]	2.06	1.8	2.64
4. Other students told lies or spread rumors about me and tried to make others dislike me.	0	[0 – 1]	1.83	0.93	1.99
5. I had money or things taken away from me or damaged.	0	[0 – 0]	1.67	1.7	2.72
6. I was threatened or forced to do things I didn't want to do.	0	[0 – 0]	2.17	1.71	2.46
7. I was bullied with mean names or comments about my race or color.	0	[0 – 0]	1.62	1.89	2.81
8. I was bullied with mean names, comments, or gestures with a sexual meaning.	0	[0 – 0]	1.86	1.74	2.42
9. I was bullied with cruel messages or hurtful photographs using a cellphone or Internet.	0	[0 – 0]	1.66	2.27	3.23
10.I was bullied in other forms that weren't mentioned.	0	[0 – 0]	2.36	1.48	2.15
Aggression					
1. I called another student(s) mean names, made fun of, or teased him/her in a hurtful way.	0	[0 – 0]	2.19	1.18	2.19
2. I kept him/her out of things on purpose, excluded him or her from my group of friends, or completely ignored him or her.	0	[0 – 0]	1.67	1.66	2.86
3. I hit, kicked, pushed, and shoved him or her around or locked him or her indoors.	0	[0 – 0]	2.41	1.93	2.6
4. I spread false rumors about him/her and tried to make others dislike him/her.	0	[0 – 0]	2.17	2.09	2.9
5. I took money or things from him or her or damaged his/her belongings.	0	[0 – 0]	1.83	2.54	3.44
6. I threatened or forced him/her to do things he/she didn't want to do.	0	[0 – 0]	2.28	2.54	3.22
7. I bullied him/her with mean names or comments about his/her race or color.	0	[0 – 0]	1.97	2.1	3
8. I bullied him/her with mean names, comments, or gestures with sexual meaning.	0	[0 – 0]	1.87	2.54	3.53
9. I bullied him/hers with cruel messages or hurtful photographs using a cellphone or Internet.	0	[0 – 0]	2.01	2.54	3.37
10. I bullied others using other forms that weren't mentioned.	0	[0 – 0]	2.15	2.11	3.03

**New categorization: 0, never happened to me in the last two months at school; 1, it has happened once or twice in the last two months; 2, it has happened to me 2 o 3 times a month or more in the last two months. Beta1 represents the latent trait that is needed for the student to pass from 0 to 1; Beta 2 represents the threshold for passing from the answer category of 1 to 2.*

The subscale of victimization shows that in eight of the ten items (except items #1 and #4), at least 75% of the students did not suffer bullying at school in the last 2 months. In items #1 and #4, at least 25% of them declared that they were bullied. The 10 items discussed represented the trait of victimization in students. We observed that the discrimination parameters varied between 1.62 (bullying about race and color) and 2.36 (other forms of bullying). Though the 1.62 value was the lowest estimator, it remains high according to Baker's (2001) classification; therefore, all items in this subscale discriminated the victimization trait very well. In the first (Beta1) and second (Beta 2) thresholds, the item with the lowest latent trait was "#1. I was called mean names, was made fun of, or teased in a hurtful way," and the item with the highest victimization trait was #9 or cyberbullying.

Every item of the perpetration subscale showed that at least 75% of the students reported not having bullied others at school in the last 2 months. These 10 items had high values or very high values, according to Baker's (2001) classification, in the trait of perpetration (range between 1.67 and 2.41). Regarding the first threshold (Beta1), the item with the lowest latent trait (1.18) was "#1. I called another student(s) mean names, made fun of, or teased him/her in a hurtful way." Four items had the highest latent trait (2.54): "#5. I took money or things from him or her or damaged his/her belongings," "#6. I threatened or forced him/her to do things he/she didn't want to do," "#8. I bullied him/her with mean names, comments, or gestures with sexual meaning," and "#9. I have bullied others with cruel messages or hurtful photographs using a cellphone or Internet." By analyzing the second threshold (Beta 2), the lowest latent trait (2.19) was "#1. I called another student(s) mean names, made fun of, or teased him/her in a hurtful way," and "#8. I bullied him/her with mean names, comments, or gestures with sexual meaning" was the highest latent trait (3.53).

Differential Item Functioning by Gender

Descriptive statistics of all items of victimization and perpetration subscales by gender are shown in **Table 5**. Independently of gender, all items have asymmetric responses and high degree of kurtosis.

The victimization subscale items have a discrimination parameter estimate between 1.52 and 2.19 for girls and between 1.67 and 2.56 for boys. In general, the discrimination parameters of all items (except "#4. Other students told lies or spread rumors about me and tried to make others dislike me") were higher among boys than girls. We also found that the item "#8. I was bullied with mean names, comments, or gestures with a sexual meaning" had the highest difference between girls and boys, followed by the item "#1. I was called mean names, was made fun of, or teased in a hurtful way." In general, most items showed that

TABLE 5 | Item parameters accounting for differential item functioning by Gender in subscale of victimization and aggression of the OBVQ-R.

Questions	Gender	*n*	Mean	Median	[Q1-Q3]	*SD	Kurtosis	Skewness	Alpha	Beta1	Beta2
Victimization											
1. I was called mean names, was made fun of, or teased in a hurtful way.	Boys	1188	0.56	0	[0 - 1]	1.07	6.48	2.09	2.27	0.73	1.43
	Girl	1577	0.43	0	[0 - 1]	0.92	9.40	2.59	1.90	0.89	1.86
2. Other students left me out of things on purpose, excluded from their group of friends, or completely ignored me.	Boys	1183	0.30	0	[0 - 0]	0.77	13.38	3.18	1.86	1.26	2.09
	Girl	1577	0.36	0	[0 - 0]	0.78	11.85	2.84	1.81	0.96	2.23
3. I was hit, kicked, pushed, shoved around, or locked indoors.	Boys	1182	0.17	0	[0 - 0]	0.58	24.42	4.39	2.15	1.61	2.36
	Girl	1573	0.10	0	[0 - 0]	0.46	42.13	5.84	2.02	1.97	2.93
4. Other students told lies or spread rumors about me and tried to make others dislike me.	Boys	1180	0.33	0	[0 - 0]	0.79	12.15	2.97	1.85	1.14	2.05
	Girl	1577	0.44	0	[0 - 1]	0.87	9.64	2.53	1.95	0.76	1.88
5. I had money or things taken away from me or damaged.	Boys	1181	0.20	0	[0 - 0]	0.61	19.50	3.88	1.73	1.65	2.54
	Girl	1578	0.16	0	[0 - 0]	0.53	23.79	4.21	1.63	1.74	2.89
6. I was threatened or forced to do things I didn't want to do.	Boys	1182	0.18	0	[0 - 0]	0.60	23.32	4.31	2.19	1.60	2.31
	Girl	1577	0.13	0	[0 - 0]	0.54	34.70	5.37	2.13	1.81	2.62
7. I was bullied with mean names or comments about my race or color.	Boys	1181	0.20	0	[0 - 0]	0.68	20.30	4.08	1.74	1.75	2.47
	Girl	1577	0.13	0	[0 - 0]	0.49	34.91	5.17	1.52	2.03	3.19
8. I was bullied with mean names, comments, or gestures with a sexual meaning.	Boys	1178	0.23	0	[0 - 0]	0.75	17.63	3.82	2.08	1.56	2.08
	Girl	1574	0.15	0	[0 - 0]	0.57	31.08	5.05	1.68	1.92	2.83
9. I was bullied with cruel messages or hurtful photographs using a cellphone or Internet.	Boys	1179	0.09	0	[0 - 0]	0.42	46.27	6.11	1.67	2.25	3.13
	Girl	1569	0.08	0	[0 - 0]	0.38	51.38	6.26	1.66	2.28	3.30
10. I was bullied in other forms that weren't mentioned.	Boys	1176	0.22	0	[0 - 0]	0.72	17.86	3.81	2.56	1.45	1.96
	Girl	1570	0.18	0	[0 - 0]	0.61	23.61	4.30	2.19	1.53	2.34
Aggression											
1. I called another student(s) mean names, made fun of, or teased him/her in a hurtful way.	Boys	1177	0.33	0	[0 - 0]	0.71	12.58	2.87	1.90	1.02	2.16
	Girl	1567	0.20	0	[0 - 0]	0.58	19.82	3.77	2.52	1.31	2.22
2. I kept him/her out of things on purpose, excluded him or her from my group of friends, or completely ignored him or her.	Boys	1174	0.16	0	[0 - 0]	0.53	27.77	4.54	2.11	1.58	2.55
	Girl	1567	0.18	0	[0 - 0]	0.55	24.47	4.21	1.51	1.69	3.06
3. I hit, kicked, pushed, and shoved him or her around or locked him or her indoors.	Boys	1173	0.12	0	[0 - 0]	0.48	33.50	5.09	2.48	1.72	2.38
	Girl	1565	0.06	0	[0 - 0]	0.34	61.92	7.02	2.24	2.17	2.89
4. I spread false rumors about him/her and tried to make others dislike him/her.	Boys	1171	0.07	0	[0 - 0]	0.36	54.93	6.51	2.54	1.97	2.75
	Girl	1563	0.08	0	[0 - 0]	0.39	57.47	6.80	1.98	2.18	3.02
5. I took money or things from him or her or damaged his/her belongings.	Boys	1171	0.06	0	[0 - 0]	0.31	52.40	6.40	1.91	2.35	3.12
	Girl	1566	0.04	0	[0 - 0]	0.25	108.72	9.08	1.73	2.74	3.82
6. I threatened or forced him/her to do things he/she didn't want to do.	Boys	1170	0.04	0	[0 - 0]	0.29	108.35	9.40	2.11	2.49	3.22
	Girl	1564	0.03	0	[0 - 0]	0.25	151.21	11.32	2.46	2.58	3.22
7. I bullied him/her with mean names or comments about his/her race or color.	Boys	1169	0.12	0	[0 - 0]	0.45	35.95	5.19	1.62	2.04	3.19
	Girl	1564	0.06	0	[0 - 0]	0.32	64.16	7.06	2.38	2.17	2.88
8. I bullied him/her with mean names, comments, or gestures with sexual meaning.	Boys	1168	0.07	0	[0 - 0]	0.34	46.52	5.98	1.65	2.38	3.43
	Girl	1562	0.02	0	[0 - 0]	0.18	101.41	9.07	2.23	2.68	3.67
9. I bullied him/hers with cruel messages or hurtful photographs using a cellphone or Internet.	Boys	1164	0.05	0	[0 - 0]	0.33	88.08	8.63	2.57	2.28	2.91
	Girl	1557	0.04	0	[0 - 0]	0.25	112.13	9.25	1.73	2.76	3.79
10. I bullied others using other forms that weren't mentioned.	Boys	1165	0.08	0	[0 - 0]	0.39	56.16	6.62	2.17	2.10	2.92
	Girl	1546	0.07	0	[0 - 0]	0.32	61.38	6.70	2.27	2.07	3.03

**SD, Standard Deviation.*

TABLE 6 | Item parameters accounting for differential item functioning by ses in subscale of victimization and aggression of the OBVQ-R.

Questions	SES	*n*	Mean	Median	[Q1-Q3]	*SD	Kurtosis	Skewness	Alpha	Beta1	Beta2
Victimization											
1. I was called mean names, was made fun of, or teased in a hurtful way.	Low	767	0.80	0	[0 – 1]	1.27	4.15	1.56	2.05	0.41	1.17
	Medium	966	0.40	0	[0 – 0]	0.88	10.18	2.69	2.05	0.91	1.83
	High	1029	0.33	0	[0 – 0]	0.77	11.74	2.89	1.98	1.08	2.01
2. Other students left me out of things on purpose, excluded from their group of friends, or completely ignored me.	Low	763	0.41	0	[0 – 0]	0.93	9.29	2.61	2.11	0.97	1.72
	Medium	961	0.30	0	[0 – 0]	0.70	14.26	3.13	1.45	1.23	2.76
	High	1032	0.30	0	[0 – 0]	0.71	13.38	3.04	1.94	1.08	2.20
3. I was hit, kicked, pushed, shoved around, or locked indoors.	Low	759	0.24	0	[0 – 0]	0.74	16.26	3.62	2.07	1.44	2.13
	Medium	961	0.11	0	[0 – 0]	0.43	36.39	5.22	1.66	2.02	3.20
	High	1031	0.07	0	[0 – 0]	0.34	60.15	6.77	2.42	2.00	2.92
4. Other students told lies or spread rumors about me and tried to make others dislike me.	Low	765	0.52	0	[0 – 1]	1.02	7.10	2.20	2.05	0.79	1.52
	Medium	961	0.40	0	[0 – 1]	0.80	10.72	2.64	1.71	0.86	2.13
	High	1027	0.30	0	[0 – 0]	0.70	14.86	3.20	1.71	1.14	2.43
5. I had money or things taken away from me or damaged.	Low	765	0.24	0	[0 – 0]	0.68	14.93	3.38	2.10	1.40	2.14
	Medium	960	0.16	0	[0 – 0]	0.54	26.34	4.49	1.62	1.82	2.86
	High	1030	0.15	0	[0 – 0]	0.50	25.70	4.34	1.38	1.95	3.37
6. I was threatened or forced to do things I didn't want to do.	Low	763	0.23	0	[0 – 0]	0.75	18.07	3.88	2.54	1.45	2.00
	Medium	960	0.13	0	[0 – 0]	0.51	33.57	5.18	2.16	1.78	2.60
	High	1032	0.11	0	[0 – 0]	0.45	37.33	5.36	1.88	1.92	2.88
7. I was bullied with mean names or comments about my race or color.	Low	764	0.28	0	[0 – 0]	0.80	14.17	3.34	1.74	1.44	2.15
	Medium	961	0.14	0	[0 – 0]	0.54	31.58	5.04	1.39	2.18	3.30
	High	1029	0.09	0	[0 – 0]	0.38	47.59	5.93	1.55	2.24	3.56
8. I was bullied with mean names, comments, or gestures with a sexual meaning.	Low	760	0.22	0	[0 – 0]	0.75	18.73	3.98	1.51	1.84	2.51
	Medium	958	0.18	0	[0 – 0]	0.63	24.72	4.50	2.34	1.56	2.29
	High	1030	0.16	0	[0 – 0]	0.60	27.05	4.70	2.02	1.76	2.40
9. I was bullied with cruel messages or hurtful photographs using a cellphone or Internet.	Low	757	0.12	0	[0 – 0]	0.51	36.70	5.52	1.99	1.97	2.65
	Medium	958	0.08	0	[0 – 0]	0.35	51.26	6.16	1.44	2.46	3.73
	High	1029	0.07	0	[0 – 0]	0.34	54.02	6.41	1.61	2.40	3.41
10. I was bullied in other forms that weren't mentioned.	Low	757	0.28	0	[0 – 0]	0.82	14.16	3.38	2.53	1.33	1.82
	Medium	957	0.16	0	[0 – 0]	0.55	26.00	4.47	2.47	1.53	2.29
	High	1028	0.18	0	[0 – 0]	0.62	23.40	4.33	2.27	1.55	2.30
Aggression											
1. I called another student(s) mean names, made fun of, or teased him/her in a hurtful way	Low	759	0.45	0	[0 – 1]	0.85	9.06	2.39	2.22	0.70	1.69
	Medium	953	0.20	0	[0 – 0]	0.57	19.88	3.73	2.13	1.35	2.43
	High	1028	0.16	0	[0 – 0]	0.48	22.12	3.90	1.81	1.60	2.86
2. I kept him/her out of things on purpose, excluded him or her from my group of friends, or completely ignored him or her.	Low	757	0.22	0	[0 – 0]	0.66	18.98	3.83	2.06	1.44	2.22
	Medium	951	0.17	0	[0 – 0]	0.56	28.31	4.62	1.62	1.73	2.95
	High	1029	0.14	0	[0 – 0]	0.42	21.40	3.74	1.56	1.75	3.49
3. I hit, kicked, pushed, and shoved him or her around or locked him or her indoors.	Low	755	0.18	0	[0 – 0]	0.58	19.77	3.86	2.39	1.49	2.08
	Medium	951	0.06	0	[0 – 0]	0.35	74.81	7.74	2.39	2.16	2.85
	High	1028	0.04	0	[0 – 0]	0.26	94.66	8.46	2.00	2.44	3.61
4. I spread false rumors about him/her and tried to make others dislike him/her.	Low	753	0.13	0	[0 – 0]	0.53	32.23	5.11	2.88	1.65	2.19
	Medium	948	0.06	0	[0 – 0]	0.31	59.39	6.76	2.06	2.24	3.14
	High	1029	0.05	0	[0 – 0]	0.29	91.43	8.28	1.37	2.92	4.56

(Continued)

TABLE 6 | Continued

Questions	SES	*n*	Mean	Median	[Q1-Q3]	*SD	Kurtosis	Skewness	Alpha	Beta1	Beta2
5. I took money or things from him or her or damaged his/her belongings.	Low	754	0.06	0	[0 – 0]	0.34	65.23	7.19	1.95	2.32	3.03
	Medium	951	0.04	0	[0 – 0]	0.25	106.38	9.20	1.59	3.00	3.82
	High	1028	0.05	0	[0 – 0]	0.25	45.80	6.06	2.48	2.16	3.16
6. I threatened or forced him/her to do things he/she didn't want to do.	Low	753	0.04	0	[0 – 0]	0.33	96.12	9.20	3.18	2.25	2.57
	Medium	949	0.04	0	[0 – 0]	0.30	117.47	0.06	3.35	2.27	2.70
	High	1028	0.03	0	[0 – 0]	0.17	103.67	8.70	1.58	3.07	5.25
7. I bullied him/her with mean names or comments about his/her race or color.	Low	752	0.16	0	[0 – 0]	0.50	23.43	4.07	2.21	1.51	2.51
	Medium	950	0.07	0	[0 – 0]	0.34	64.54	6.93	1.46	2.55	3.76
	High	1027	0.04	0	[0 – 0]	0.30	93.62	8.91	1.82	2.83	3.36
8. I bullied him/her with mean names, comments, or gestures with sexual meaning.	Low	751	0.07	0	[0 – 0]	0.31	44.14	5.89	2.12	2.15	3.18
	Medium	949	0.03	0	[0 – 0]	0.20	54.89	6.89	1.71	2.83	3.97
	High	1026	0.04	0	[0 – 0]	0.27	91.35	8.55	1.91	2.60	3.39
9. I bullied him/hers with cruel messages or hurtful photographs using a cellphone or Internet.	Low	746	0.06	0	[0 – 0]	0.35	70.39	7.73	2.76	2.13	2.60
	Medium	945	0.04	0	[0 – 0]	0.31	122.94	10.18	1.80	2.70	3.72
	High	1026	0.03	0	[0 – 0]	0.21	73.52	7.72	1.71	2.85	4.07
10. I bullied others using other forms that weren't mentioned.	Low	747	0.13	0	[0 – 0]	0.48	34.71	5.12	2.17	1.74	2.60
	Medium	939	0.05	0	[0 – 0]	0.31	74.91	7.56	2.15	2.30	3.08
	High	1021	0.05	0	[0 – 0]	0.26	84.56	7.80	1.92	2.43	3.81

**SD, Standard Deviation.*

the parameters Beta 1 and Beta 2 were higher in girls than in boys (see **Table 6**).

Regarding the perpetration subscale, we found that the cyberbullying item (#9) had the highest difference between girls (1.73) and boys (2.57), followed by item "#7. I was bullied with mean names or comments about my race or color" (girls, 2.38 and boys, 1.62). Most items showed that the parameters Beta 1 and Beta 2 were higher in girls than in boys (see **Table 5**).

Differential Item Functioning by SES

Descriptive statistics of all items of the victimization and perpetration subscales by SES are shown in **Table 6**. All items have asymmetric responses and a high degree of kurtosis, especially among students coming from middle- and high-income schools.

The victimization subscale items had discrimination parameter estimates between 1.55 and 2.54 for students of low-income schools, between 1.39 and 2.53 for students of middle-income schools, and between 1.38 and 2.42 for students of high-income schools. Additionally, most discrimination parameter estimates were higher among students coming from low-income schools, except item "#3. I was hit, kicked, pushed, shoved around, or locked indoors," which was higher in high-income schools; and item "#8. I was bullied with mean names, comments, or gestures with a sexual meaning," which was higher in middle-income schools. Most items showed that the parameters Beta 1 and Beta 2 were higher in students coming from middle- or high-income schools than in those students coming from low-income schools (see **Table 6**), except item "#8. I was bullied with mean names, comments, or gestures with a sexual meaning," which was higher among students attending low-income schools.

Regarding the perpetration subscale, the items had discrimination parameter estimates between 1.95 and 2.88 for students of low-income schools, between 1.46 and 3.35 for students of middle-income schools, and between 1.37 and 2.48 for students of high-income schools. Most discrimination parameter estimates were higher among students coming from low-income schools, except "#5. I took money or things from him or her or damaged his/her belongings, which was higher in high-income schools" and "#6. I threatened or forced him/her to do things he/she didn't want to do," which was higher in middle-income schools. All items showed that the parameters Beta 1 and Beta 2 were higher in students coming from middle- or high-income schools than in those students coming from low-income schools (see **Table 6**).

Concurrent Evidence of Validation

In the victimization subscale, there was a concordance from 0.14 to 0.36 for similar items; all the concordances are statistically significant (p-values < 0.001). Five out of eight items have a "fair agreement." On the other hand, four of the eight items analyzed in the perpetration subscale have a "fair agreement" with a range concordance between 0.22 and 0.32 and two items ("I threatened or forced him/her to do things he/she didn't want to do" and "I bullied him/her with mean names, comments, or gestures with sexual meaning") had no association between instruments. See **Table 7**.

TABLE 7 | Concurrent analysis between OBVQ-R and School Violence between Peers Questionnaire (MIAP)/Internet Experiences Questionnaire (IEQ).

OBVQ-R	MIAP/IEQ	*n*	Kappa*	CI	*p*-value
Victimization					
I was called mean names, was made fun of, or teased in a hurtful way.	[MIAP] They insult me or put me nicknames that offend or ridicule me.	2,398	0.36	(0.32 – 0.40)	0.000
Other students left me out of things on purpose, excluded from their group of friends, or completely ignored me.	[MIAP] They ignore me ("ice law") or don't let me participate.	2,391	0.29	(0.24 – 0.33)	0.000
I was hit, kicked, pushed, shoved around, or locked indoors.	[MIAP] They hit me.	2,386	0.29	(0.22 – 0.36)	0.000
Other students told lies or spread rumors about me and tried to make others dislike me.	[MIAP] They speak ill of me.	2,385	0.28	(0.24 – 0.32)	0.000
I had money or things taken away from me or damaged.	[MIAP] They hide things, break things, or rob me.	2,775	0.18	(0.13- 0.23)	0.000
I was threatened or forced to do things I didn't want to do.	[MIAP] They threat me just to get me scared, they force me to do things I do not want to do with threats (bring money, do their homework, ask my sneakers, etc.), they force me to do things (miss classes, get out of class).	2,389	0.18	(0.08 – 0.27)	0.000
I was bullied with mean names, comments, or gestures with a sexual meaning.	[MIAP] They sexually harass me.	2,375	0.14	(0.04 – 0.24)	0.000
I have been bullied with cruel messages or hurtful photographs using a cellphone or Internet.	[IEQ] I have been a victim of bullying through text messages (using cellphone or WhatsApp), or internet (posting on a website or blog) or sending pictures or videos without your permission (using cellphone).	2,247	0.34	(0.25 – 0.42)	0.000
Aggression					
I called another student(s) mean names, made fun of, or teased him/her in a hurtful way.	[MIAP] I insult or put nicknames that offend or ridicule him/her.	2,373	0.32	(0.27 – 0.37)	0.000
I kept him/her out of things on purpose, excluded him or her from my group of friends, or completely ignored him or her.	[MIAP] I ignore ("ice law") or do not let participate him/her.	2,375	0.22	(0.17 – 0.27)	0.000
I hit, kicked, pushed, and shoved him or her around or locked him or her indoors.	[MIAP] I hit him/her.	2,372	0.26	(0.17 – 0.36)	0.000
I spread false rumors about him/her and tried to make others dislike him/her.	[MIAP] I speak bad about him or her.	2,368	0.13	(0.07 – 0.20)	0.000
I took money or things from him or her or damaged his/her belongings.	[MIAP] I hide, break or steal things from him/her.	2,368	0.13	(0.04 - 0.22)	0.003
I threatened or forced him/her to do things he/she didn't want to do.	[MIAP] I threat him/her just to make /him/her afraid, I force him/her to things with threats (ask money, ask to do homework, ask for their sneakers, etc.), I force him/her to do things (not to go to class, get out from class).	2,368	0.09	(-0.11 – 0.28)	0.201
I bullied him/her with mean names, comments, or gestures with sexual meaning.	[MIAP] I sexually harass him/her.	2,363	0.09	(-0.10 – 0.27)	0.183
I have bullied others with cruel messages or hurtful photographs using a cellphone or Internet	[IEQ] I have bullied others through text messages (using cellphone or WhatsApp), or internet (posting on a website or blog) or sending pictures or videos without your permission (using cellphone).	2,272	0.22	(0.09 – 0.35)	0.001

**Kappa interpretation: 0, "there is no agreement"; 0-0.2, "slight agreement"; 0.2-0.4, "fair agreement"; 0.4- 0.6, "moderate agreement"; 0.6-0.8, "substantial agreement"; 0.8-1.0, "almost perfect agreement." CI, Confidence Interval.*

The item about racist bullying was not included in these analyses because the MIAP does not ask about that form of bullying.

DISCUSSION

This is the first study that explores the validity and reliability of the OBVQ-R in Chile. This study confirms the two-factor structure and unidimensionality of the victimization and perpetration subscales (Solberg and Olweus, 2003; Breivik and Olweus, 2015). All items should be considered as key elements of each subscale. Additionally, the model considering both subscales correlated had a better fit than the model exploring both subscales uncorrelated. We also found differences by gender and socioeconomic status of the schools in the expression of the victimization and perpetration traits. The concurrent validation conducted in our study found that the Cohen's kappa statistic score was in the range of slight or higher agreement between compared instruments. The reliability of the instrument seems good for both subscales.

All items of the questionnaire are important for each subscale, having a high factor loading and high or very high discrimination parameter estimates. In the victimization subscale, the items "I was called mean names," "I was hit, kicked and pushed," and "I was threatened or forced to do things" were those with the highest discrimination estimates. It is worth mentioning that the item "other forms of bullying" had the highest alpha score. Some other authors have removed this item from the analyses (Breivik and Olweus, 2015), but our results support the idea of keeping this item as part of the subscale but include additional questions to understand better what students feel about this item. On the other hand, in the perpetration subscale, the item "I was threatened or forced" had the highest alpha score. Several studies have found different discrimination items (Breivik and Olweus, 2015; Resett et al., 2015), highlighting the importance of performing validation studies in different countries to take into account cultural differences. On the other hand, in both subscales, the IRT analysis showed that the item with the lowest-severity parameter was "I was called mean names" and "I called another student(s) mean names," which may be explained because verbal aggression is one of the most common forms of bullying. In addition, the items with the highest-severity parameters in both subscales were different. In the victimization subscale, the highest-severity parameter was cyberbullying, but in the perpetration subscale it was sexual bullying. The fact that being a victim of cyberbullying was considered a severe form of bullying may explain the findings of other authors about the relationship between cyberbullying and suicidal ideation and attempts (John et al., 2018; Peng et al., 2019). Regarding the perpetration subscale, bullying others with "mean names, comments, or gestures with sexual meaning" can be considered a final step in the aggression possibilities and a more severe behavioral pattern of the perpetrators. These results are similar to those reported by Breivik and Olweus (2015).

We were able to compare different models of the structure of the questionnaire, finding that the best model corresponds to two correlated dimensions of bullying, victimization, and perpetration. This structure has been found in other studies (Kyriakides et al., 2006; Breivik and Olweus, 2015). Additionally, we found that both subscales were correlated, which may be explained because many students who considered themselves as victims were also perpetrators.

We found that boys responded with a lower-severity parameter in almost every item. In the victimization subscale, the exception was the rumors item, in which girls showed a lower-severity parameter than boys. In the perpetration subscale, in the item about threats or being forced to do things, boys and girls had the same-severity parameter, and in the item about racial bullying, girls had a lower-severity parameter than boys. The latter may be explained because boys are more involved in bullying than girls, which is supported by other studies (Zych et al., 2015). About the rumors item, we did not expect to find differences between subscales (in the victimization subscale, girls had lower severity, and in the perpetration subscale, they had higher severity than in boys). Previous literature shows that girls are more involved in relational forms of bullying, either as victims or bullies (Wang et al., 2009). An explanation of this may be that female students in Chile are less likely to recognize themselves as spreading rumors about others because they considered these actions culturally unacceptable, similar to what happens with physical bullying among girls. However, they did recognize being the target of rumors.

We found differences in the expression of bullying by SES. Generally, different forms of victimization and perpetration were more common among students coming from low-income schools. Students from low-income families may have been exposed to a higher proportion of family conflicts than students from families with more economic resources. For instance, there is evidence that children and adolescents of low SES families had a higher chance of being exposed to domestic violence (Cunradi et al., 2002) and harsher punishment (Straus and Stewart, 1999), which may shape how they interact with others in their school context. Moreover, students from high-income families may have a better development of problem-solving skills and prosocial norms and values (Galobardes et al., 2006a,b). It is important to have local information, because other countries do not have the SES differences in the bullying experience that we found in Chile, and this instrument would allow us to conduct future comparisons (Tippett and Wolke, 2014).

In terms of the concurrent analysis of the OBVQ-R with the MIAP and the IEQ, we found differences between both subscales. The concordance between the items of the three instruments for the victimization subscale ranged from "slight agreement" to "fair agreement" but was significant in all cases. We could say that students who were perceived as victims of bullying were also perceived as victims of school violence in general; however, it seems that both concepts are not quite the same for them considering the small degree of agreement. These results highlight the idea that school violence and bullying are perceived as two different concepts by adolescents. In the perpetration subscale, the concordance between the items of three instruments was between 0.09 and 0.32. Only in two items, there was no correlation (#6. I threatened or forced him/her to do things he/she didn't want to do, and #8. I bullied him/her with mean names, comments, or gestures with sexual meaning"). Regarding these last two items, the formulation of the sentences was slightly different between the OBVQ-R and the MIAP. For instance, when it comes to threats, in the MIAP, both items refer to actions one can do to force another person to do things, including a range of examples. The OBVQ-R takes a more general approach, without specifying the action or the consequence of the behavior. For the items about sexual bullying, the MIAP asks for "sexual harassment," unlike the OBVQ-R, which asks for "being bullied with names, comments or gestures with sexual meaning." Other authors also take the view that the definition of sexual harassment is broad and it includes a range of behaviors (McMaster et al., 2002; Chiodo et al., 2009). These researchers also postulate that sexual harassment may include in the same definition severe (e.g., sexual assault) and less severe behaviors (e.g., sexual jokes or comments) (McMaster et al., 2002). In another study, Shute et al. (2008) asked adolescents about sexual harassment and victimization and found that physical sexual harassment was not as frequent as verbal sexual harassment. According to these studies, sexual harassment is a concept that may include many and varied behaviors; therefore, in our study, students may have

considered a more general definition of sexual harassment (in the MIAP), taking together severe and less severe actions, while in the OBVQ-R, students may have answered it according to a more specific and narrower concept.

We can mention several limitations of this study. First, we used retrospective, self-reported measures in an adolescent population, which may introduce reporting bias (Pokorski et al., 1994) and social desirability bias (Brittingham et al., 1998), especially for the aggressive behaviors. However, the biases mentioned above do not threaten the validity of self-reported measurements among students (Brener et al., 2003). Additionally, when administering the OBVQ-R scale, research assistants did not report any complaints about the comprehension of items. Second, this study followed a cross-sectional design, which does not allow inferences about the long-term effects of these behaviors. Third, a 28% (9/32) of the invited schools agreed to participate. This may have introduced a selection bias in the results. However, we managed to include schools from different socioeconomic backgrounds and with similar participation proportion in the total sample of students, reducing the risk of bias. Fourth, the MIAP and IEQ questionnaires, used to compare the information gathered with the OBVQ-R, were the only available instruments with results published in scientific journals in Chile. Even though we recognize that the psychometric properties and features of these instruments were not ideal, we considered it important to make available to the audience and potential users the comparison between the instruments to provide as much information as possible to make informed decisions in the future when selecting a questionnaire to evaluate bullying experiences. Fifth, even though the sample size was large and aimed to represent the adolescent population in Chile, there could be regional differences in bullying among adolescents living in the North and South regions in Chile. Finally, it is important to mention that there is one item that requires further exploration for future research: #10, exploring "other" forms of bullying. Students did not have any problem answering this item; however, it is difficult to know, as it is stated in the questionnaire, what the other forms of bullying the students are referring to. Therefore, we suggest continuing using this item but including a new question where students can write the other forms of bullying they are referring to, to understand this item better.

CONCLUSION

The OBVQ-R appears to have a good item structure, validity, and reliability when assessing bullying among adolescent students in Chile. We have provided evidence that this is a two-factor structure questionnaire, and the victimization and perpetration subscales gather information about several forms of bullying. This instrument may be useful for studying the prevalence of bullying and assessing the effectiveness of anti-bullying programs.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by The Ethical Committee of the University de los Andes, Chile. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

JG, CS, CR-B, and RA conceived and designed the study and supervised data collection. JG, MG, and DV analyzed and interpreted the data and produced the draft of the manuscript. RA supervised all steps in the study. All authors provided a critical revision of the manuscript.

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SUPPLEMENTARY MATERIAL

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MINI REVIEW
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Bystander Roles in Cyberbullying: A Mini-Review of Who, How Many, and Why

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Cyberbullying has progressively increased due to the massive use of the internet and social networks. Bystanders constitute the largest group, occupying a key role in the evolution of the cyberbullying situation and its consequences for the victim. Research shows different ways in which bystanders behave, suggesting different types of sub-roles associated with different study variables. The objective of this literature review is to identify and characterize the roles of bystanders in cyberbullying situations that involve adolescent students. To achieve this objective, a systematic search was carried out in the Web of Science, PubMed, and Scopus databases for articles published between 2015 and 2020, resulting in 233 articles. Articles were then selected by relevant title and summary. Subsequently, the inclusion and exclusion criteria were applied, resulting in a total of nine articles. The findings of this review allowed us to identify two to five types of bystanders, the largest type representing outsiders and the smallest type representing assistants of the aggressor. The identified types of bystanders are characterized for variables such as sex, age, previous experience, and empathy. The results are discussed considering the available theoretical and empirical evidence.

Keywords: cyberbullying, bystanders, cyberbystanders, roles, adolescents, literature review

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INTRODUCTION

Technology and the internet have transformed society through a process of mutual interaction, allowing communication at any time and transcending territorial borders (Castells, 2014). Internet use has become widespread in adolescents, with 92.9% reporting having at least one social media account (Barry et al., 2017) and using an average of three different platforms daily (Vannucci and Ohannessian, 2019). Constant exposure to social networks and the internet raises concern about the possible negative effects on the well-being of adolescents, specifically due to phenomena such as cyberbullying, which is positively associated with online time (Lee and Shin, 2017; Shapka et al., 2018; Craig et al., 2020), and favored by the use of smartphones, which allow connection at any time and place (Martin et al., 2018).

Cyberbullying can be defined as a form of intentional harassment that is directed at a particular person, carried out through electronic and digital means and produced by an imbalance of power associated with greater development of technical skills when using the internet (Smith et al., 2013; Olweus and Limber, 2018). Additionally, anonymity is considered a significant risk factor in this phenomenon (Barlett et al., 2016, 2020). On the other hand, cyberbullying is considered a social phenomenon that can negatively affect victims, aggressors, and bully/victims, significantly increasing the risk of suicide (DeSmet et al., 2014, 2019; Hellfeldt et al., 2020; Kim et al., 2020).

Regarding the prevalence of cyberbullying, one in three adolescent participants reported having been a victim of cyberbullying (United Nations International Children's Emergency Fund (UNICEF), 2019). Research by Antoniadou et al. (2019) classified cyberbullying participants as bystanders (75%), bully/victims (11.2%), victims (8.2%), and aggressors (5.6%). Thus, the percentage of bystanders in cyberbullying situations was significantly higher than the other roles, making it relevant to deepen the understanding of bystander characteristics and behavior due to the impact their actions may have on the development of the situation and the experience of the victim and the aggressor.

The Role of Bystanders in Cyberbullying and Its Relationship With Personal and Contextual Variables

At present, the role of bystanders in cyberbullying has received little attention, despite its relevance and conceptual differences with traditional bullying (Garaigordobil, 2017; Sarmiento et al., 2019). Specifically, Kozubal et al. (2019) reported that, when bystanders are exposed to a human face with an expression of sadness, they can modify their behavior and not reinforce cyberbullying. However, this is far from what happens on internet platforms since the facial expression of the victim is rarely seen.

Regarding the role of bystanders and sex, some studies support the hypothesis that adolescent women tend to show more supportive behaviors toward the victim compared to men (Machackova et al., 2016; Allison and Bussey, 2017; Campbell et al., 2017; Patterson et al., 2017), but there is also evidence that there are no significant differences between the sexes (Kozubal et al., 2019). Regarding bystanders and age, studies showed that there are no behavioral differences (Machackova et al., 2016; Campbell et al., 2017), although Pabian et al. (2016) reported that students had a less empathetic response 6 months after the first measurement, which could reflect a desensitization effect over time.

Regarding the role of the bystanders and their association with the socio-affective variables in cyberbullying, the presence of greater moral disengagement, less empathy, and a lower perception of responsibility and self-efficacy is reported, since bystanders do not see the emotional response of the victim, which interferes with their evaluation of the situation (Barlińska et al., 2018; Domínguez-Hernández et al., 2018; Knauf et al., 2018). On the other hand, there are contextual variables that affect the emergence and type of behavior displayed by bystanders in the face of cyberbullying, including degree of friendship, severity of the incident, actions of other bystanders (Domínguez-Hernández et al., 2018), and whether the situation is non-anonymous (You and Lee, 2019) or those situations that occur in private (DeSmet et al., 2014; Patterson et al., 2017). The last variable is linked to personal characteristics since adolescents with greater empathy will decide to intervene regardless of whether it is in private or in public (Wang, 2020).

Regarding the role of bystanders in traditional bullying, Salmivalli et al. (1996) and Salmivalli (2010) referred to different bystander types: assistants of the aggressor (join the aggressor), reinforcers of the aggressor (laugh or encourage the aggressor), outsiders (do not get involved in the situation), and defenders of the victim (support victims). This classification is used by the renowned anti-bullying program, Kiusaamista Vastaan (KiVa) (Salmivalli and Poskiparta, 2012), developed in Finland, which works with victims, aggressors, and bystanders. Similarly, within the role of the bystanders, specific types can be differentiated, making it important not to homogenize them since this would hinder the understanding of the implications that the different forms of behavior have on the other participants (Moxey and Bussey, 2019).

As a result of the above, it can be pointed out that there is not much knowledge about how bystanders behave in cyberbullying situations, making it necessary to continue generating data on the subject (Garaigordobil, 2017; Sarmiento et al., 2019; Íñiguez-Berrozpe et al., 2020). Along with this, the studies that address types of bystander behaviors denominate, group, and characterize them in different ways, making it difficult to understand the sub-roles and their characteristics. Therefore, the objective of this study was to identify and characterize the roles of bystanders in cyberbullying in adolescent students.

METHODS

This article reports the results of a systematic review of the different roles of bystanders in cyberbullying. A systematic literature search was carried out following the guidelines of Bramer et al. (2018) in the Web of Science, PubMed, and Scopus databases in November 2020. The question that guided the search strategy was: What are the characteristics of bystander roles in cyberbullying situations in adolescent students? To carry out the review, a combination of search terms were applied, including Medical Subject Headings (MeSH), for example, *bystander, cyberbystanders, adolescent* (MeSH), *student* (MeSH), *cyberbullying* (MeSH), *participant role,* and *bystander intervention*. From several articles ($n = 233$), those with a title related to the topic of interest ($n = 98$) were first screened followed by those having a relevant abstract ($n = 47$). Subsequently, the full articles were reviewed following the standard quality assessment criteria used to evaluate primary research articles (Kmet et al., 2004), and the inclusion and exclusion criteria were applied, resulting in nine articles being selected (**Figure 1**).

Inclusion Criteria

Articles that reported an identification and/or characterization of the types of bystanders in cyberbullying were included. Only scientific articles published in English or Spanish between the years 2015 and 2020 that included samples of adolescents were considered for the review.

Exclusion Criteria

Articles that only addressed one type of bystander or that referred to this role in a general way were excluded. Articles that addressed traditional bullying, violence, or aggression between school children or cyberbullying in preschool children,

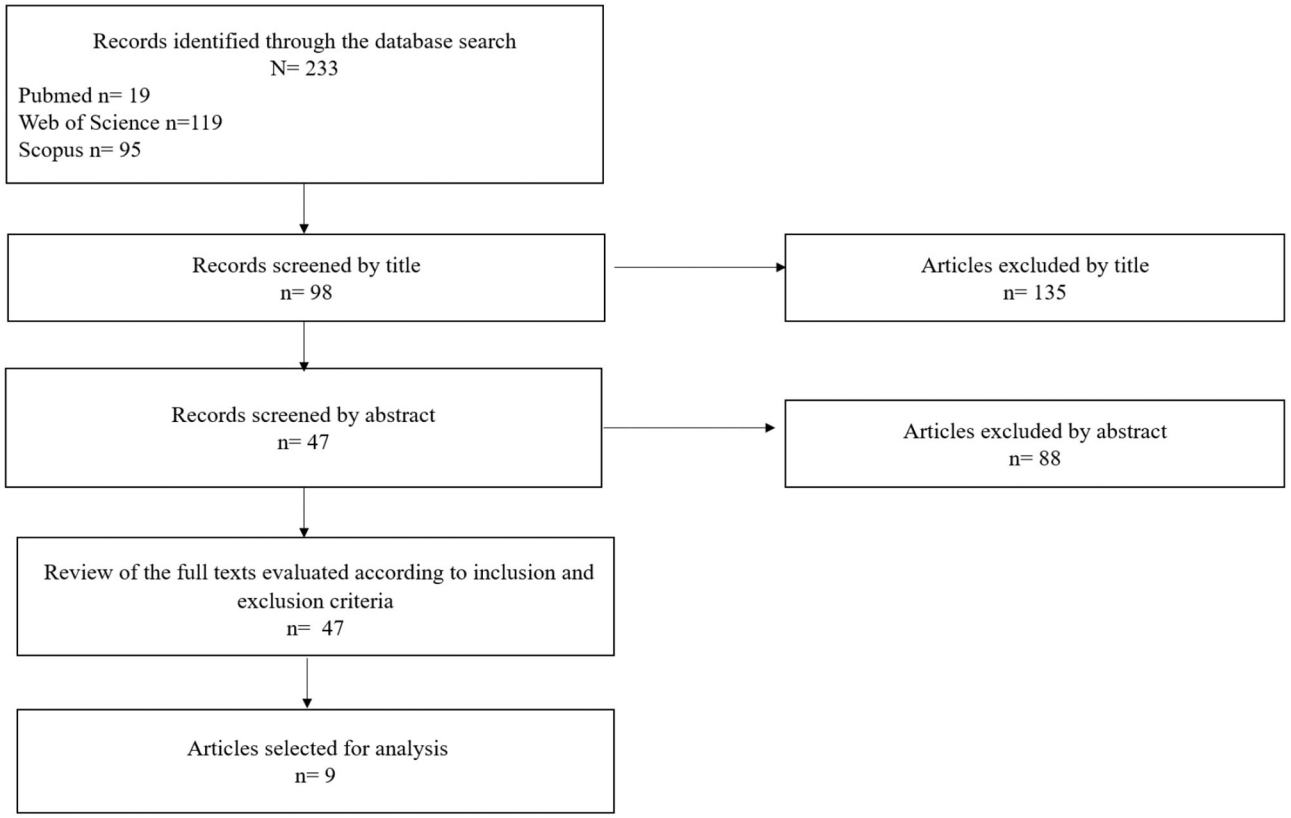

FIGURE 1 | Flowchart of article selection.

elementary school children, or adults were excluded. Theses, conference proceedings, systematic reviews, or articles in a language other than English or Spanish or whose publication date preceded 2015 were not considered for the review.

RESULTS

Nine high-quality investigations were analyzed (**Table 1**), mostly representing cross-sectional studies. Due to their design, it was evident that the objectives, study design, sample selection method, measurement instruments, data analysis methods, and results were rigorously described and were appropriate in each of the selected studies.

The studies came from different countries (Belgium, Spain, Czech Republic, Thailand, Germany, Israel, and Australia). The mean sample size of the nine studies was 1,572.7, but there was high variability (SD = 1,444.33). The sample sizes were between 321 and 5,036 adolescent students. Participant ages ranged from 9 to 23 years with most between 12 and 17 years, since the objective of the review was to address adolescent bystanders. Regarding the sex of the participants, the study by Quirk and Campbell (2015) stands out because it had a much higher percentage of women (75.4%), compared to the other investigations which had distributions close to 50% between the sexes.

Bystander Roles in Cyberbullying: How Many and Who

Studies That Identified Two Bystander Groups

The study by DeSmet et al. (2016) referred to two groups of bystanders: those who show positive behavior (44.9%), that is, who defend or support the victim or report the incident to adults or peers, and those who show negative behavior (55.1%), which is related to passive behavior or enjoying and/or reinforcing the behavior of the aggressor. Olenik-Shemesh et al. (2015) reported a passive bystander role that included those who did not get involved in the cyberbullying situation (55.4%) and an active bystander role (44.6%) that incorporated adolescents who supported the victim. On the other hand, Machackova and Pfetsch (2016) made a distinction between adolescents who supported the victims and those who reinforced the actions of the aggressor, but the study did not report the percentage of each role.

Studies That Identified Three Bystander Groups

The studies by Panumaporn et al. (2020) and Erreygers et al. (2016) noted the following distinction: adolescents willing to intervene or help the victims (42.3–34.6%, respectively);

TABLE 1 | Types of cyberbystanders and related factors.

References	Country(s), sample, age/grade	Results: Types of cyberbystander	Results: Related factors
DeSmet et al. (2016)	*n* = 1,979 (47.3% men; 54.7% women). Age: 12–15 years. Belgium.	1) Group of adolescents who show positive behavior (defenders, those who provide support and who report what happened to others to adults and peers) (44.9%). 2) Group of adolescents who show negative behavior (passive behavior, enjoy watching cyberbullying, and those who reinforce the aggressor's behavior) (55.1%).	1) Group of adolescents with positive behavior - Intention to behave in a positive way (increased by friendship bond) - Greater self-efficacy - Negative attitude toward passivity - Positive attitude to comfort the victim - Previous victimization experience - Younger adolescents in the age range - Less moral disengagement - Mothers aware of the activities of their children on the internet - School organizes daily information for students 2) Group of adolescents with negative behavior - Intention to behave in a negative way - Positive attitude toward the passive observation - Greater moral disengagement - Greater in males - Older adolescents in the age range - Difficulties with social skills, empathy, and problem-solving - Decreases in parent-school communication
Erreygers et al. (2016)	*n* = 2,309 (50.3% men; 49.7% women). Age: 9–17 years. Belgium.	1) Joins the aggressor (4.6%). 2) Helps the victim (42.3%). 3) Not involved (53.6%).	1) Group joining the aggressor - Less empathy - Older - More impulsive 2) Group that helps the victim - Greater empathy - Younger - Less impulsive - Previous experience of victimization by bullying. - There were no statistically significant differences according to sex.
González-Cabrera et al. (2019)	*n* = 5.036 (49.3% men; 50.7% women). Age: Two age groups; 10–14 years and 15–23 years. Spain.	1) Defender of the victim (54.6%) 2) Assistant of the aggressor (2.2%) 3) Reinforcer of cyberbullying (1.6%) 4) Outsider (22.7%) 5) Supporter of the victim (18.3%)	- Significantly higher number of men in the assistant of the aggressor and outsider groups - Higher number of women in the defender of the victim group
Machackova and Pfetsch (2016)	*n* = 321 (66% men; 44% women). Age: 12–18 years. Germany.	1) Support the victims 2) Reinforce the aggressors (does not indicate percentages)	1) Group that supports victims - Affective empathy (cognitive empathy was not significant) 2) Group that reinforces the victims - Normative beliefs about cyberbullying The sex and age variables did not present statistically significant relationships with the groups of cyberbystanders.
Olenik-Shemesh et al. (2015)	*n* = 1,094 (51.6% men; 48.4% women). Age: 9–18 years. Israel.	1) Passive bystander (55.4%) 2) Active bystander (44.6%)	1) Passive bystander group - Men - Younger ages in the established range - Less perceived social support from significant others (greater emotional and social loneliness). 2) Active bystander group - Greater presence of women

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TABLE 1 | Continued

References	Country(s), sample, age/grade	Results: Types of cyberbystander	Results: Related factors
			- Older than passive bystanders - Greater perceived social support from significant others (less emotional and social loneliness).
Panumaporn et al. (2020)	*n* = 578 (41.7% men; 58.3% women). Age: 11–19 years. Thailand.	1) Adolescents who are willing to intervene or help the victims (34.6%). 2) Adolescents who ignore the cyberbullying situation observed (28%). 3) Adolescents who partake in cyberbullying (26.3%).	1) Group willing to intervene - Previous bullying experiences (directly or through close friends /family) - High level of attachment to parents - Women - The behavior of providing support to the victim depends on whether the norm of the group is to intervene or ignore - Higher self-esteem 2) Group that ignores cyberbullying - There is no previous victimization, nor experience as aggressors. - They perceive that the norm of the group is to ignore, so they do not provide help 3) Group that joins in cyberbullying - Positive attitude toward bullying and participation - Older - Less attachment to parents - Previous experiences in the role of aggressor in traditional bullying
Quirk and Campbell (2015)	*n* = 716 (24.6% men; 75.4% women). Age 12–18 years. Australia.	1) Assistants (4.4%) 2) Reinforcers (7.4%) 3) Outsiders (63.2%) 4) Defenders (25%)	1) Assistants - Higher percentage of men 2) Outsiders - Low percentage of males - More older adolescents in the role of outsiders compared to defenders. No clarity regarding the distribution of women.
Schultze-Krumbholz et al. (2018)	*n* = 849 (45.6% men; 52.7% women). Age: 11–17 years. Germany.	1) Outsiders (28.4%) 2) Aggressive defenders (9.5%) 3) Prosocial defenders (52.2%) 4) Assistants (2.8%)	1) Outsiders - Low probability of participating as a bully, victim, defender, or assistant - Communicates the observed situations to parents or peers 2) Aggressive defenders - More likely to inform their peers than their parents - Related to reactive aggression - Engage as bullies and/or victims 3) Prosocial defenders - They provide support to the victim - They communicate the observed cyberbullying situations to their parents - Younger than all other groups - Low levels of proactive aggression - High levels of cognitive and affective empathy, compared to outsiders - Higher percentage of men 4) Assistants - Higher percentage of men - Reactive aggression. - Low cognitive empathy Self-esteem was not considered relevant in any group. Age and sex were not significant when other variables were included in the analysis.

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TABLE 1 | Continued

References	Country(s), sample, age/grade	Results: Types of cyberbystander	Results: Related factors
Song and Oh (2018)	*n* = 1,058 (52.8% men; 47.2% women). Age: 14–19 years. South Korea.	1) Defenders (30.5%) 2) Outsiders (60.7%) 3) Reinforcers (5.4%) 4) Assistants (3.3%)	1) Defenders (evaluated defensive tendency in general) - Low moral disengagement - Low antisocial conformity - No experience in the role of aggressor - Greater empathy - Scarce/negative relation with the aggressor - Greater perceived control of the situation of aggression - Absence of other bystanders Age and sex not significant for any of the groups.

n, *Sample size.*

adolescents who ignore the cyberbullying situation (53.6–28%); and finally, bystanders who join the cyberbully (4.6–26.3%) (Erreygers et al., 2016; Panumaporn et al., 2020).

Studies That Identified Four Bystander Groups

These studies showed a similar distribution and percentage of adolescents in each of the roles. Specifically, the following trends were observed: outsiders, 63.2–60.7%; defenders, 25–30.5%; reinforcers, 7.4–5.4%; and assistants 4.4–3.3% (Quirk and Campbell, 2015; Song and Oh, 2018). Also, Schultze-Krumbholz et al. (2018) distinguished four sub-roles but made a differentiation in terms of the types of the defender, with aggressive defenders characterized by behaviors such as confronting the aggressor, activating others, and comforting victims (9.5%) and prosocial (52.2%), who are more likely to support the victim and inform their parents. The other bystander subtypes indicated are outsiders (28.4%) and assistants (2.8%).

Studies That Identify Five Bystander Groups

The study by González-Cabrera et al. (2019) had the most extensive classification, grouping the participants into five sub-roles: defender of the victim (54.6%), supporter of the victim (18.3%), outsiders (22.7%), cyberbullying reinforcer (1.6%), and assistants of the aggressor (2.2%). There was a distinction made between positive behavior in the case of those who defended the victim, those who interrupted the situation, and those who provided help, in contrast with adolescents who only supported the victim but did not stop the aggressor.

Bystander Roles in Cyberbullying: Who and Why

Regarding the different roles of cyberbystanders and gender, three investigations observed a higher percentage of men in the groups that presented negative behaviors (Olenik-Shemesh et al., 2015; DeSmet et al., 2016), specifically, in the roles of assistants of the aggressor (Quirk and Campbell, 2015; Schultze-Krumbholz et al., 2018) and outsiders (González-Cabrera et al., 2019). Meanwhile, women tended to show an active role, providing help to the victim of cyberbullying (Olenik-Shemesh et al., 2015; Machackova et al., 2016; González-Cabrera et al., 2019; Panumaporn et al., 2020). On the contrary, other studies analyzed did not find gender differences (Erreygers et al., 2016; Machackova and Pfetsch, 2016; Schultze-Krumbholz et al., 2018; Song and Oh, 2018).

With regard to age, four investigations indicated that younger adolescents were more likely to carry out positive interventions in cyberbullying situations than older adolescents, who tended to show negative or passive behavior (Olenik-Shemesh et al., 2015; Quirk and Campbell, 2015; DeSmet et al., 2016; Erreygers et al., 2016). Consequently, two studies showed a higher percentage of older adolescents in the group of bystanders who joined the aggressor (Erreygers et al., 2016; Panumaporn et al., 2020). On the other hand, three of the nine investigations did not find differences between ages (Machackova et al., 2016; Schultze-Krumbholz et al., 2018; Song and Oh, 2018).

In relation to personal variables, these were reported to have a significant association with the different bystander roles and

were present with greater frequency in the results obtained. It was shown that experiences of previous victimization, those experienced directly or indirectly through close reports, increased the interventions to provide help to the victim in a cyberbullying situation (DeSmet et al., 2016; Erreygers et al., 2016; Panumaporn et al., 2020). However, previous experiences in the role of aggressor were linked to bystanders who were willing to join the cyberbully (Panumaporn et al., 2020). Therefore, Song and Oh (2018) reported that defenders do not share experiences of this type. Another relevant variable in the research is the self-efficacy perceived by adolescents regarding their intervention in the cyberbullying situation (Olenik-Shemesh et al., 2015; DeSmet et al., 2016).

With regard to social skills, the reviewed studies showed that empathy levels were low in adolescents who showed negative behaviors (DeSmet et al., 2016), such as those in the roles of assistants to the aggressor and outsiders (Erreygers et al., 2016; Schultze-Krumbholz et al., 2018), specifically, an association was shown with cognitive empathy (Barlińska et al., 2018; Schultze-Krumbholz et al., 2018). In contrast, adolescents who were willing to intervene had higher empathy levels (Erreygers et al., 2016; Schultze-Krumbholz et al., 2018; Song and Oh, 2018). Machackova et al. (2016) reported that affective empathy predicts support for the victim, while cognitive empathy did not show significant results. Along the same line, another variable associated with bystander roles was moral disengagement, which was related to interventions that supported the victim, while the greater the moral disengagement, the more the passive behavior increased (DeSmet et al., 2016; Song and Oh, 2018).

DISCUSSION

The objective of this research was to identify and characterize the roles of cyberbullying bystanders in adolescent students. The results allowed the identification of nine articles (**Table 1**), whose participants were adolescents from different countries (Belgium, Spain, Czech Republic, Thailand, Germany, Israel, and Australia), that met the standard quality assessment criteria (Kmet et al., 2004). The findings of this study showed that bystanders are not a homogeneous group in terms of characteristics and behavior. Specifically, the selected studies identified between two to five types of bystanders. Although the investigations that identified two groups of bystanders (Olenik-Shemesh et al., 2015; DeSmet et al., 2016; Machackova and Pfetsch, 2016), represent a progress in the studies that consider them a completely homogeneous group, they are still considered too general and could limit the understanding of the particularities of bystander roles in cyberbullying (Patterson et al., 2017; Knauf et al., 2018; Wright et al., 2018).

Differences were established with adolescents who show negative behavior, since their actions may be oriented toward either ignoring the situation or joining the aggressor (Erreygers et al., 2016; Panumaporn et al., 2020). The classification of four types of cyberbystanders (assistants, reinforcers, outsiders, and defenders) stood out because the sizes of these groups were similar in the Republic of Korea (Song and Oh, 2018) and in Australia (Quirk and Campbell, 2015), and this classification of bystanders coincided with that of Salmivalli et al. (1996) in regard to traditional bullying. Another finding revealed that, in most of the studies reviewed, there were high percentages of adolescents who did not intervene in cyberbullying situations (Olenik-Shemesh et al., 2015; Quirk and Campbell, 2015; DeSmet et al., 2016; Erreygers et al., 2016; Song and Oh, 2018), contrary to research that shows that the highest percentage of adolescents assume the role of the spectator who intervenes, defends, and helps the victim (Schultze-Krumbholz et al., 2018; González-Cabrera et al., 2019). In this sense, the distinction between defenders who show prosocial behavior and defenders who manifest aggressive behavior stands out (Schultze-Krumbholz et al., 2018), showing that these students also assume other roles in cyberbullying such as those of victim or aggressor. This reflects that the internet favors less stable roles.

With regard to the different types of bystander roles and their characterization, it can be noted that several studies associated a higher percentage of males with roles that manifest negative or passive behavior, such as reinforcing or joining the aggressor (Olenik-Shemesh et al., 2015; Quirk and Campbell, 2015; DeSmet et al., 2016; Schultze-Krumbholz et al., 2018; González-Cabrera et al., 2019), while women tended to show behavior aimed at providing help to the cyberbullying victim (Olenik-Shemesh et al., 2015; Machackova et al., 2016; González-Cabrera et al., 2019; Panumaporn et al., 2020). This coincides with previous research on the role of bystanders, which associated women with greater prosociality (Allison and Bussey, 2017; Campbell et al., 2017; Patterson et al., 2017). Findings related to age were contradictory, with research showing that younger adolescents tended to carry out positive interventions in cyberbullying situations compared to older adolescents who showed negative or passive behavior (Olenik-Shemesh et al., 2015; Quirk and Campbell, 2015; DeSmet et al., 2016; Erreygers et al., 2016; Panumaporn et al., 2020), which could be explained as a desensitization effect (Pabian et al., 2016).

Along the same lines, the previous experiences that adolescents have had both in the role of victim and in the role of the aggressor are relevant (DeSmet et al., 2016; Erreygers et al., 2016; Song and Oh, 2018; Panumaporn et al., 2020), concurring with other investigations (Charaschanya and Blauw, 2017; Domínguez-Hernández et al., 2018; Kozubal et al., 2019; Huang et al., 2020). In the case of students in the spectator role with previous experiences as an aggressor, it is evident that they could continue to affect the lives of other students by supporting cyberbullying situations. This result shows the need to continue making efforts to curb the increase in cyberbullying in a highly digitized society. On the other hand, the self-efficacy perception of the adolescent and the belief that their actions can interrupt the cyberbullying situation arose as a factor addressed in the literature (Olenik-Shemesh et al., 2015; DeSmet et al., 2016), since adolescents who did not intervene had lower levels of social and emotional self-efficacy and therefore reported a higher perception of fear (Olenik-Shemesh et al., 2015).

Regarding social skills, many studies addressed empathy, noting that it was related to adolescents who intervened positively and with those who showed negative behaviors (DeSmet et al.,

2016; Erreygers et al., 2016; Schultze-Krumbholz et al., 2018; Song and Oh, 2018). It is relevant to note that greater empathy is shown when the positive intervention involves prosocial and non-aggressive behaviors. It should also be taken into account that different investigations show a significant association specifically with cognitive empathy: in contrast, this relationship is not observed for affective empathy (Barlińska et al., 2018; Schultze-Krumbholz et al., 2018), although there is no agreement on this (Kozubal et al., 2019). It is also linked to sex, since women view cyberbullying situations as more serious and intervene more frequently, which could be explained by greater empathy (Huang et al., 2019; 2020). However, according to DeSmet et al. (2016), empathy is a less significant predictor in cyberbullying than in traditional bullying due to the lower emotional participation of students linked to the characteristics of digital platforms. In turn, greater moral disengagement was associated with the different bystander roles that exhibit passive behavior (DeSmet et al., 2016; Song and Oh, 2018). Coincidentally, studies have linked difficulties in the development of social skills with cyberbullying, observing that moral disengagement is related to problems in evaluating the situation they are witnessing (Domínguez-Hernández et al., 2018; Knauf et al., 2018; Antoniadou et al., 2019).

It should be noted that the efforts to identify and characterize the types of bystanders were aimed at generating a greater understanding of who, how many, and why adolescents belong in each of the bystander groups. Achieving greater knowledge in the area will allow better planning and development of interventions, considering that bystanders do not represent a group with homogeneous characteristics. Thus, it is relevant to include distinctions between spectators related to personal and social variables that transcend the binary categorization of active/passive behavior or positive/negative behavior. It is also necessary to integrate contextual variables, transitioning from individual to social (Gálvez-Nieto et al., 2020), since cyberbullying is a phenomenon that requires a multidisciplinary approach.

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All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

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The Association Between Generalized and Specific Problematic Internet Use and Its Gender Differences Across Different Educational Levels

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This study had two aims: to test the effect and the effect size of specific problematic Internet use (SPIU) [online shopping, online pornography, social network site (SNS) usage, and Internet gaming] on generalized problematic Internet use (GPIU) and to reveal the gender differences in GPIU and SPIU for students from the elementary school level to the university level. In total, 5,215 Chinese students (2,303 males, mean age = 16.20 years, range = 10–23 years) from four types of schools (elementary school, junior high school, senior high school, and university) provided self-report data on demographic variables (gender and educational levels), online shopping, online pornography, SNS usage, Internet gaming, and GPIU. After calculations had been controlled for demographic variables, the results indicated that (i) online shopping, online pornography, SNS usage, and Internet gaming positively predicted GPIU—and Internet gaming was the most critical predictor of GPIU—and that (ii) gender differences were revealed in Internet gaming and GPIU in all educational levels, except at senior high school where the gender differences in GPIU were not significant. Significant gender differences were found for online shopping and online pornography for all educational levels above elementary school. These results provided further understanding of the association between GPIU and SPIU and gender differences in PIU, which suggested that gender differences across different educational levels should be considered in interventions of PIU.

Keywords: GPIU, SPIU, gender difference, study period difference, cognitive–behavioral model

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INTRODUCTION

In the past decade, an increasing body of research has been conducted on problematic Internet use (PIU) in both adolescents and adults (Assunção and Matos, 2017; Lai and Kwan, 2017; Schimmenti et al., 2017). PIU can be defined as excessive or compulsive Internet usage that causes negative personal, social, and professional consequences (Davis, 2001; Han et al., 2017; Tian et al., 2017). Too much time spent on the Internet would lead individuals to suffer low level of learning engagement (Iyitoglu and Çeliköz, 2017), more negative emotions (such as severe depression

and anxiety disorder) (Fayazi and Hasani, 2017; Zhao et al., 2017), and maladaptive cognitions (Tian et al., 2017), which could cause PIU. Cross-sectional studies have demonstrated that PIU is linked to several negative outcomes, including academic failure (Iyitoglu and Çeliköz, 2017), physical health difficulties (Trojak et al., 2017), psychological dysfunction (Han et al., 2017), and behavioral problems (Ivezaj et al., 2017; Quinones and Griffiths, 2017). Although a large number of studies have declared the predictors of PIU, such as personality factors, environmental factors, and cognitive factors (e.g., Davis, 2001; Sariyska et al., 2017; Tian et al., 2017), more studies are still needed to further explore the potential predictors of PIU.

LITERATURE REVIEW

Cognitive–Behavioral Model

Davis (2001) has suggested that the cognitive–behavioral model could offer theoretical explanations of the origins and pathogenesis of PIU. This model suggests that "real" cases of Internet dependence were different from artifact dependence. "Real" Internet dependence was considered to be a general, multidimensional overuse of the Internet, as part of which the user has no clear objective, defined as generalized PIU (GPIU). However, some users were dependent on a specific function of the Internet, such as online shopping, viewing online pornography, chatting in a social network site (SNS), and playing games. While these users spent a large amount of time on specific content on the Internet rather than multiple Internet functions, they also tended to be associated with symptoms of PIU, which were defined as specific PIU (SPIU). Recently, a series of studies found that individuals tended to develop GPIU by having different purposes for Internet usage (Sariyska et al., 2017; Tian et al., 2017). For example, Griffiths (2015) found that Internet gaming addiction could increase an individuals' GPIU. Andreassen and Pallesen (2014) also found that SNS usage addiction could increase individuals' GPIU. The results from previous studies suggest that there are significant associations between SPIU and GPIU. Therefore, examining the associations between SPIU and GPIU and identifying the important order of online shopping, online pornography, SNS usage, and Internet gaming in predicting GPIU are helpful for families and schools in developing Internet addiction interventions. Additionally, the cognitive–behavioral model has indicated that both SPIU and GPIU were different across individuals' gender and educational levels, but only a few studies have tested them. The other aim of the present study was to test the effects of gender and educational levels on SPIU and GPIU.

The Association Between SPIU and GPIU

Although the cognitive–behavioral model distinguishes GPIU from SPIU, the model ignores the association between GPIU and SPIU. For example, individuals who spent a large amount of time on Internet gaming also tended to have high scores on GPIU, but it does not mean that individuals with high scores on GPIU have used Internet gaming a lot: it may be that these individuals have spent the time on other Internet activities. Therefore, SPIU was significantly associated with GPIU (e.g., Mcdaniel et al., 2017). Additionally, the cognitive–behavioral model has suggested that excessive online shopping, online pornography, SNS usage, and Internet gaming could lead to symptoms of PIU (Lee and LaRose, 2007; Ballester-Arnal et al., 2016; Allen et al., 2017; Lee et al., 2017; Mcdaniel et al., 2017). However, the model did not clarify the effect size of these activities on the symptoms of PIU. For example, a previous study found that Internet gaming was more likely to be associated with symptoms of PIU rather than SNS usage (Montag et al., 2015). It may be that individuals tended to use Internet gaming to relieve the pressure or for entertainment, and the full and delightful experience of gaming could cater to their needs, leading them to spend more time on Internet gaming, even developing symptoms of PIU. In contrast, most individuals use SNS for social contact or work. Individuals tend to use it in a steady-going rather than an increasing manner, and therefore fewer individuals would suffer from PIU because of SNS usage. From this point of view, we firmly believe that the effects of online shopping, online pornography, SNS usage, and Internet gaming on GPIU were different. Evaluating the effect size of SPIU on GPIU could provide us a particular order for SPIU interventions. Additionally, evaluating the association between SPIU and GPIU is also important for the development of a cognitive–behavioral model. For example, while SPIU has a specific effect on GPIU, the path from SPIU to GPIU should be added to the model.

Gender Differences in PIU

Gender differences in terms of PIU have been debated in literature on the topic. Some studies have indicated that male students had higher levels of PIU than female students and that female students engage more in SNS such as Facebook, Qzone, and WeChat, where they upload pictures as an act of self-expression, self-advertisement, and/or for communication/relationship maintenance (e.g., Sariyska et al., 2017; Tian et al., 2017). In contrast, male students exhibit more interest in playing computer games for entertainment (Niculović et al., 2014; Schimmenti et al., 2017). As computer games require more time spent online, male students are more likely to develop PIU. However, other studies have suggested the opposite: that female participants had higher PIU than male participants as females tend to use mobile phones more frequently (e.g., Han et al., 2017; Jiang and Zhao, 2017). Scholars have argued that females exhibit considerably higher motivation to use the Internet for interpersonal, entertainment, and shopping uses, which are positively related to PIU. These debates may be caused by either GPIU being used or one of the SPIUs being used (such as SNS usage or Internet gaming), which could just reflect the gender differences in PIU one-sidedly. Therefore, a study to test gender differences both in GPIU and SPIU simultaneously may be helpful to clarify these debates.

The Influence of Educational Levels on Gender Differences in PIU

Educational level difference was another critical factor that could influence gender differences in PIU (Bianchi and Phillips, 2005; Baron and Campbell, 2012; Lepp et al., 2014; Piko et al., 2017).

A 2-year longitudinal study revealed that female students were associated with academic-purpose computer overuse, whereas male students were associated with game-purpose computer overuse across time, which indicated gender differences in PIU (Yang et al., 2014). Furthermore, the motivations for Internet use may differ for people of different educational levels. For example, Caplan et al. (2009) revealed that "massively multiplayer online" game players tend to decrease the time they spent playing these games as their age increased. These results indicated that the motivations for Internet use could interact with an individual's gender in predicting PIU. Therefore, identifying the interaction between gender and educational levels in predicting GPIU and SPIU could be used to further clarify the aforementioned debates.

The Present Study

There were two aims in the present study: one was to test the effect size of SPIU (online shopping, online pornography, SNS usage, and Internet gaming) on GPIU and another was to examine the gender differences both in SPIU and GPIU for students from the elementary school level to the university level. A structural equation modeling (SEM) analysis was used to evaluate the effect size of each SPIU on GPIU, and difference tests were used to examine gender differences in SPIU and GPIU. We hypothesized that (i) each of the SPIUs tends to have a different effect size on GPIU and that (ii) the gender differences in SPIU and GPIU tend to change across different educational levels.

METHODS

Sample and Procedure

Sample

In total, 5,500 students (all of them were contacted in the class) from five cities in China completed the self-reported questionnaires. Two hundred and eighty-five participants (5.18%) were excluded from the analyses due to excessive missed responses and uniform responses (missing data of participants were not included in later data analysis), resulting in a final sample of 5,215 respondents (94.82%; mean age = 16.19 years, standard deviation = 3.10). More specifically, 546 elementary school students (264 males, aged from 11 to 13 years; mean age = 11.59 years, standard deviation = 0.60), 1,710 junior school students (822 males, aged from 12 to 15 years; mean age = 13.50 years, standard deviation = 0.99), 688 senior school students (303 males, aged from 15 to 18 years; mean age = 16.22 years, standard deviation = 1.09), and 2,271 university students (914 males, aged from 17 to 21 years; mean age = 19.25 years, standard deviation = 1.74) took part in this survey; all the universities and schools were selected randomly. Additionally, all of the students' parents were notified and given the option of refusing to allow their child's participation. Parental consent forms were distributed to all the students. Almost 99.8% of the students' parents (due to the young age of the children who participated) returned the consent forms, providing permission for their children's to take part.

Measures

Online Shopping

Online shopping was assessed using the Online Shopping Addiction Scale (Zhao et al., 2017). Participants answered 18 items (e.g., "I frequently think about how to gain more spare time or money to spend on online shopping") on a seven-point scale ranging from 1 = "Completely disagree" to 7 = "Completely agree." The Cronbach's α coefficient for this sample was 0.96.

Online Pornography

The viewing of online pornography was assessed using the Online Pornography Scale (Kor et al., 2014). Participants answered 12 items (e.g., "I feel I cannot stop watching pornography online") on a seven-point scale ranging from 1 = "Strongly disagree" to 7 = "Strongly agree." The Cronbach's α coefficient for this sample was 0.94.

SNS Usage

SNS usage was assessed using the Facebook Usage Scale (Ellison et al., 2007). In this study, the Facebook context was changed to the contexts of WeChat and Qzone, which were the most popular SNSs in China at the time of this study. Participants answered 12 items (e.g., "I feel out of touch when I haven't logged onto WeChat/Qzone for a while") on a seven-point scale ranging from 1 = "Strongly disagree" to 7 = "Strongly agree." The Cronbach's α coefficient for this sample was 0.85.

Internet Gaming

Internet gaming was assessed using the Internet gaming disorder test (Király et al., 2015). Participants answered 10 items (e.g., "Have you risked or lost a significant relationship because of gaming?") on a seven-point scale ranging from 1 = "Strongly disagree" to 7 = "Strongly agree." The Cronbach's α coefficient for this sample was 0.92.

Generalized PIU

GPIU was assessed using the Problematic Internet Use Scale (Gómez et al., 2017). Participants answered 11 items (e.g., "You need to spend more and more time connected to the Internet to feel comfortable") on a seven-point scale ranging from 1 = "Strongly disagree" to 7 = "Strongly agree." The Cronbach's α coefficient for the present sample was 0.88.

Statistical Analyses

Firstly, SEM was used to test the regression coefficients of online shopping, online pornography, SNS usage, and Internet gaming on GPIU; the largest standardized regression coefficient was the most critical predictor of GPIU. Secondly, multivariate analysis of variance (MANOVA) was used to test the gender differences in online shopping, online pornography, SNS usage, Internet gaming, and GPIU across the different educational levels. SEM analyses were conducted using MPLUS 7.0 and a robust maximum likelihood estimation with microarray background correction (Ullman, 2006). In this study, χ^2 was used as the primary criterion to evaluate the model fit (Hu and Bentler, 1999). In addition, the root mean square error of approximation (RMSEA), Tucker–Lewis index (TLI), and the comparative fit

index (CFI) were also used to evaluate the model. RMSEA values of ≤0.05, ≤0.08, and ≥0.1 indicate good model fit, reasonable model fit, and poor model fit, respectively. TLI and CFI values of >0.95 but <1 indicate a good model fit (Byrne, 2012). SPSS version 21.0 was used to conduct a bivariate correlation analysis and MANOVA.

RESULTS

Descriptive Statistics and Correlation Analysis

The skewness and kurtosis values for each variable are presented in **Table 1**. Mardia's value for each studied variable was smaller than 3, which indicated that the data in the present study were normal. **Table 2** depicts Pearson's correlation, mean, and standard deviation values among all the observed factors in the measurement model. Educational level (1 = elementary school; 2 = junior high school; 3 = senior high school; and 4 = university) was positively associated with gender (1 = male and 2 = female), online shopping, online pornography, SNS usage, and GPIU. Gender was positively associated with online shopping, and SNS usage, whereas it was negatively associated with online pornography and Internet gaming. Moreover, online shopping, online pornography, SNS usage, Internet gaming, and GPIU were positively associated with each other.

SEM Analysis for the Effect Size of SPIU on GPIU

SEM analyses were used to test the effects of online shopping, online pornography, SNS usage, and Internet gaming on GPIU (the total scores of each variable were used as the observed variables). **Figure 1** depicts the standardized solution for the structural model of the studied variables. The model was a saturated model: χ^2 (0) = 0, RMSEA = 0.32, TLI = 1.00, CFI = 1.00. All the standardized path coefficients were presented in this model; the dotted lines were not significant, whereas the solid lines were significant. We discovered that online shopping ($\beta = 0.28$, $p < 0.01$), online pornography ($\beta = 0.04$, $p < 0.01$), SNS usage ($\beta = 0.28$, $p < 0.01$), and Internet gaming ($\beta = 0.38$, $p < 0.01$) had significant effects on GPIU. Additionally, we conducted a series of different tests to determine which was the most critical predictor of GPIU among online shopping, online pornography, SNS usage, and Internet gaming. According to Kim's (1993) suggestion, the results showed that the regression coefficient of Internet gaming was bigger than the regression coefficients of online shopping ($?\chi^2/?df = 183.17$, $p < 0.01$), online pornography ($?\chi^2/?df = 460.40$, $p < 0.01$), and SNS usage ($?\chi^2/?df = 57.93$, $p < 0.01$), which suggested that Internet gaming was the most critical predictor of GPIU. Based on these findings, hypothesis (i) was verified.

Descriptive Statistics and Difference Tests

MANOVA was used to determine gender differences in relation to online shopping, online pornography, SNS usage, Internet gaming, and GPIU in students from elementary school to university level. The results indicated that the gender × educational level interaction exerted a significant main effect on online shopping [$F(3, 5204) = 4.35$, $p < 0.01$]. Simple effect analysis demonstrated that female students had higher levels of online shopping than male students among junior school [$F(2, 1707) = 14.17$, $p < 0.01$], senior school [$F(2, 685) = 7.04$, $p < 0.01$], and university [$F(2, 2,268) = 15.90$, $p < 0.01$], while no difference was found in elementary school [$F(2, 544) = 0.13$, $p > 0.05$]. The gender × educational level interaction exerted a significant main effect on online pornography [$F(3, 5,204) = 23.02$, $p < 0.01$]. Simple effect analysis demonstrated that male students had higher levels of online pornography than female students among junior school [$F(2, 1,707) = 9.69$, $p < 0.01$], senior school [$F(2, 685) = 11.80$, $p < 0.01$], and university [$F(2, 2,268) = 120.99$, $p < 0.01$], while no difference was found in elementary school [$F(2, 544) = 1.62$, $p > 0.05$]. The gender × educational level interaction exerted a significant main effect on SNS usage [$F(3, 5,204) = 3.89$, $p < 0.01$]. Simple effect analysis demonstrated that female students had higher levels of SNS usage than male students in university [$F(2, 2,268) = 8.83$, $p < 0.01$], while no difference was found among elementary school [$F(2, 544) = 0.50$, $p > 0.05$], junior school [$F(2, 1,707) = 1.12$, $p > 0.05$], and senior school [$F(2, 685) = 0.70$, $p > 0.05$]. The gender × educational level interaction exerted a significant main effect on Internet gaming [$F(3, 5,204) = 2.92$, $p < 0.05$]. Simple effect analysis demonstrated that male students had higher levels of Internet gaming than female students among elementary school [$F(2, 544) = 37.74$, $p < 0.01$], junior school [$F(2, 1,707) = 85.11$, $p < 0.01$], senior school [$F(2, 685) = 26.92$, $p < 0.01$], and university [$F(2, 2,268) = 173.84$, $p < 0.01$]. The gender × educational level interaction exerted a significant main effect on GPIU [$F(3, 5,204) = 11.45$, $p < 0.01$]. Simple effect analysis demonstrated that male students had higher levels of GPIU than female students among elementary school [$F(2, 544) = 14.96$, $p < 0.01$], junior school [$F(2, 1,707) = 10.20$, $p < 0.01$], and university [$F(2, 2,268) = 3.88$, $p < 0.01$], while no difference was found in senior school [$F(2, 685) = 0.36$, $p > 0.05$]. Based on these results, hypothesis (ii) was verified.

DISCUSSION

The present study evaluated the association between SPIU and GPIU and found that the effect of Internet gaming on GPIU was bigger than the effects of online shopping, online pornography, and SNS usage, which was an important finding. Although the cognitive–behavioral model had distinguished the SPIU and GPIU, it did not distinguish the association between SPIU and GPIU. From this point of view, the results of the present study expanded the cognitive–behavioral model to some extent. Additionally, the results of the present study have found that gender differences in SPIU and GPIU were different across educational levels, which was also important for the development of a cognitive–behavioral model. Although some previous studies have found gender differences and educational level differences in SPIU and GPIU (e.g., Bianchi and Phillips, 2005; Baron and

TABLE 1 | Skewness and kurtosis values for each variable.

Items	Online shopping		Online pornography		SNS usage		Internet gaming		GPIU	
	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis	Skewness	Kurtosis
Elementary school	1.84	0.49	1.73	1.31	0.34	−0.72	1.42	0.24	0.87	0.61
Junior high school	1.29	1.58	2.37	0.71	0.04	−0.68	0.78	0.21	0.40	−0.08
Senior high school	0.96	0.41	2.63	0.73	−0.35	−0.41	0.96	0.34	0.23	−0.12
University	0.82	0.82	1.98	0.46	−0.57	0.41	0.86	0.46	0.34	0.07

TABLE 2 | Mean, standard deviation, and Pearson's correlation values of the studied variables.

Variables	*M* ± SD	1	2	3	4	5	6	7
1. Educational level	2.90 ± 1.08	1						
2. Gender	1.55 ± 0.52	0.08**	1					
3. Online shopping	40.10 ± 20.37	0.25**	0.12**	1				
4. Online pornography	19.70 ± 12.17	0.08**	−0.19**	0.34**	1			
5. SNS usage	19.15 ± 6.00	0.30**	0.04**	0.05**	0.08**	1		
6. Internet gaming	24.45 ± 12.93	0.00	−0.31**	0.40**	0.21**	0.18**	1	
7. GPIU	37.28 ± 13.28	0.18**	−0.02	0.22**	0.43**	0.51**	0.53**	1

**Coefficient is significant at the 0.05 level.*
***Coefficient is significant at the 0.01 level.*

Campbell, 2012; Andreassen and Pallesen, 2014; Lepp et al., 2014; Griffiths, 2015; Griffiths et al., 2017; Piko et al., 2017), these studies did not evaluate gender differences across different educational levels. These two important findings were discussed with related theories, respectively.

Association Between SPIU and GPIU

Based on the aforementioned findings, online shopping, online pornography, SNS usage, and Internet gaming were predictors of GPIU, which is consistent with previous studies (Lee and LaRose, 2007; Ballester-Arnal et al., 2016; Griffiths et al., 2016; Ding et al., 2017; Mcdaniel et al., 2017; Zhao et al., 2017; Tian et al., 2018). Crucially, in the present study, it was revealed that, after controlling for demographic variables, Internet gaming was the most vital predictor of students' GPIU. It may be that Internet gaming can involve online shopping, SNSs, and online pornography. More specifically, there are different types of Internet gaming, such as social Internet gaming, violent Internet gaming, pornographic Internet gaming, and Internet gaming involving shopping; one Internet game even includes all the aforementioned functions. For example, a highly prevalent Internet game worldwide called League of Legends is characterized by intense, fast-paced competition between two teams of players (Kim et al., 2017). During the game, players need to communicate with each other to develop a strategy for attacking other teams; furthermore, they can buy equipment (such as weapons, skins, and blood bottles) for their characters with game currency through an Internet store (Kim et al., 2017). Based on these findings, Internet gaming is the most critical predictor of students' GPIU compared with online shopping, online pornography, and SNSs.

However, Montag et al. (2015) investigated the association between GPIU and SPIU, and the results indicated that SNS usage (β = 0.68, $p < 0.01$) was the most critical predictor of GPIU rather than online shopping (β = 0.68, $p < 0.29$), online pornography (β = 0.42, $p < 0.01$), and Internet gaming (β = 0.45, $p < 0.01$). Several reasons might explain why their results were not consistent with our results. Firstly, a different sample was used. Students with a mean age of 16.2 years from different educational levels were followed in our study, whereas the mean age of the sample analyzed by Montag et al. was 19.98 years, and all of the participants were university students. The results of our study indicated that SNS usage tended to increase faster than Internet gaming, and the sample with only university students may have overstated the effect of students' SNS usage by Montag et al. Secondly, in the study of Montag et al., multiple regression analyses rather than an SEM were used to examine the effects of online shopping, online pornography, SNS usage, and Internet gaming on GPIU. A SEM can control measurement errors from both independent and dependent variables, whereas multiple regression analysis can only control measurement errors from independent variables (Schuurman et al., 2016). Furthermore, an SEM can control the

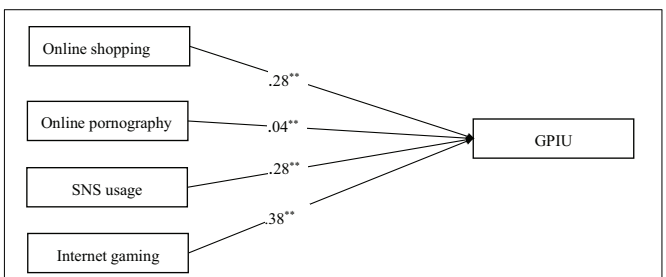

FIGURE 1 | Effects of online shopping, online pornography, SNS usage, and Internet gaming on GPIU.

multicollinearity (all of the variance inflation factors of each variable were smaller than 5, which indicated that there were no serious multicollinearity problems) among online shopping, online pornography, SNS usage, and Internet gaming through partial correlations, whereas a multiple regression analysis cannot (Hu and Bentler, 1999). As stated in Section "Introduction," online shopping, online pornography, SNS usage, and Internet gaming overlap with each other to a certain extent. These limitations in multiple regression analysis may have caused a measurement error for the subsequent analysis of the effects of online shopping, online pornography, SNS usage, and Internet gaming on GPIU. Thirdly, a different conception of Internet gaming and SNS usage was adopted. The frequency of engagement in online video games was employed to measure Internet gaming and Qzone was adopted as SNS usage in the study of Montag et al. In our study, Internet gaming was defined as a multidimensional structure that is related to continuation, preoccupation, negative consequences, escape, tolerance, loss of control, and giving up other activities because of excessive Internet gaming, and Qzone and WeChat usage was adopted to determine SNS usage. These different conceptions may have also led to different outcomes.

Gender Differences in SPIU and GPIU for Students From Elementary School to University Level

This study was the first to evaluate gender differences in SPIU and GPIU in students from the elementary school level to the university level. The results indicated that from elementary school to university, gender differences in SPIU and GPIU tended to be changeable. More specifically, this could be as follows:

Firstly, for elementary school students, no gender differences were revealed in online shopping, online pornography, and SNS usage, whereas male students reported higher scores than female students in Internet gaming and GPIU. This is because, in elementary school, both male and female students rarely use the Internet to engage in online shopping, online pornography, and SNS usage due to being too young, whereas male students tended to use the Internet to engage in gaming-related activities for entertainment. It is possible that male students reported a higher score than female students in GPIU exclusively due to Internet gaming. In a previous study, intrinsic motivation was examined, which is related to the pleasure and satisfaction from engaging in a behavior, to explain the gender differences in Internet gaming. It is possible that males tended to have more experience with video games, which could help them overcome the challenges related to specific Internet games (Kober and Neuper, 2011). While males generally perceived more enjoyment than females during a complicated computer game, the intrinsic motivation of continuance behavior in relation to online gaming tended to increase (Wang and Wang, 2008). Furthermore, the evolved gender roles may be another factor that led to the gender difference in online gaming. For example, studies have suggested that females were more sensitive to frustrations in relation to online gaming than males (Liu and Alloy, 2010; Kober and Neuper, 2011); therefore, they may have perceived less enjoyment than males and, as a result, tended not to use the Internet to engage in gaming-related activities.

Secondly, in junior high school students, males reported higher scores than females in terms of online pornography, Internet gaming, and GPIU, whereas they scored lower in online shopping, and there were no gender differences in SNS usage. For online pornography, Ballester-Arnal et al. (2016) also reported these gender-related differences in online pornography in junior high school students (mean age = 14.76 years). This is because male students reported more arousal from online sexual activities than girls; therefore, male students were more likely to use the Internet to seek pornographic material for enjoyment (Shaughnessy et al., 2011; Ballester-Arnal et al., 2016). For online shopping, gender differences have been discussed, and the findings of Cho (2004) and Hasan (2010) indicated that more products associated with females, such as food, home wear, and clothing, were widely available online. The diversity of commercial products related to females may be a crucial factor leading to more female students shopping online than males. Furthermore, it has been reported that females enjoy the physical evaluation of products, such as seeing and feeling the product even though they may not necessarily buy them (Cho, 2004; Hasan, 2010), and female students may shop online solely for entertainment. Therefore, for junior high school students, online pornography and Internet gaming were the two critical predictors for male students' GPIU, whereas online shopping was an important predictor for female students' GPIU.

Thirdly, in senior high school students, males reported higher scores than females in online pornography and Internet gaming, but lower scores in online shopping, whereas there were no gender differences in SNS usage and GPIU. Similarly, for junior high school students, online pornography and Internet gaming were the two most crucial predictors for male students' GPIU, whereas online shopping was the most critical predictor for female students' GPIU. However, no gender differences were noted in GPIU. This may have been because female students' engagement in online shopping increased faster with age than male students, which led to the gender differences in GPIU decreasing. Although male students' viewing of online pornography increased faster with age than did female students', the results of this study indicated that, after controlling for demographic variables, online shopping played a more crucial role than online pornography in predicting GPIU. The absence of an observed gender difference in GPIU may be due to the increase in online shopping for female students.

Finally, in university students, male participants reported higher scores than females in online pornography and Internet gaming, but lower scores in online shopping, SNS usage, and GPIU. Gender stereotypes can be used to interpret gender differences in the motivations for Internet use. More specifically, the perceived characteristics of female students are interdependence, a need to nurture, and a concern for others. They are more likely to use social media platforms such as Facebook, Qzone, and WeChat to obtain social or emotional support from others such as family members and peers who share similar experiences (Huan et al., 2014; Tian et al., 2015, 2017; Han et al., 2017). However, male students are typically

perceived as independent, autonomous, and self-sufficient, and even though they seek less social or emotional support from others, they are more likely to use pornographic material or computer games for entertainment (Huan et al., 2014; Tian et al., 2017). Therefore, for university students, online pornography and Internet gaming were the two most critical predictors for male students' GPIU, whereas online shopping and SNS usage were the most crucial predictors for female students' GPIU. Additionally, female students reported higher scores than male students in GPIU. It may be that the effects of increased online shopping and SNS usage on female students' GPIU were greater than that of increased online shopping, online pornography, and SNS usage on male students' GPIU.

In summary, gender differences in online shopping, online pornography, SNS usage, Internet gaming, and GPIU were dynamic and changeable in students from the elementary school level to the university level. To interpret these results, it is necessary to explain inconsistent conclusions from other studies. Yang et al. (2014) examined GPIU in 1,173 junior high school students (mean age = 13 years), and the results suggested that male students reported higher levels of GPIU than did female students. In contrast, Jiang and Zhao (2017) investigated GPIU in 468 university students (mean age = 18.2 years), and the results indicated that female students reported higher levels of GPIU than did male students. These inconsistent conclusions can be explained by the results in our study that junior high school male students spent more time viewing online pornography and participating in Internet gaming for entertainment than did female students, whereas female university students engaged more in online shopping and SNS usage than did male students due to a desire to consume products and share their emotions.

IMPLICATIONS FOR THE PREVENTION OF GPIU

According to our findings, some implications for the treatment and prevention of GPIU in school students are provided. Firstly, although, after controlling for demographic variables, online shopping, online pornography, SNS usage, and Internet gaming could positively predict GPIU, Internet gaming was the most important predictor of GPIU. Therefore, this finding suggests that interventions could be aimed at those participating in Internet gaming. Similarly, a previous study has suggested that education and training about the risks of excessive or compulsive Internet gaming can alleviate many symptoms of GPIU (Young and Case, 2004). Secondly, gender differences were revealed in online shopping, online pornography, SNS usage, Internet gaming, and GPIU for students from the elementary school level to the university level. This finding suggests that gender differences should be taken into consideration in interventions. For example, online pornography viewing tended to be unchangeable for female students, whereas the viewing of online pornography for male students tended to increase markedly from the elementary school level to the university level. Therefore, interventions related to online pornography should be aimed toward male students rather than female students. Finally, educational level differences were revealed in online shopping, online pornography, SNS usage, Internet gaming, and GPIU from elementary school students to university students. This finding suggests that educational level differences should be taken into consideration in interventions. For example, junior high school students had the highest scores in Internet gaming; therefore, interventions for Internet gaming should focus mostly on junior high school students.

LIMITATIONS AND FUTURE DIRECTIONS

Although the present study evaluated the effects of SPIU on GPIU and also examined the gender differences in these effects from elementary school to university level, there were also several limitations. Firstly, a cross-sectional design was used, which made it difficult to make a causal inference. Therefore, more future studies are needed to further evaluate the results of the present study. Secondly, the data of the present study have some skewness and kurtosis values that fall out of the accepted range, which may lead to analytical errors. Therefore, future studies should further verify the results of the present study with satisfactory skewness and kurtosis values. Finally, only Chinese students were evaluated in the present study, which made it difficult to generalize the results of the present study into other countries. More studies are needed to further verify the results of the present study, with samples from other countries.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The present study was conducted in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards, with the approval of the Human Research Ethics Committee of Qingdao University of science and technology. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

YT and TZ wrote the manuscript and data analysis. QS and LS conducted data analysis and interpretation of data for the manuscript. SC and NQ polished the manuscript and checked the manuscript.

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To Help or Not to Help: Intervening in Cyberbullying Among Chinese Cyber-Bystanders

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Cyberbullying has become a serious concern among Internet users worldwide. However, relatively little is known about individuals who witness cyberbullying and how they behave. A bystander is someone who sees bullying or other forms of aggressive or violent behavior that targets someone else and who may choose to respond by either being part of the problem (a hurtful bystander), or part of the solution (a helpful bystander). Few studies examined the phenomena of cyber-bystanders in Chinese populations. Guided by the five-step bystander theoretical model and the theory of planned behavior, this study, addressed this gap to understand how the characteristics of cyber-bystanders explained their intervention in cyberbullying in a Chinese population. This study tested two preregistered hypotheses: (1) controlling for age and gender, awareness of cyberbullying, attitudes, subjective norm and perceived behavioral control to intervene; plus past experience with cyberbullying (measured as past experience in cyberbullying perpetration and victimization), felt responsibility, and self-efficacy to intervene with regard to cyberbullying would explain the intention of cyber-bystanders to intervene in cyberbullying, and (2) the intention of cyber-bystanders to intervene cyberbullying would positively explain their intervening behavior. A total of 581 college students with experience of witnessing cyberbullying were included in the analysis. Applying structural equation modeling with observed variables, a path analysis model was built to test the hypotheses; this study also conducted exploratory analyses by including direct paths from the characteristics of cyber-bystanders to explain intervening behavior. Results found that only awareness of cyberbullying, a subjective norm, and self-efficacy to intervene positively explained intention to intervene cyberbullying; therefore, hypothesis 1 was partly supported. Also, intention to intervene cyberbullying positively explained intervening behavior; therefore, hypothesis 2 was supported. For the exploratory analysis, intention to intervene partially mediated the relation between a subjective norm to intervene and intervening behavior; and intention to intervene also partially mediated the relation between self-efficacy to intervene and intervening behavior. In addition, past experience in cyberbullying victimization also positively and directly predicted intervening behavior. Findings provided a foundation for designing future intervention programs to mobilize cyber-bystanders to become "upstanders."

Keywords: cyberbullying, cyber-bystanders, intervening behavior, Chinese college students, intention

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Cyberbullying is defined as "long-term, aggressive, intentional, and repetitive acts by one or more individuals using electronic means against an almost powerless victim" (Dehue, 2013, p. 2). While being bullied in traditional physical settings increased the risks of both internalized and externalized problems (e.g., Prino et al., 2019), being cyberbullied also poses significant psychological threats to adolescents, which include increased depressive symptoms, poor academic performance, loneliness, as well as other socio-emotional problems (Olenik-Shemesh et al., 2012; Schenk and Fremouw, 2012; Wigderson and Lynch, 2013; Na et al., 2015; Tennant et al., 2015). In traditional school bullying, students can take up a role in the bullying event, such as bullies, victims, bullied victims (Marengo et al., 2018), or bystanders (Longobardi et al., 2019). Similarly, cyberbullying also involves a number of cyber-bystanders. However, research on cyber-bystanders is limited. Unlike in traditional face-to-face bullying, a single cyberbullying incident can "snowball" and go viral online because of the potentially unlimited number of individuals who are online and witness the cyberbullying incidents. These individuals who witness cyberbullying may then become cyber-bystanders who share, comment, or forward the details of cyberbullying incidents to countless others (Slonje et al., 2013), resulting in widespread humiliation and victimization. Cyber-bystanders may reinforce the frequency of cyberbullying because their presence or responses may fulfill the agentic goals of cyberbullies of being admired, feeling dominant, and powerful (Salmivalli, 2010). On the other hand, some cyber-bystanders may choose to stop cyberbullying by calling attention to the incident, helping or defending the victims, or stopping to share or comment on cyberbullying incidents. Bystanders who witness bullying, in both traditional physical and online contexts, make up a large proportion of those who are involved in bullying incidents of any sort. Studies found that 23–85% of students have reported being involved as bystanders in traditional bullying situations (e.g., Pepler and Craig, 1995; Quirk and Campbell, 2015), while 10–91% reported being involved as cyber-bystanders (e.g., Lenhart et al., 2011; Quirk and Campbell, 2015). Schultze-Krumbholz et al. (2018) also found that among adolescents who were involved in cyberbullying, cyber-bystanders (who defended the victims or remained as outsiders) made up the largest group. Therefore, cyber-bystanders who intervene the incidents may play key roles in developing, maintaining, or stopping of the "vicious cycle" of cyberbullying.

Building on two classic models, the *five-step bystander intervention model* (Latané and Darley, 1970) and the *theory of planned behavior* (TPB; Ajzen, 1991), along with an integrating model suggested by Desmet et al. (2014), DeSmet et al. (2016), this study examined the socio-cognitive factors that explain the intention and the likelihood of intervening in cyberbullying incidents. Cyber-bystander behaviors in a Chinese population in Hong Kong, China, were examined for two reasons: (1) behaviors of bystanders may be influenced by cultural or societal values (e.g., Pozzoli et al., 2012); however, most studies on cyber-bystanders were carried out in Western settings (e.g., Desmet et al., 2014; DeSmet et al., 2016); and (2) currently, cyberbullying is a criminal offense in the United Kingdom, United States, Australia, New Zealand, yet there is no legislation against cyberbullying in Hong Kong; and cyberbullying is rarely discussed or addressed in the curricula of most Hong Kong local schools or colleges. Therefore, the experience of the responses to and the interpretation about cyberbullying of Chinese students in Hong Kong, China could be different from the patterns reported for their Western counterparts.

In addition, Schwartz et al. (2001) suggested that being sensitive to others and minimizing interpersonal conflicts are highly valued in the Chinese culture. Therefore, self-control and interdependent self-construal are cultivated and socialized. For instance, the socialization process such as a parenting style called "guan," is commonly observed in the Chinese population but not their western counterparts (e.g., Lan et al., 2019). Moreover, timid behavior or seemingly shy behavior could be a reflection of the cultural emphasis on self-restraint and behavioral inhibition rather than being unable to protect oneself (Xu and Farver, 2009). Therefore, there may be cultural differences in the belief systems of students and their attitudes toward cyber-bullying and cyber-bystanding behaviors, as well as in their perceived norm as outlined in the theory of planned behavior. Moreover, as suggested by Romera et al. (2017), most research on cyberbullying has been conducted primarily in North America and Europe, and the importance of culture has been overlooked. Indeed, studies have suggested that Chinese students tended to report cyberbullying incidents to adults, a response that may be influenced by Confucian beliefs (Li, 2008).

Currently, there are few studies of cyber-bystanders in Chinese populations. Huang and Chou (2010) reported gender differences (with females reporting fewer cyber-bystanding experiences), and cyber-bystanders were more likely to become cyber-victims as compared with cyber-bullies. Zhou et al. (2018) found that males reported more by-standing behaviors, and that moral disengagement partially mediated the relation between neuroticism and bystander behavior. Li et al. (2013) found that almost 90% of Chinese school students had been cyber-bystanders, and there were significant positive correlations among being a cyberbully, a cyber-victim, and cyber-bystander. Mojdehi et al. (2019) compared the perspectives of Chinese, Persian, and Canadian youths on cyberbullying events as cyber-bystanders. They found that Persian youth evaluated cyberbullying less negatively than Canadian and Chinese youth; while Canadian and Chinese youth rated the behaviors of perpetrators more negatively than their Persian counterparts. To the best of the knowledge of the author, studies that have comprehensively examined the belief system or socio-cognitive factors that predict the behavior of cyber-bystanders among Chinese students are scarce. This study, therefore, addressed this gap and allowed us to understand how the characteristics of cyber-bystanders explain their intervention in cyberbullying in a Chinese population.

The five-step bystander intervention model (Latané and Darley, 1970) has been well-validated to examine behaviors of bystanders in various social situations (e.g., Pozzoli and Gini, 2013; Nickerson et al., 2014). For bystanders to intervene, they must: (1) notice that an event is taking place; (2) interpret the incident as an emergency or requiring an action of some kind; (3) feel a responsibility to take action; (4) know how to apply for

the appropriate assistance; and (5) take action or choose to help. The current study applied this model to the online context.

Noticing cyberbullying is the first component in the five-step bystander intervention model. For individuals to notice and interpret an event as an emergency, the event has to be vivid (Dovidio et al., 2006; Loewenstein and Small, 2007). Because cyber-bystanders cannot observe the emotional responses of the cyber-victims, they may underestimate the severity of the situation (Heirman and Walrave, 2008), which may result in fewer intervening behaviors. In addition, most adolescents tend to interpret cyberbullying as something that is for fun, and only about 50% are aware of cyberbullying (Runions et al., 2013). Furthermore, bullying in the online context tends to be ambiguous and thus poses difficulties for cyber-bystanders to notice or interpret an event as cyberbullying (Bastiaensens et al., 2014; Van Cleemput et al., 2014). Past studies suggested that being aware of the consequences of cyberbullying and knowing how to act pro-socially promotes healthy online behavior in adolescents (Cowie and Colliety, 2010). Dillon and Bushman (2015) found that students who noticed cyberbullying were more likely to intervene. Nickerson et al. (2014) also confirmed that noticing harmful events is essential for bystander intervention to take place. Greitemeyer et al. (2006) found that the speed of noticing aggressive events predicted helping behaviors. Therefore, the first aim of this study was to understand how awareness of cyberbullying is related to the intervening behavior of cyber-bystanders among Chinese students.

Interpreting cyberbullying is the second component in the five-step bystander intervention model. How individuals interpret an event as cyberbullying depends on their belief systems. According to the theory of planned behavior (TPB; Ajzen, 1991), belief systems include attitudes (A), subjective norm (SN), and perceived behavioral control (PBC), and intention to behave. Attitudes are general affective evaluations of an individual of the behavior of another. Subjective norm involves the beliefs of individuals about how others they care about view or approve their behavior. Perceived controlled behavior refers to the perceived difficulty/self-efficacy of individuals in responding or carrying out an action. These three elements (i.e., attitudes, subjective norm, and perceived behavioral control) can predict the intention of individuals to act and their actual behavior. Few studies on cyberbullying demonstrated that certain elements of TPB (e.g., attitudes; Pornari and Wood, 2010; and subjective norm; Wright and Li, 2013) can be applied to explain cyberbullying. Heirman and Walrave (2012) found that elements of A, SN, PCB, and intention to behave explained some of the variances in the perpetration of cyberbullying. Nevertheless, only a few studies have applied the attitude component of TPB in predicting behaviors of cyber-bystanders, with two exceptions. Work by Pabian et al. (2016) suggested that positive attitudes toward cyberbullying (i.e., accepting cyberbullying) predict later bystander behaviors. DeSmet et al. (2016) proposed an integrative model based on TPB and environmental influences. The results showed that the attitudes of students toward cyber-bystanding predicted their cyber-bystanding behaviors. Still, no studies examined the belief system of cyber-bystanders in a Chinese population. Therefore, the second aim of this study was to investigate how the belief system of cyber-bystanders (i.e., A, SN, and PBC) explained the intervening behavior of cyber-bystanders.

Felt responsibility to intervene cyberbullying is the third component in the five-step bystander intervention model. Due to the large number of cyber-bystanders in a typical online context, felt responsibilities of individuals to intervene cyberbullying are often diffused. Moreover, attributions of cyber-bystanders attributions about victim characteristics further diffuse their intentions and felt responsibilities to intervene. According to the attribution theory of Weiner (1986), if bystanders perceive that the victims of bullying are responsible for the bullying or that these victims should be blamed, the bystanders may be less likely to offer help. Van Cleemput et al. (2014) found that, when cyber-bystanders believed that it should be the responsibility of the victims to act, the cyber-bystanders would not intervene, because if the victims provoked the bullies first, the cyber-bystanders tended to think that the victims were "deserved" to be bullied. In addition, if the cyber-bystanders perceived that the victims were their friends, they were then more likely to feel responsible to intervene. Obermaier et al. (2016) reported that felt responsibility of cyber-bystanders mediated the relation between a number of bystanders and intention to intervene. The third aim of this study, therefore, was to examine the relationship between the felt responsibility of cyber-bystanders to intervene and their likelihood of intervening.

Finally, *knowing how to intervene* in the five-step bystander intervention model determines whether individuals take action to intervene in a cyberbullying incident. In traditional physical bullying settings, the lack of appropriate intervention skills is predictive to the non-intervening behavior of the bystanders (Burn, 2009). Similarly, in the online context, cyber-bystanders may not have enough information and communication technology (ICT) knowledge to intervene or report the incidents. Self-efficacy refers to the confidence of an individual to accomplish a specific task (Bandura et al., 1996) and, in this context, the ability to defend cyberbullying victims. Desmet et al. (2014), DeSmet et al. (2016) found that self-efficacy encouraged positive upstanding behavior by influencing intention to intervene in cyberbullying events. Therefore, the last aim of this study was to investigate whether self-efficacy in intervening cyberbullying predicts cyberbullying.

Past research has shown high prevalence rates of cyberbullying among undergraduate students (e.g., Dilmaç, 2009; Minor et al., 2013; Faucher et al., 2014). In the United States, between 4.3 and 21% of college students reported have been bullied online (Finn, 2004; MacDonald and Roberts-Pittman, 2010; Webber and Ovedovitz, 2018). About 36% of college students in Spain suffered from being disseminated with lies and rumors online (Yubero et al., 2017). Another study showed that, in Greece, 58.4% of college students participated in cyber-bullying incidents (Kokkinos et al., 2014). In Hong Kong, Leung et al. (2018b) found that 58% of college students reported cyberbullying others, and 68% reported being cyber-victimized. Although the prevalence rate of cyberbullying among college students is not low, few studies have targeted this age group. Therefore, this study examined the mechanism of

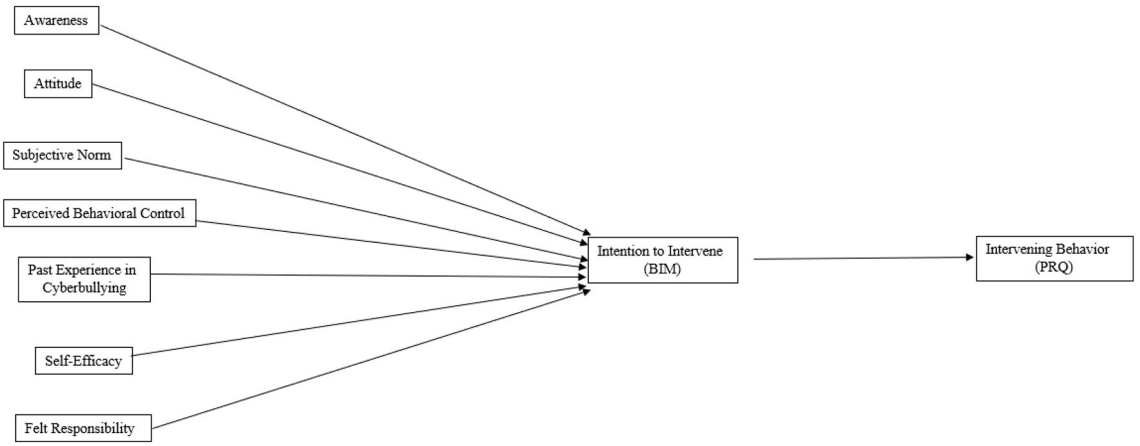

FIGURE 1 | Proposed conceptual model of the preregistered hypotheses. For simplicity, controlled variables (age and gender) and concurrent relations among predictors are not shown in the conceptual model. Past experience in cyberbullying was measured as "experience in cyberbullying victimization" and "experience in cyberbullying victimization" separately.

cyberbullying intervention in a sample of Hong Kong Chinese college students.

This study also explored the relevance of prior cyberbullying involvement to the belief system and intervening behaviors of an individual to cyberbullying incidents. For instance, past studies suggested that experience with cyberbullying or being cyberbullied predicted perceived behavioral control and subjective norm toward cyberbullying (e.g., Heirman and Walrave, 2012). Concerning the intervening behavior of cyber-bystanders, Van Cleemput et al. (2014) found that victims of cyberbullying were more likely to demonstrate positive intervening behavior when they witnessed cyberbullying. Desmet et al. (2014) also found that past experience with being cyberbullied positively predicted helping behavior among adolescents. Therefore, the prior involvement of students in cyberbullying was included in the present model as a predictor of intervening behavior.

Finally, evidence for the effect of gender and age on the behavior of cyber-bystanders has been mixed. Barlińska et al. (2013) and Machackova et al. (2013) found that gender and age did not significantly predict helping behavior of bystanders, whereas DeSmet et al. (2016) found that girls were more likely to demonstrate positive intervening behavior. Other studies conducted among young adolescents found that, with increasing age, they were less likely to help victims when witnessing cyberbullying (e.g., Van Cleemput et al., 2014; Erreygers et al., 2016). As the predictive power of gender and age remains unclear, and few studies have focused on college populations, gender and age were added as controlled variables (i.e., covariates) in the current study.

The primary goal was to understand how characteristics of cyber-bystanders, namely their awareness of cyberbullying, belief systems of cyber-bystanders (i.e., attitudes, subjective norm, and perceived behavioral control to intervene), past involvement in cyberbullying, felt responsibility, and self-efficacy with regard to cyberbullying intervention predict intention of individuals to intervene in cyberbullying.

Figure 1 displays the preregistered conceptual model. There were two hypotheses:

> Hypothesis 1: Controlling for gender and age, awareness of cyberbullying, attitudes, subjective norm, and perceived behavioral control to intervene, plus felt responsibility, past involvement in cyberbullying (measured as past experience in cyberbullying perpetration and victimization), and self-efficacy with regard to intervention would explain the intention of cyber-bystanders to intervene cyberbullying.
> Hypothesis 2: Controlling for gender and age, the intention of cyber-bystanders to intervene cyberbullying would positively explain their intervening behavior and the likelihood of defending the victim.

METHOD

Participants

A total of 699 college students aged below 30 years old answered a 10-item scale adopted from Leung et al. (2018c) to measure the frequency of witnessing cyberbullying in the past 3 months. The scale was used with Hong Kong Chinese students in a prior study to measure cyberbullying involvement, and it was adopted to measure if the participants witnessed such behavior online. A sample item is "I witness others gossip or say mean things about other students on the Internet," on a scale from "never" = 1, to "always" = 5. The composite score was created by adding up the scores of 10 items; individuals who never witnessed any cyberbullying would have a composite score from this scale.

As this study aimed at understanding the behavior of cyber-bystanders, only 581 participants ($M = 20.46$, $SD = 1.78$; males = 134, females = 447) who had past experience as cyber-bystanders (i.e., had a composite score >10) were included in the subsequent

analysis; in other words, 83.1% of college students in the current study witnessed cyberbullying, which was similar to past studies. For instance, Lenhart et al. (2011) found that 88% of students had witnessed cyberbullying; a study in Hong Kong also showed that about 90% of students in Hong Kong witnessed cyberbullying (Leung, 2018).

Measures

Basic Demographics

Age, gender, year of study, and time spent online were measured.

Past Experience in Cyberbullying

Similar to bullying in the physical context, researchers suggested that clarifications on the definition and measurement of bullying are needed (e.g., Volk et al., 2017). Although aggression and bullying overlap, they are not identical, particularly in terms of power differences and being repetitive, which are signatures of bullying but not necessarily of aggression (Hawley et al., 2011). In the online context, nevertheless, because of its anonymous nature, it could be difficult to detect the power difference between the bullies and the victims. Therefore, as suggested by Volk et al. (2017), when there was "no gold standard measure of bullying" (p. 41), the most suitable measurements should be chosen to test the hypotheses. Among the few studies that offered a clear definition of cyberbullying, Langos (2012) suggested the clear and concise definitions of cyberbullying should be:

> Cyberbullying involves the use of ICTs to carry out a series of acts as in the case of direct cyberbullying, or an act as in the case of indirect cyberbullying, intended to harm another (the victim) who cannot easily defend himself or herself. Direct cyberbullying involves a perpetrator repeatedly directing unwanted electronic communications to a victim who cannot easily defend himself or herself with the intent to harm the victim. Indirect cyberbullying involves directing a single or repeated unwanted electronic communications to a victim who cannot easily defend himself or herself with the intent to harm the victim. An intention to harm is established where a reasonable person, adopting the position of the victim and having regard to all the circumstances, would regard the series of acts or an act as acts or an act intended to harm the victim (p. 288).

The participants were given the aforementioned definition of cyberbullying, and they indicated how frequently they have been involved in various kinds of behaviors that constitute cyberbullying (as perpetrators or victims), using the nine-item cyberbullying and cyber-victimization scales by Patchin and Hinduja (2015). A sample item for the cyberbullying perpetration scale is "I cyberbullied others"; Cronbach's alpha = 0.96. A sample item for the cyber-victimization scale is "I have been cyberbullied"; Cronbach's alpha = 0.95. The two scales were developed by Patchin and Hinduja (2015), two renowned researchers in the field of cyberbullying. Both scales demonstrated strong initial validity and reliability in 10 different surveys, which involved more than 15,000 students.

Awareness of Cyberbullying

The participants rated six items on a seven-point scale (1 = strongly disagree; 7 = strongly agree) to measure their cyberbullying awareness (Brewer, 2011). A sample item is: "People are negatively affected by cyberbullying." This scale was used by Leung et al. (2018a) with a Hong Kong Chinese sample, Cronbach's alpha = 0.80. Cronbach's alpha of this scale in the present study was 0.75.

Attitudes Toward Cyberbullying

The attitudes toward cyberbullying questionnaire (PACQ; Barlett and Gentile, 2012) consists of nine items. The participants rated on a seven-point scale (1 = strongly disagree; 7 = strongly agree). This scale was used in a Hong Kong Chinese sample before, with a Cronbach's alpha of 0.86 (Leung et al., 2018a). A sample item is, "Sometimes using passive aggressive methods of sending mean e-mails to others is the only way to get even." The scale was reversed code so that a high score means a more negative attitude toward cyberbullying (i.e., believing that cyberbullying is not good). Cronbach's alpha of this scale in the present study was 0.86.

Subjective Norm (SN)

The participants rated four questions adapted from Kraft et al. (2005), using a seven-point scale (1 = strongly disagree; 7 = strongly agree) to measure their subjective norms about bystander behavior. A sample item is: "Most people who are important to me would like me to intervene in a cyberbullying incident." Cronbach's alpha of this scale in the present study was 0.88.

Perceived Behavioral Control (PBC) on Intervening Behavior

The participants completed a nine-item scale adapted from Kraft et al. (2005) to measure their perceived behavioral control, using a seven-point scale (1 = strongly disagree; 7 = strongly agree). The items were adjusted to fit into the online context. For example, "I have full control over my intervening behavior when I witness cyberbullying incidents." Cronbach's alpha of this scale in the present study was 0.84.

Intention to Intervene in a Cyberbullying Context

The participants completed the 12-item bystander intervention measure (Koon, 2013; reliability > 0.70), using a five-point scale (1 = strongly unlikely to intervene; 5 = strongly likely to intervene). A sample item is "Privately advise the victim to block the harasser." Cronbach's alpha of this scale in the present study was 0.87.

Felt Responsibility to Intervene

The participants rated a three-item scale to measure their felt responsibility to intervene in a cyberbullying situation, using a five-point Likert (1 = strongly disagree; 5 = strongly agree; Obermaier et al., 2016). A sample item is "I highly feel personally responsible to support the cyber-victim." Cronbach's alpha of this scale in the present study was 0.84.

TABLE 1 | Descriptive statistics of demographic variables.

Variable	Mean (SD)/*N* (%)
Age	20.46 (1.78)
Gender	
Males	134 (23.1)
Females	447 (76.9)
Time spent online (hours)	2.82(2.60)

Self-Efficacy to Intervene Cyberbullying

The participants rated their self-efficacy to intervene in cyberbullying, using 10 items adopted from Schwarzer and Jerusalem (1995) on a seven-point scale (1 = strongly disagree; 7 = strongly agree); e.g., "I have confidence that I can effectively resolve urgent cases of cyberbullying." Modifications were made to fit the cyberbullying context. It was used in the Hong Kong Chinese sample, with Cronbach's alpha = 0.96 (Leung et al., 2019). Cronbach's alpha of this scale in the present study was 0.93.

Intervening Behavior

The participants completed a three-item scale adopted from the participant role questionnaire (Salmivalli and Voeten, 2004). This scale measures the frequency of bystanders to intervene when witnessing aggression and the likelihood to defend the victim, using a five-point Likert scale, from "1" as never to "5" as always. The items will be adjusted to fit in the cyberbullying context. A sample item is, "Tell others to stop cyberbullying." Cronbach's alpha of this scale in the present study was 0.87.

Procedure

Local Hong Kong college students were invited via mass emails on campus. They were given a link to access the online questionnaire. Ethics approval was obtained from the University of the author. A consent form was shown on the first page of the questionnaire. The participants were given a HK$50 coupon (∼USD$6) for their participation.

RESULTS

Table 1 shows the descriptive statistics of the demographic variables. **Table 2** shows the descriptive statistics, internal reliabilities, and correlations of the measured study variables. **Table 3** shows the gender differences in our study variables, using independent samples *t*-test analyses.

Results of the correlational analysis showed that awareness of cyberbullying, subjective norm, perceived behavioral control to intervene, felt responsibility, and self-efficacy with regard to the intervention were positively correlated with intention to intervene cyberbullying; while the intention to intervene was positively correlated with intervening behavior (see **Table 2**).

To test hypotheses 1 and 2, the relations among the measured variables were further investigated, using path analysis (a form of SEM with observed variables), using lavvan package (Rosseel, 2012) in R (R Development Core Team, 2012); age and gender were included in the model as covariates in explaining

TABLE 2 | Descriptive statistics, internal reliability, and correlations of study variables.

Variable	Mean (SD)	Cronbach alpha	Awareness	Attitude	Subjective norm	Perceived behavioral control	Past experience in cyberbullying perpetration	Past experience in cyberbullying victimization	Felt responsibility	Self-efficacy	Intention to intervene	Intervening behavior
Awareness	32.02 (5.16)	0.75	1									
Attitude	50.75 (8.21)	0.86	0.361**	1								
Subjective norm	16.50 (4.45)	0.88	0.136**	0.022	1							
Perceived behavioral control	31.92 (7.74)	0.85	0.003	−0.027	0.408**	1						
Past experience in cyberbullying perpetration	0.90 (3.35)	0.96	−0.262**	−0.410**	0.008	0.084*	1					
Past experience in cyberbullying victimization	1.34 (4.00)	0.95	−0.252**	−0.370**	0.043	0.087*	0.809**	1				
Felt responsibility	8.71 (2.62)	0.84	0.101*	0.072	0.406**	0.255**	−0.027	0.020	1			
Self-efficacy	34.93 (10.05)	0.93	0.058	0.015	0.436**	0.597**	0.037	0.055	0.338**	1		
Intention to intervene	46.73 (11.42)	0.87	0.136**	−0.013	0.365**	0.341**	0.004	−0.015	0.260**	0.411**	1	
Intervening behavior	4.99 (2.26)	0.87	0.049	−0.074	0.274**	0.226**	0.209**	0.241**	0.206**	0.303**	0.291**	1

*$p < 0.05$, **$p < 0.001$.

TABLE 3 | Independent samples *t*-test comparing gender differences in study variables.

Variable	Gender	*N*	*M*	*SD*	*t*	*p*
Awareness	Male	134	29.46	5.92	−5.98	<0.001
	Female	447	32.79	4.64		
Attitude	Male	134	45.80	8.89	−7.63	<0.001
	Female	447	52.23	7.38		
Subjective norm	Male	134	16.76	4.35	0.76	0.446
	Female	447	16.43	4.48		
Perceived behavioral control	Male	134	33.31	7.10	2.39	0.017
	Female	447	31.50	7.89		
Past experience in cyberbullying perpetration	Male	134	2.47	5.80	4.02	<0.001
	Female	447	0.43	1.91		
Past experience in cyberbullying victimization	Male	134	3.23	6.51	4.27	<0.001
	Female	447	0.77	2.60		
Felt responsibility	Male	134	8.66	2.52	−0.28	0.779
	Female	447	8.73	2.66		
Self-efficacy	Male	134	35.81	9.66	1.15	0.249
	Female	447	34.66	10.16		
Intention to intervene	Male	134	47.24	11.05	0.59	0.554
	Female	447	46.57	11.54		
Intervening behavior	Male	134	5.32	2.36	2.10	0.036
	Female	447	4.86	2.20		

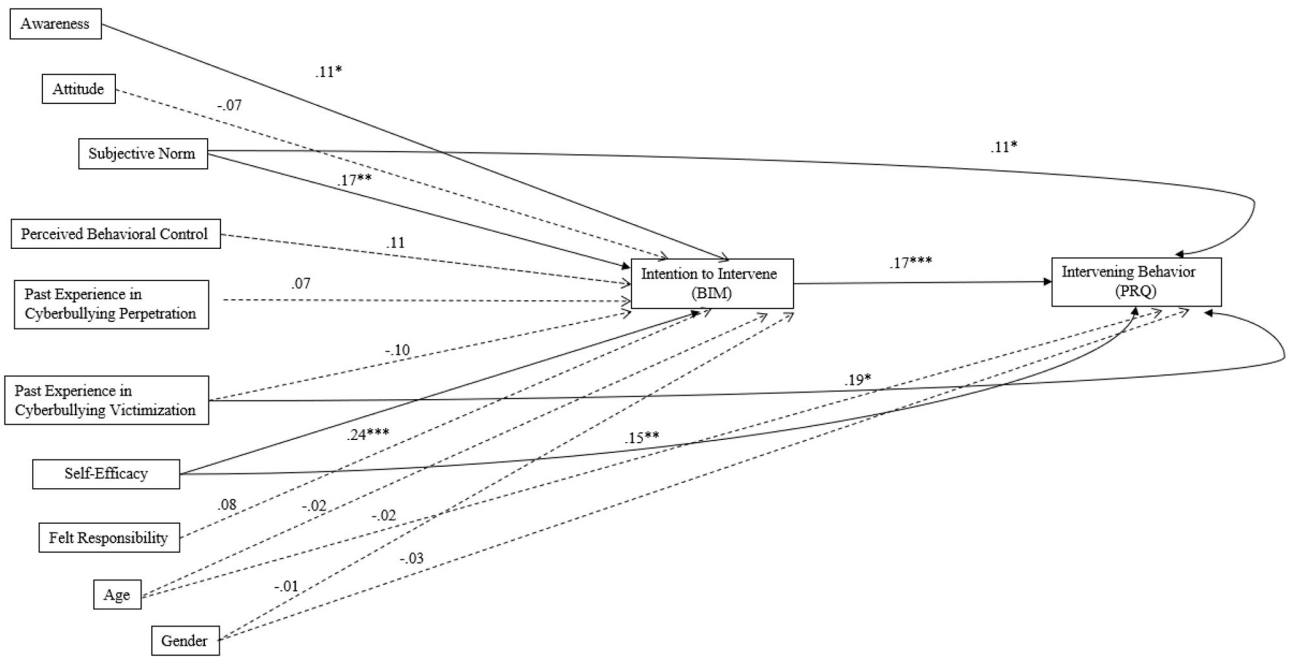

FIGURE 2 | Results of path analysis among variables. Values in path analysis represent standardized regression coefficients. Solid lines and dotted lines represent significant paths and non-significant paths, respectively. *$p < 0.05$, **$p < 0.01$,***$p < 0.001$.

both intention to intervene and intervening behavior. An exploratory analysis was conducted by including direct paths from characteristics of cyber-bystanders to intervening behavior as well.

As indicated in **Figure 2**, for hypotheses 1 and 2, when all the measured characteristics of cyber-bystanders were included in the model of path analysis, only awareness of cyberbullying (beta = 0.11, $p = 0.018$), subjective norm (beta = 0.17, $p = 0.002$), and self-efficacy (beta = 0.24, $p < 0.001$) to intervene positively and significantly explained intention to intervene. Also, intention to intervene (beta = 0.17, $p < 0.001$) positively explained intervening behavior.

For the exploratory analysis, results showed that subjective norm (beta = 0.10, $p = 0.011$) and self-efficacy to intervene

(beta = 0.15, p = 0.003) positively and directly explained intervening behavior of cyber-bystanders; while past experience in cyberbullying victimization (beta =0.19, p = 0.033) positively and directly explained the intervening behavior, despite of the fact that it did not explain intention to intervene. Other direct paths from awareness (beta = 0.07, p = 0.125), attitude (beta = −0.003, p = 0.948), perceived behavioral control (beta = −0.01, p = 0.893), past experience in cyberbullying perpetration (beta = 0.06, p = 0.493), and felt responsibility to intervening behavior (beta = 0.06, p = 0.134) were not significant. As analysis of direct paths to intervening behavior was added as exploratory analysis, for the sake of simplicity, only significant direct paths are included in **Figure 2**. Characteristics of cyber-bystanders added in the model accounted for 23.8% in the total variance of the intention of cyber-bystanders to intervene in cyberbullying, while all these characteristics, along with intention to intervene cyberbullying, accounted for 20.0% of variance in intervening behavior.

The indirect effect was tested, using a percentile bootstrap estimation approach, with 1,000 samples. Results showed that subjective norm had significant direct effect (B = 0.05, SE = 0.02, 95% CI [0.01, 0.09], beta = 0.10, p = 0.011), indirect effect *via* intention to intervene (B = 0.02. SE = 0.01, 95% CI [0.01, 0.03], beta = 0.03, p = 0.011), and total effect (B = 0.07, SE = 02, 95% CI [0.03, 0.11], beta = 0.13, p = 0.001) on intervening behaviors. Results also showed that self-efficacy had the significant direct effect (B = 0.03, SE = 0.01, 95% CI [0.01, 0.06], beta = 0.15, p = 0.003), indirect effect *via* intention to intervene (B = 0.01, SE = 0.003, 95% CI [0.004, 0.02], beta = 0.04, p = 0.002), and total effect (B = 0.04, SE = 0.01, 95% CI [0.02, 0.06], beta = 0.19, p < 0.001) on intervening behaviors. In other words, intention to intervene cyberbullying partially mediated the relations between subjective norm and self-efficacy to intervene, respectively, to intervening behavior of cyber-bystanders.

DISCUSSION

Guided by the two classic models, the five-step bystander intervention model (Latané and Darley, 1970) and the theory of planned behavior (TPB; Ajzen, 1991), along with an integrating model suggested by Desmet et al. (2014), DeSmet et al. (2016), this study aimed at studying a bundle of characteristics of cyber-bystanders together and to test if they explained the intention of cyber-bystanders to intervene and their intervening behavior. It was among the first few studies to investigate the underlying socio-cognitive mechanism of intervening behavior of cyber-bystanders among Chinese students, a population that has been under-researched in the existing literature. In the path analysis model, controlling for gender and age, awareness of cyberbullying, subjective norm, and self-efficacy to intervene positively and significantly explained intention to intervene cyberbullying. Therefore, hypothesis 1 was partially supported. Results of the path analysis model also showed that intention to intervene positively and significantly explained intervening behavior; therefore, hypothesis 2 was supported. Exploratory analysis of direct paths from characteristics of cyber-bystanders to intervening behavior further suggested that past experience in cyber-victimization positively and directly explained intervening behavior; while the intention to intervene partially mediated subjective norm and self-efficacy to intervene to intervening behavior, respectively.

According to the five-step intervention model, noticing or being aware of an emergency is the very first step for any intervention to take place (Latané and Darley, 1970), while the second step involves interpretation of individuals of the event, and this is affected by belief systems of individuals, which can further be explained by TPB, which includes attitudes (A), subjective norm (SN), and perceived behavioral control (PBC). The third and fourth steps to intervene involve felt responsibility and self-efficacy to intervene, while the last step is the intervening behavior. As TPB suggested that intention to engage in a behavior predicts the behavioral responses of individuals, intention to intervene cyberbullying was included as a mediator in the current study.

Awareness of cyberbullying is the first step of the five-step intervention model. Consistent with past literature, which suggested the importance of noticing cyberbullying (e.g., Dillon and Bushman, 2015), this study supported that, among Chinese college students who witnessed cyberbullying, their awareness of cyberbullying positively explained their intention to intervene, which, in turn, positively explained their intervening behavior. To prevent bullying in school settings, the first step in the bullying intervention program in the face-to-face context was to raise awareness of students (e.g., Salmivalli, 1999; Salmivalli et al., 2005). Findings of the present study provided empirical evidence that such awareness is also important when bullying happened in the online context.

Nevertheless, few interventions in existing literature have targeted this age group, and only a handful of studies were conducted to increase awareness or knowledge of college students of cyberbullying (e.g., Doane et al., 2016). Therefore, the future intervention program in tertiary education should consider raising awareness of cyberbullying of college students. A potentially effective way to increase awareness of cyberbullying of college students is to adopt an experiential learning approach. For instance, Leung et al. (2018a) conducted one of the very few studies that aimed at addressing cyberbullying among Hong Kong Chinese college students. In the 1-h short intervention program, college students actively participated in a Facebook role play activity, watched a documentary about cyberbullying, and involved in a discussion and a self-reflection writing task. With an experimental learning design, students experienced and understood the feelings of the cyber-victims; their sympathy for victims was boosted, and their cognitive experience was challenged *via* group discussion. Leung et al.'s (2018a) study showed that (a) the participants who were in the intervention group increased awareness of cyberbullying, as compared with the control group; and (b) among the participants who reported themselves being highly engaged in the intervention, such effect was maintained in an 8-week follow-up. Therefore, it is suggested that similar intervention programs that promote awareness of college students of cyberbullying should be included in the tertiary education curriculum in the future.

The second step of the five-step intervention model involves how individuals interpret an event; such a process is likely to be affected by how individuals perceive their important referents want them to conduct a behavior. Results of this study found that the higher the subjective norm that participants believed their important referents would approve them to intervene cyberbullying, the higher their intention to intervene cyberbullying was, which, in turn, positively explained intervening behavior. This is consistent with past studies on bullying in face-to-face context. Past studies reported that if students believed that their parents and friends expected them to support victims of bullying, they expressed higher intention to intervene (e.g., Rigby and Johnson, 2006). In the online context, Bastiaensens et al. (2016) found that among those who witnessed cyberbullying, when they thought that their peers would approve of cyberbullying behavior, they would experience more social pressure to join in the cyberbullying incidents. A recent paper by Leung et al. (2018c), using a simulated Facebook setting manipulated the environment of a simulated Facebook setting into two conditions: the offending condition, in which comments that "support the cyber-bullies to further offend the cyber-victims" were shown vs. the defend condition, in which comments that "defend or help the cyber-victims" were shown among Hong Kong Chinese students. Results showed that only the defend condition promoted higher normative beliefs for cyber-bystanders to help the victims. Therefore, when educators promote intervening/defending behaviors of cyber-bystanders in the future intervention programs against cyberbullying, it is important for these programs to include perspectives of significant others of students. For instance, if cyber-bystanders believe that their peers, family members, etc., approve them to engage as "cyber-upstanders" to help cyber-victims, they are more likely to adhere to this subjective norm, which may help cyber-bystanders to become "upstanders" upon witnessing cyberbullying.

Another step of the five-step intervention model involves enhancement in self-efficacy to intervene. Self-efficacy is a self-related belief that has been widely studied in different psychological and educational studies. According to Bandura (1977), having high self-efficacy in a certain domain helps individuals to approach a situation in a more prosocial and confident manner, and several intervention programs on cyberbullying aimed at raising self-efficacy of students in combating cyberbullying (e.g., a recent one by Leung et al., 2019 has raised self- efficacy of college students to combat cyberbullying with a six-session constructivist-based anti-cyberbullying e-course). Consistent with previous findings, self-rated self-efficacy of students to intervene or stop cyberbullying predicted their intervening behavior (e.g., DeSmet et al., 2016); results of this study found that self-efficacy to intervene cyberbullying positively explained intention to cyberbullying, which, in turn, positively explained intervening behavior. Other recent studies in the Western context have also found that higher self-efficacy predicted a higher level of defending behavior among young Australian (e.g., Clark and Bussey, 2020) adolescents. Therefore, it seems that, regardless of the age and cultural background of students, it is important to target increasing the necessary defending and empathic skills for cyber-bystanders to intervene cyberbullying.

Besides the aforementioned characteristics of cyber-bystanders, results showed that past experience in cyberbullying victimization positively and directly explained intervening behavior; in other words, the participants who were cyber-victimized more in the past were more likely to demonstrate intervening behavior. However, past experience in cyberbullying perpetration (i.e., being cyber-bullies) did not explain intervening behavior. Findings from the current study are also in line with other past studies (e.g., Bussey et al., 2020; Clark and Bussey, 2020) on a younger population; they found that only past cyberbullying victimization, but not cyberbullying perpetration, was positively related to cyber-defending behavior. These results could be explained by other past studies, which suggested that past experience in being cyber-victimized may activate greater empathy, and empathy has been found to be a strong predictor of defending behavior (Van Cleemput et al., 2014).

Attitudes toward cyberbullying, PBC, and felt responsibility to intervene cyberbullying did not significantly predict intention to intervene nor intervening behavior in the path analysis model; therefore, only part of hypothesis 1 was supported. Ajzen and Fishbein (1977) proposed the "correspondence hypothesis," which stated that, when attitudes and behaviors were measured at corresponding levels of specificity, the correlation between attitudes and behaviors would be higher. In other words, general attitudes predicted general behavioral tendencies, but only specific attitudes predicted specific behavior. In the present study, "intervening behavior" was a specific behavior to help the cyber-victims by intervening a cyberbullying circumstance; however, a scale that measured a more general attitude toward cyberbullying, instead of the specific attitude toward "intervening cyberbullying" was used. This low correspondence between attitude and behavior may explain the lack of significant relations among attitudes, intention to intervene, and intervening behavior in this study.

PBC means the level of confidence individuals have in their abilities to correctly perform a behavior (Ajzen, 1991). Although past studies found that PBC was one of the predictors of cyberbullying behavior (e.g., Heirman and Walrave, 2012), there is a lack of studies examining the role of PBC among cyber-bystanders. The current study found that PBC did not explain intention to intervene nor intervening behavior with regard to cyberbullying. Some past studies suggested that PBC is the weakest or non-significant predictor of behavior in the presence of other predictors (e.g., Greaves et al., 2013; Tipton, 2014; Prapavessis et al., 2015). Riemenschneider et al. (2011) also found that PBC did not significantly predict the behavior of students related to ethical decisions. As ethical judgments could vary by culture or other contextual factors, these contextual factors may, in turn, potentially affect the relationship between PBC and the behaviors of cyber-bystanders.

Felt responsibility did not explain intention to intervene nor intervening behavior in the current study, albeit felt responsibility has long been considered as an important factor to predict intervening behavior. A possible explanation is that felt responsibility can be perceived differently by students in the

online context, in which other factors, such as anonymity and increased emotional distance between a victim and a bystander, may contribute to a weaker linkage between felt responsibility and intervening behavior. Concerning felt responsibility, as suggested by the study of Gahagan et al. (2016), college student participants reported that felt responsibility upon witnessing cyberbullying depends on circumstances, namely, "(a) personal connection to the cyber-victim, (b) personal morals regarding cyberbullying, and (c) personal capabilities to helping the cyber-victim" (p. 1103). These circumstantial factors, however, were not included in the current study when measuring felt responsibility. Future studies should consider examining the effects of circumstantial factors on intention to intervene and intervening behaviors.

As a cross-sectional design was employed in this study, therefore, the causal relation between measured variables cannot be drawn. Nevertheless, the results of the current study provide guidance and grounds for future investigations on causal or longitudinal relations among characteristics of cyber-bystanders and their intervening intention or behavior upon witnessing cyberbullying. Moreover, given the high prevalence rates of cyberbullying among undergraduate students (e.g., Dilmaç, 2009; Minor et al., 2013; Faucher et al., 2014), therefore, with an aim to fill up the gap in the existing literature on understanding behavior of cyber-bystanders in this under-researched population, the current study mainly examined the cyberbullying phenomenon among Chinese college students, who are "emerging adults" or adolescents older than typical teenagers. Our findings may not fully generalize to explain cyberbullying intervention in younger adolescents. Future studies can involve students from a wider age range to examine the developmental impacts on behaviors of cyber-bystanders. While only age and gender were collected and included as covariates in the current study, future studies can investigate the role of other sociodemographic variables (such as socioeconomic status, life events, and family relationships) in intervening behaviors of cyber-bystanders.

The current study only focused on psychosocial and cognitive characteristics in explaining cyberbullying intervention. It is possible that the focus of this study may overlook the effects of other predictive factors on intervening behaviors. Also, although gender and age were already included in the model as covariates, the gender ratio in the present study was imbalanced (with 76.9% of the female participants). However, as the study was conducted in Hong Kong, China, according to statistics (University Grants Committee, 2019) on the student ratio of female to male college students in Hong Kong, China, there are more female than male students in most universities (a female-to-male student ratio ranging from 1.13:1 to 3.17:1). Despite its limitations, findings from this study provide implications for future studies to further investigate the mechanism of socio-cognitive factors that explain the intention of cyber-bystanders to intervene and intervening in behavior upon witnessing cyberbullying in a Chinese population. As cyberbullied victims may suffer from a number of negative outcomes such as having more depressive symptoms and other socio-emotional problems (e.g., Olenik-Shemesh et al., 2012; Tennant et al., 2015), and that mood disorders and psychological strains are related to more mental health problems such as suicidal thoughts and behaviors (e.g., Zhang et al., 2020), and suicide rates are high among college students (e.g., Lew et al., 2020); it is important to develop anti-cyberbullying programs to combat cyberbullying. For instance, a recent study has found that attachment to peers and parents buffered depression symptoms among Chinese youth (e.g., Lan and Wang, 2020). Therefore, future cyberbullying programs may consider fostering interpersonal support, together with strengthening specific psychosocial resources or factors (e.g., awareness and self-efficacy to intervening cyberbullying) that this study found to promote positive bystander behaviors and safe cyberspace.

DATA AVAILABILITY STATEMENT

The datasets generated for this study are available on request to the corresponding author.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Human Research Ethics Committee, The Education University of Hong Kong. The participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AL: conceptualization, data collection/analysis, and write-up.

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The Influence of Interpersonal Sensitivity on Smartphone Addiction: A Moderated Mediation Model

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Smartphone addiction is a behavioral dependence characterized by excessive or compulsive Internet use and a preoccupation with and loss of control over this use that interferes with an individual's daily functioning and results in negative mental processes and subsequent social consequences. Smartphone addiction can negatively impact physical and mental health as well as academic performance, sleep quality, and even interpersonal interaction and relationships. Based on the compensatory Internet use theory, this study explores the relationship between interpersonal sensitivity and smartphone addiction in college students and constructed a moderated mediation model. A sample of 881 college students was tested using the Interpersonal Sensitivity Scale, Smart Phone Addiction Scale, Fear of Missing Out Scale, and Relational Self-Construal Scale. We used AMOS 26.0 to conduct a confirmatory factor analysis and employed SPSS 24.0 to test our hypotheses. The results indicated that (1) interpersonal sensitivity was positively related to the fear of missing out and smartphone addiction; (2) the fear of missing out mediated the relationship between interpersonal sensitivity and mobile phone addiction; (3) relational self-construal moderated interpersonal sensitivity and the fear of missing out; and (4) relational self-construal moderated the mediating effect of the fear of missing out on the relationship between interpersonal sensitivity and smartphone addiction. We concluded that the fear of missing out and relational self-construal play a moderated mediation effect on the relationship between smartphone addiction and interpersonal sensitivity. Our findings provided some theoretical implications. Specifically, in addition to proposing a new approach for the study of smartphone addiction, we also introduced a theoretical basis for psychotherapy and intervention of smartphone addiction. In addition, this study also provides some insightful ideas for educational practitioners.

Keywords: interpersonal sensitivity, fear of missing out, smartphone addiction, relational self-construal, college students

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INTRODUCTION

Preoccupied while on his smartphone, a college student in Nanjing, China bumped into a sculpture and knocked it down while walking on campus. A teenager in Zhejiang, China is physically paralyzed and suffers from severe mental deficiency due to excessive use of his mobile phone. Feeling left out and deserted, an elderly man became violent and erratic

when his children and grandchildren spent all of their time playing with their mobile phones. The rapid development of mobile Internet, instant messaging, mobile payment, online shopping, and many other mobile applications has made people's lives more convenient and efficient. However, social problems associated with the overuse of smartphones are increasing as more people become enslaved by their smart phones. Scholars define these uncontrollable mobile phone use behaviors as smart phone addiction, which refers to a new type of addiction that is causing widespread psychological and behavioral problems (Liu et al., 2017). Individual social function is being impaired due to the excessive use of smart phones and the often uncontrollable behaviors that result. Mobile phone addiction seems to be particularly widespread in colleges and universities. Cao (2018) found that the rate of mobile phone addiction among Chinese college students was 25.39%, and 51.81% of college students have experienced decreased efficiency in either work or study due to excessive use of mobile phones. Mobile phone addiction is seriously damaging the physical and mental health of college students, which is affecting their academic performance (Lepp et al., 2014), sleep quality (Yu and Liu, 2019), interpersonal relationship (Chen et al., 2016), etc.

There are several factors that seem to influence college students' mobile phone addiction. Among these factors, personality trait is a major predictor in studies on addictive behaviors (Dodes, 2009). Previous studies conducted in Chinese context have found that personality factors, such as extroversion, impulsivity, neuroticism, and high risk-taking can positively predict smartphone addiction (Wang et al., 2014). In their research on air force soldiers in China, Wang et al. (2015) found that interpersonal sensitivity is related to neuroticism and negative emotions while negative emotion plays a partial mediating role between neuroticism and interpersonal sensitivity. As a stable and common personality trait, interpersonal sensitivity has not yet been widely considered in studying its interaction with smartphone addiction. Therefore, determining whether or not interpersonal sensitivity affects mobile phone addiction will be one of the primary concerns of this paper.

Interpersonal sensitivity is a personality tendency marked by constantly worrying about negative social evaluation. People with interpersonal sensitivity are more likely to perceive a high degree of social threat, so they always keep vigilant of their own evaluation by other people. They tend to take defensive behavior (such as obedience or inhibition) in advance to avoid such evaluation (Marin and Miller, 2013). According to the compensatory Internet use theory, individuals in less favorable circumstances may choose to alleviate their negative emotions through virtual network activities and may tend to select the network media that meets their needs to compensate for the lack of social communication in real life. Individuals who lack social stimulation in real life are more likely to engage in social activities through the Internet (Kardefelt-Winther, 2014). Many studies have confirmed that the compensatory Internet use theory is not only applicable to Internet addiction, but also can be used to explain mobile phone addiction (Elhai et al., 2018). People with interpersonal sensitivity are more likely to use virtual social media on mobile phones to make up for the lack of social interaction in face to face situations. In addition, interpersonal sensitivity is often accompanied by a sense of incompetence, causing people with interpersonal sensitivity to frequently misunderstand other people's behaviors. This leads to individual discomfort and ultimately avoidance behaviors and social needs dissatisfaction (Marin and Miller, 2013; Babadi-Akashe et al., 2014). This dissatisfaction encourages individuals to further immerse themselves in various kinds of social media on mobile phones. Eventually such an individual begins pay attention to the dynamics of surrounding people, as well as other people's comments on their own messages in order to meet their inner needs, which results in even greater dependence on mobile social communication (Ye et al., 2019). You et al. (2019) also found that due to the anonymity and escapism of the Internet, those who cannot establish or maintain a normal offline relationships with others are more likely to interact with others online through the Internet or mobile phones. Therefore, people with interpersonal sensitivity are more likely to become addicted to the use of mobile phones. In view of these findings, this study proposes

> *Hypothesis* 1: Interpersonal sensitivity has a significant correlative impact on smartphone addiction.

Although individual interpersonal sensitivity may have an impact on mobile phone addiction, the mediating role between the two also needs to be explored in order to better clarify the internal mechanism of mobile phone addiction. Interpersonal sensitivity can lead individuals to pay too much attention to and set very high standards for their own behaviors. These individuals worry about the negative interpersonal consequences caused by making mistakes, which leads to problems related to anxiety and induces specific behaviors, such as mobile phone addiction (Kumari et al., 2012; Buglass et al., 2016; Baker et al., 2016). This paper argues that the anxiety related to "fear of missing out" embedded in the compensatory Internet use theory may help explain the relationship between interpersonal sensitivity and mobile phone addiction. Fear of missing out is a type of diffused anxiety caused by the individual's fear of missing out on other people's interesting experiences (Przybylski et al., 2013; Elhai et al., 2019). In real life, people at risk subconsciously check their social media software due to their underlying anxiety related to the fear of missing out. This phenomenon has evolved from the original individual phenomenon to a widespread social syndrome (Li and Ma, 2019). Interpersonally sensitive individuals have a lack of certain specific psychological controls and cannot carry out effective measures to realize self-regulation. Instead, these individuals rely on external material and environmental stimuli to compensate for their psychological need. Continual and chronic excessive attention to external information gradually evolves into the fear of missing out. Empirical studies also show that fear of missing out leads to social media dependence

(Oberst et al., 2017), and individuals who are afraid of missing out are more likely to use mobile social media frequently and excessively focus on their friends' plans and arrangements (Przybylski et al., 2013). A survey study also found that individuals who have the fear of missing out are more likely to use Facebook in class or check information on mobile phones while driving (Rozgonjuk et al., 2019). People who are afraid of missing out will pay more attention to the emotional state of others in social interaction and have a higher demand for recognition, which often leads to overuse of social media, such as smart phones (Oberst et al., 2017). Therefore, this study proposes

> *Hypothesis* 2: The fear of missing out mediates the relationship between interpersonal sensitivity and mobile phone addiction.

This study also explores the boundary conditions required in order for interpersonal sensitivity to effectively cause mobile phone addiction, because this impact process is also affected by factors, such as individual self-concept (Zhang and Kang, 2016) and growth experience (Hall et al., 2009). Researchers have found that an individuals' self-construal can affect his or her emotions and behaviors in social media use (Chang, 2015). Relational self-construal is a specific classification of self-construal wherein individuals construct themselves according to their relationship with other people deemed more important than themselves (Li et al., 2014). Specifically, individuals with a high level of relational self-construal tend to overly consider other people's feelings and pay excessive attention to relationship maintenance (Nazir and Maya, 2019). They are more sensitive to interpersonal relationships, and they are eager to avoid less favorable evaluation, striving instead for group praise, and acceptance (Liu and Gu, 2015). These individuals believe that missing key information may lead to exclusion from the group. Therefore, in interpersonal communication, these individuals will often pay continuous attention to the latest status of others as well as their own evaluation, and for them, the discomfort caused by missing information is intensified. It can be seen that interpersonal sensitivity has a stronger effect on the fear of missing out for people with higher levels of relational self-construal. On the other hand, individuals with higher levels of relational self-construal are relatively independent and tend to consider their own interests rather than focusing too much on others. They are more likely to take the initiative to avoid spurious interpersonal communication in an attempt to protect themselves from negative evaluation. They do not feel compelled to dwell on other people's emotions and dynamics simply to integrate into the group, and the anxiety and fear caused by missing information are significantly reduced. It can be seen that the effect of interpersonal sensitivity on the fear of missing out may be weakened for people with lower levels of relational self-construal. This study, then, proposes

> *Hypothesis* 3: Relational self-construal may play a key role in the relationship between interpersonal sensitivity and the fear of missing out. When an individual in question is a person with a high level of relational self-construal, the influence of interpersonal sensitivity on the fear of missing out is enhanced.

Hypotheses 2 and 3 further support the model with regard to a moderated mediation effect. For individuals with a high level of relational self-construal, interpersonal sensitivity will lead to anxiety due to the fear of missing out on the latest news and messages in mobile media. This anxiety then leads to mobile phone addiction. For individuals with a low level of relational self-construal, interpersonal sensitivity has less of an effect on the fear of missing out, and thus, it is less likely to induce mobile phone addiction. As Nazir and Maya (2019) have shown, individuals with high levels of independent self-construal are more individualistic. They distance themselves from others so they are less dependent on social media, so for them, the risk of mobile phone addiction is lower. This study, therefore, proposes

> *Hypothesis* 4: Relational self-construal moderates the mediating effect of the fear of missing out between interpersonal sensitivity and mobile phone addiction. This means that the higher the level of relational self-construal, the stronger the mediating effect of the fear of missing out. By contrast, the lower the level of relational self-construal, the weaker the mediating effect. The research model is shown in **Figure 1**.

MATERIALS AND METHODS

Sample

This study randomly selected students as the research sample from six universities in Hangzhou, China, and distributed 881 questionnaires. To avoid the influence of smart-phone usage

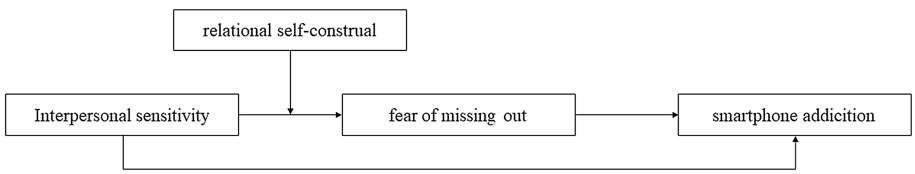

FIGURE 1 | Research model.

on the process and results of our data collection, we chose to distribute only paper-based questionnaires rather than online questionnaires. All the questionnaires were distributed and collected with our research team consisting of one professor, one lecturer, one PhD student, and five graduate students. In order to avoid homologous errors and improve data reliability, questionnaires were sent out at two different points in time. We identify the two distribution times as T1 and T2, and there was an interval of 2 weeks between the two distributions. At T1, students were required to answer questions relating to interpersonal sensitivity, relational self-construal, and the fear of missing out. Two weeks later, at T2, the same group of students was required to answer questions relating to smartphone use and addiction. After eliminating invalid questionnaires, 863 valid questionnaires were obtained representing an effective rate of 97.95%. Participants in this survey ranged from freshmen to seniors with an age range between 17 and 23. The average age of participants was 20.93 years old. This study involved 510 female students and 353 male students, and our sample included 591 liberal arts students, 242 science and engineering students, and 30 art students. In addition, since this study was carried out in China with Chinese students involved, hence, all materials, including all scales were adapted to Chinese language.

Data Collection Instruments

This study used a five-point Likert-type scale, with responses ranging from "not applicable," coded as 1, to "always," coded as 5.

The Interpersonal Sensitivity Measure

The 36-item Interpersonal Sensitivity Measure (IPSM) developed by Boyce and Parker (1989) was used, which included five structural dimensions: "interpersonal awareness," "needs for approval," "separation anxiety," "timidity," and "fragile inner-self." The higher the total score, the stronger the interpersonal sensitivity is for an individual. In this study, the Cronbach α coefficient of this scale is 0.86, and the α coefficients of the five dimensions range from 0.61 to 0.73.

The revision process of the Chinese version of IPSM is as follows. First, two university teachers majoring in psychology independently translated the scale into Chinese, and the first draft of the scale is formed through repeated discussion and modification. Then, two university teachers majoring in English were invited to translate and revise the Chinese version of the scale. Finally, each item of the scale was discussed by graduate students majoring in psychology to ensure that the wording of each item conforms to the rules of expression in Chinese.

The Smartphone Addiction Scale for College Students

The 22-item smartphone addiction scale for college students (SAS-C) developed by Su et al. (2014) was used, including six structural dimensions: "withdrawal behavior," "salience behavior," "social comfort," "negative effects," "use of application (app)," and "renewal of app." According to the criteria proposed by Cao (2018), the individual is regarded as non-addictive to smartphone use when the total score is less than or equal to 65 and is considered as addictive to smartphone use when the total score is more than or equal to 66. The higher the individual total score, the higher the level of smartphone addiction. In this study, the Cronbach α coefficient of the scale is 0.87, and the α coefficients of the six dimensions range from 0.62 to 0.83.

The Fear of Missing Out Scale

This study used the 10-item Fear of Missing Out Scale developed by Przybylski et al. (2013). With this scale, the higher the score, the higher the level of fear of missing out. In order to adapt this scale to the specific scenario in China, we drew on the previous studies (Ma and Liu, 2019) and set the background of fear of missing out as "WeChat, QQ space, or Microblog (the three most popular social media most frequently used by youngsters in China)." We used question items, such as "when I had a good time, it is important for me to share details through social networking sites (such as circle of friends in WeChat, QQ space, or Microblog)." In this study, the Cronbach α coefficient of the scale was 0.79.

The Relational Self-Construal Scale

The 9-item relational self-construal scale revised by Huang (2012) was used to measure and identify the degree of self-definition according to intimate others. The higher the score, the higher the level of relational self-construal. This scale was originally developed by Cross et al. (2000). After revision, questions eight and nine with a correlation of less than 0.40 in Chinese context were removed. The scale has good reliability and validity in existing studies and is suitable for research in the field of pedagogy and Psychology (Li et al., 2018a). In this study, the Cronbach α coefficient of the scale was 0.83.

Testing Procedure and Data Processing

In this study, trained students majoring in psychology were selected to conduct the survey, using a unified procedure for group testing with questionnaires collected on the spot. SPSS 24.0 and Amos 26.0 were used for data analysis and testing. Meanwhile, the Bootstrap method *via* the SPSS macro program PROCESS V3.3 was applied to test the mediating effect, so as to test the significance level of the intermediary path within the 95% confidence interval. Also included in the statistical analysis as control variables are the gender, average time of using smartphone, grade, major, only-child in the family or not, parenting style (spoiling type, indulgent type, or democratic type), and growth environment (main caregivers in the growth process: parents, grandparents, or other relatives; attending boarding school or with no caregiver around). Respondents were required to choose one of the types of each control variable; for example, they were asked to select one of the parenting styles from the choices of "spoiling type, indulgent type, and democratic type" in the questionnaires.

DATA ANALYSIS AND RESULTS

Confirmatory Factor Analysis

The Harman single-factor test was used to test common method deviation (Podsakoff et al., 2003). The results revealed the mutation rate interpretation of the first factor was 16.68%, which was less than the critical value of 40%, indicating that there was no obvious deviation of the common method in this study.

We compared our hypothesized model (i.e., model 4, the baseline four-factor model) with a three-factor models (i.e., model 3, combining interpersonal sensitivity and fear of missing out), a two-factor model (i.e., model 2 combining interpersonal sensitivity and fear of missing out and combining smartphone addiction and relational self-construction), and a one-factor model combining all items (i.e., model 1; **Table 1**). Considering the changes in chi-square (i.e., χ^2), two major fit indicators [i.e., comparative fit index (CFI) and incremental fit index (IFI)], and root mean square error of approximation (RMSEA), our hypothesized four-factor model (with χ^2/df =1.79, IFI = 0.91, CFI = 0.91, and RMSEA = 0.03) showed better fit than other alternative models (Bentler and Bonett, 1980; Bagozzi et al., 1991). Therefore, the discriminant validity of the constructs was confirmed. This suggests that the participants of our survey could distinguish the focal constructs clearly.

Descriptive Statistics and Correlation Analysis

The mean value, standard deviations, Cronbach's alpha, and correlation coefficient of the variables are shown in **Table 2**. Correlation analysis showed that interpersonal sensitivity is significantly positively correlated with smartphone addiction (r = 0.49, p < 0.01) and fear of missing out (r = 0.56, p < 0.01), and fear of missing out is significantly positively correlated with smartphone addiction (r = 0.45, p < 0.01). Thus, these results preliminarily support the subsequent regression analysis.

Hypotheses Testing

Model 4 (a simple mediation model) in the SPSS expansion macro PROCESS prepared by Hayes (2012, unpublished) was used to test the mediation effect of fear of missing out on the relationship between interpersonal sensitivity and smartphone addiction. Interpersonal sensitivity was a significant predictor of smartphone addiction [β = 0.48, SE=0.03, p < 0.001, (CI) = (0.40, 0.58)], thus supporting Hypothesis 1. Results of the bootstrapping test [β = 0.24, SE = 0.02, p < 0.001, (CI) = (0.13, 0.25)] supported that CI did not contain zero. Therefore, fear of missing out plays a partial mediating role in the relationship between interpersonal sensitivity and smartphone addiction. The direct (0.49) and mediated (0.19) prediction effects accounted for 72.56 and 27.94% of the overall effect, respectively. These results lend support to our Hypothesis 2.

In the second step, we employed Model 7 in the SPSS extension macro, and the moderated mediation model was tested. As shown in **Table 3**, after inputting relational self-construction into the model, the interaction between interpersonal sensitivity and relational self-construction was a significant predictor of fear of missing out (Interpersonal sensitivity × Relational self-construction: β = 0.04, SE = 0.02, p < 0.01), indicating that relational self-construction moderated the relationship between interpersonal sensitivity and fear of missing out (Model 1).

In addition, we plotted the interaction effects at different levels (i.e., +1 SD or −1 SD) of relational self-construction using the recommendation of Aiken and West (1991). **Figure 2** shows that interpersonal sensitivity is more positively related to fear of missing out when relational self-construction is high rather than low. Accordingly, the moderating effect of relational self-construction on the interpersonal sensitivity–fear of missing out association is as expected, and thus, Hypothesis 3 is supported.

We further estimated the conditional indirect effect of interpersonal sensitivity on smartphone addiction *via* fear of missing out across levels of relational self-construction by bootstrapping the bias-corrected CI. The results are presented in **Table 4**. The indirect effect of interpersonal sensitivity on smartphone addiction through fear of missing out was stronger and significant at a high level of relational self-construction (effect size = 0.19, 95% bias-corrected CI from 0.13 to 0.25) but was weaker at a low level of relational self-construction (effect size = 0.16, 95% bias-corrected CI from 0.10 to 0.21). Thus, we have further evidence to support our Hypothesis 4.

DISCUSSION

First of all, the results show that interpersonal sensitivity has a significant and positive impact on smartphone addiction. This is because interpersonally sensitive people overreact to negative evaluation and social rejection and will take defensive

TABLE 1 | Results of confirmatory factor analysis of the measurement models.

Measurement models	χ^2	df	χ^2/df	RMSEA	IFI	CFI
Model 1: One-factor (combined all items into one factor)	6466.80	2,536	2.55	0.04	0.82	0.82
Model 2: Two-factor (combined IS and FMO into one factor and combined SA and RSC into one factor)	5957.25	2,535	2.35	0.04	0.84	0.84
Model 3: Three-factor (combined IS and FMO into one factor)	5015.34	2,533	1.98	0.03	0.89	0.89
Model 4: Four-factor	4528.70	2,530	1.79	0.03	0.91	0.91

IS, interpersonal sensitivity; FMO, fear of missing out; SA, smartphone addiction; and RSC, relational self-construction.

TABLE 2 | Descriptive statistics and correlation analysis.

S. No.	Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11
1.	Gender	1.71	0.46											
2.	Time	3.15	0.71	0.06										
3.	Grade	1.94	1.12	−0.03	0.09**									
4.	Major	1.35	0.54	−0.20**	−0.01	0.08*								
5.	If the one-child	1.53	0.50	0.08*	0.06	−0.13**	−0.02							
6.	Parenting style	2.80	0.67	−0.01	0.12*	0.01	−0.03	−0.04						
7.	Growth environment	1.14	0.44	−0.11**	0.00	0.02	0.07	0.15**	−0.18**					
8.	Smartphone addiction	2.85	0.55	0.02	0.26**	0.07*	−0.08*	0.01	−0.02	−0.02	(0.87)			
9.	Interpersonal sensitivity	3.21	0.39	0.04	0.07	−0.01	−0.07	0.01	−0.05	0.02	0.49**	(0.86)		
10.	Fear of missing out	2.97	0.59	0.06	0.09**	−0.01	−0.08*	0.00	0.00	−0.05	0.45**	0.56**	(0.79)	
11.	Relational self-construction	3.64	0.53	0.08*	0.02	0.03	−0.07*	0.01	−0.02	−0.02	0.14**	0.39**	0.31**	(0.83)

*$p < 0.05$; **$p < 0.01$. *M*, mean; *SD*, standard deviation.

FIGURE 2 | Schematic diagram of interaction effect (fear of missing out).

and remedial measures quickly once they feel alienated from their surrounding interpersonal relationships (Marin and Miller, 2013). For example, WeChat, as the most widely used social media application in China, can help people with interpersonal sensitivity follow the latest activities and status of people around them as well as the comments made on their own WeChat updates. In addition, due to the portability, anonymity, and vast choice of applications on smartphones, interpersonally sensitive individuals will make up for the dissatisfaction in their real social life by using various social media applications on smartphones. This also further supports the previous research results, namely, that individuals with interpersonal sensitivity are more likely to have a variety of addictive behaviors (Taymur et al., 2016; You et al., 2019).

Secondly, based on the compensatory Internet use theory, this study confirms that the fear of missing out plays a partial mediating role between interpersonal sensitivity and smartphone addiction and clarifies the internal influence mechanism of interpersonal sensitivity on smartphone addiction. This is consistent with the findings of the previous studies which suggest that interpersonal sensitivity can lead to social anxiety (Kumari et al., 2012), and the level of anxiety related to the fear of missing out is positively correlated with social media dependence (Oberst et al., 2017). Because of the constant attention paid to the dynamic of other people and the surroundings, individuals with interpersonal sensitivity are prone to the fear of missing new updates, which can be understood as a kind of generalized anxiety. In addition, it is this kind of anxiety that further aggravates their dependence on smartphone use, which leads to smartphone addiction. However, the fear of missing out only partially mediates the relationship between interpersonal sensitivity and smartphone addiction, which means that additional interference may be present. Therefore, future research can further explore the potential influence mechanism on the basis of this study.

TABLE 3 | Moderated mediation effect analysis.

	Model 1 (criterion: fear of missing out)				Model 2 (criterion: smartphone addiction)			
	β	*SE*	*p*	95% CI	*β*	*SE*	*p*	95% CI
Control variables								
Gender	0.03	0.06	0.61	[−0.09, 0.16]	−0.07	0.06	0.29	[−0.19, 0.06]
Time	0.08*	0.04	0.05	[0.00, 0.16]	0.30**	0.04	0.00	[0.22, 0.38]
Grade	−0.02	0.03	0.42	[−0.07, 0.16]	0.05*	0.03	0.04	[0.00, 0.10]
Major	−0.05	0.05	0.36	[−0.15, 0.06]	−0.07	0.05	0.17	[−0.18, 0.03]
If the one-child	−0.02	0.06	0.75	[−0.13, 0.09]	0.02	0.06	0.72	[−0.10, 0.13]
Parenting style	0.05	0.04	0.26	[−0.04, 0.13]	0.03	0.04	0.41	[−0.04, 0.12]
Growth environment	−0.09	0.07	0.17	[−0.22, 0.04]	−0.02	0.07	0.71	[−0.15, 0.10]
Independent variable								
Interpersonal sensitivity	0.51**	0.03	0.00	[45, 0.57]	0.35**		0.00	[0.28, 0.41]
Mediator								
Fear of missing out					0.24**		0.00	[0.17, 0.30]
Moderator								
Relational self-construction	0.13**	0.03	0.00	[06, 0.18]				
Interaction term								
Interpersonal sensitivity × Relational self-construction	0.04*	0.02	0.03	[01, 0.08]				
R^2			0.33				0.34	
F			42.76**				48.63**	

*$p < 0.05$; **$p < 0.01$.

TABLE 4 | Results for conditional indirect effect across levels of relational self-construction.

Level	Effect size	Boot *SE*	LL 95% CI	UL 95% CI
M−*SD*	0.16	0.03	0.10	0.21
M	0.17	0.03	0.12	0.23
M+*SD*	0.19	0.03	0.13	0.25

Furthermore, this study also found that relational self-construal positively moderates the relationship between interpersonal sensitivity and the fear of missing out. This is because individuals with high levels of relational self-construal define themselves according to specific intimate relationships which lead to changes in self-related cognition (Chang, 2015). Individuals with high levels of relational self-construal pay excessive attention to the feelings of the relatives and friends around them and tend to overtly consider and be affected by the ideas of others. Expecting to form good interpersonal relationships around them, they constantly pay attention to the dynamics of their friends, the fear of missing out on any information about their friends, and worrying about the negative comments of others (Li et al., 2018b). Under the moderation of a high level of relational self-construal, individuals with interpersonal sensitivity will pay close attention to the emotional changes, comments, and activities of the people around them, so they have a higher level of fear of missing out. On the other hand, if the interpersonally sensitive individual holds a lower level of relational self-construal, his or her self-concept will be more stable, so he or she tends to be immersed in his or her own world and has less consideration toward the interaction with others. In such a case, he or she will not have a higher level of fear of missing out and may choose social avoidance to keep away from the emotional changes brought about by interpersonal sensitivity. This avoidance behavior serves to relieve his or her own state of tension.

Finally, the results show that relational self-construal positively moderates the mediating role of the fear of missing out between interpersonal sensitivity and smartphone addiction, a conclusion supported by testing the model. Specifically, compared with individuals with a lower level of relational self-construal, those with a higher level of relational self-construal are more worried about being negatively evaluated by others and more afraid of missing the latest news of others and are therefore more prone to smartphone addiction. This results also support the research findings of the previous studies (Cetin et al., 2012).

From the perspective of interpersonal sensitivity and the fear of missing out, this study explored the influence of these two variables on smartphone addiction. The results not only provide a new research angle for future case analysis of smartphone addiction, but also offer a theoretical basis for the practice of psychotherapy and intervention of smartphone addiction. In recent years, practitioners have begun to pay close attention to the problem of smartphone addiction and actively explore corresponding solutions. For example, the South Korean government has set up special training camps for smartphone addicts, prohibiting addicts from using smartphones for a period of 12 days. The mayor of Bandung city in Indonesia initiated a program in which students were given baby chicks and were then trained to raise them in an attempt to redirect their interest and focus and reduce their dependence on

electronic devices. In subsequent procedures relating to clinical intervention, therapists can first solve the problem of interpersonal sensitivity of addicted individuals or alleviate their fear of missing out, and then treat their addictive behaviors accordingly. In practice, colleges and universities should further improve their psychological counseling systems, establish educational programs to correct key cognitive beliefs, and address emotional and behavioral reactions of students with smartphone addiction in interpersonal situations. This will help to reduce the investment of psychological resources into their interpersonal relationships. For students with relatively higher levels of interpersonal sensitivity, this study suggests that intervention through games, group discussions, role play, and other measures may be beneficial. Psychological intervention measures, such as the method of mindfulness, cognitive therapy, and aversion therapy, can be applied to make college students realize the harm of smartphone addiction and then produce aversive reactions to smartphone addiction, so as to reduce or eliminate the behaviors or state related to smartphone addiction (Zhu, 2014).

While there may be some shortcomings in this study, we believe the results are significant and provide a solid basis upon which future research can be based. The limitation may due to the fact that this study only involved college students in Hangzhou, China in the research sample, which could impact the universality of the survey. Future research should consider a much wider geographic sampling area. Secondly, although this study has partially revised the questionnaire related to the fear of missing out and interpersonal sensitivity, the localization of these two concepts still needs to be further explored in future research. Lastly, this study only used methods involving questionnaire-based surveys with self-report scales, while further experimental research is expected to be conducted through more comprehensive data sampling and collection across longer periods of time and employing more sampling events. Expanding this research will provide a better understanding of the dynamics, causations, and correlations relating to the causal relationships and mediating mechanisms between variables.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval were not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

LL is responsible for the overall development of this study, including the selection of research angle, research dimensions, the planning of sample collection, data analysis and proofreading, and polishing of the whole paper. XW is in charge of the formulation of the general research topic, the construction of the research framework, and the proposing of the theoretical hypothesis. QL generally contributes to the construction of the theoretical framework based on the in-depth accumulation of a large volume of the literature reading and analysis. BX and PC are in charge of data collection and analysis of this study. WW is responsible for all the procedures taken during data collection. All authors contributed to the article and approved the submitted version.

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BRIEF RESEARCH REPORT
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The Relationship Between Affective and Obsessive-Compulsive Symptoms in Internet Use Disorder

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We investigated the relationships and diagnostic power of symptoms associated with affective disorders, obsessive-compulsive disorder, and drug addictions on Internet use disorder. Moreover, we tested whether Internet use disorder is characterized by a specific network of symptoms. One-hundred-and-four young adults (78 women) were assessed in laboratory using self-report measures of Internet addiction, alcohol use disorder, cannabis abuse, depression, anxiety, and stress symptoms, impulsiveness, and obsessive-compulsive symptoms. Only hoarding, obsessing, and depression symptoms were positively linked to Internet use disorder severity, with hoarding having greater power and accuracy than other obsessive-compulsive and affective symptoms. Only individuals with mild-moderate Internet use disorder were characterized by a network of strong and positive associations of affective and obsessive-compulsive symptoms. These findings may encourage future longitudinal studies aimed at identifying potential clinical criteria for the diagnosis of Internet use disorder and treatment targets.

Keywords: Internet use disorder, Internet addiction, obsessive-compulsive symptoms, depression, anxiety, diagnostic criteria, behavioral addiction, hoarding

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INTRODUCTION

Despite the growing number of studies on Internet use disorder (IUD), there is not yet an agreement on the conceptualization of Internet-related problematic behaviors. Of note, only Internet gaming disorder (IGD), one of the sub-types of IUD, has been recently included in the research appendix of the fifth edition of the DSM (DSM-5, American Psychiatric Association, 2013), however, the DSM-5 itself noted that more studies are needed, both in the context of IGD as well as more general IUD, to confirm and/or update the proposed criteria.

Given these issues and the current absence of IUD in any official classification of mental disorders, in the present work we endorse one of the most recent definitions of IUD, i.e., a condition involving excessive or poorly controlled urges and behaviors relating to Internet use that lead to subjective distress and/or interference in major areas of life functioning. It is a heterogeneous construct that may include a multitude of features relating to sexual, social networking, and gaming behaviors (Banz et al., 2016). Considering the negative consequences of IUD on affected individuals' life and their relevance for public health, identifying the diagnostic criteria for IUD should be one of the main aims of research in this field to improve reliability across studies and to develop effective treatment approaches and prevention measures (Kuss and Lopez-Fernandez, 2016).

To identify and conceptualize diagnostic criteria for IUD, several studies assessed specific psychological characteristics of individuals with IUD (e.g., Peterka-Bonetta et al., 2019). Among these studies, it has been mainly reported that individuals with IUD are more likely to have

symptoms related to the *affective* and *impulsive-compulsive domains*, and *substance addictions* (e.g., Anderson et al., 2017; Bernal-Ruiz et al., 2017). The interaction between low mood regulation and high stress reactivity (*affective domain*) and high impulsivity/poor inhibitory control (*impulsive-compulsive domain*) has been suggested to be a key aspect of both behavioral addiction and IUD. Specifically, studies that investigated *affective domain*-related alterations in IUD found that individuals who are highly responsive to stressors and employ impulsive coping strategies would be more inclined to use the Internet for mood regulation. Indeed, they seem to hold false beliefs about the power of the Internet to regulate their negative mood (Brand et al., 2019). Similarly, studies that investigated the *impulsive-compulsive domain*-related alterations in IUD found that impulsivity levels are positively associated with- or are predictive of IUD (e.g., Shokri et al., 2017), suggesting that impulsivity may be a core personality trait in problematic Internet users. An association between IUD and obsessive-compulsive symptoms has been also observed (e.g., Stavropoulos et al., 2016). Interestingly, it has been argued that individuals with IUD would be characterized by alterations of reward-related processing and behaviors that would lead to the co-occurrence of symptoms associated with obsessive-compulsive disorder (OCD) and substance addictions (Brand et al., 2019). Studies that investigated the relationship between *substance addiction* and IUD found that adolescents with IUD are more likely to use substances and, among substance abuse, problematic alcohol use has been suggested to share similar characteristics and predictors with IUD (Gámez-Guadix et al., 2015). Similarly, a link between IUD and cannabis use has been found, with most studies reporting small to medium positive associations between IUD and cannabis use (Lanthier-Labonté et al., 2020).

To the best of our knowledge, only a few studies to date have investigated together the potential links between IUD and alterations related to the *affective and impulsive-compulsive domains*. Specifically, it has been suggested that young people with obsessive-compulsive symptoms could become excessive Internet users to modulate affective symptoms (Bernal-Ruiz et al., 2017). However, associations between IUD, alterations related to the *affective domain,* that may drive problematic Internet use behaviors, and the *impulsive-compulsive domain*, that may hinder inhibition of that behaviors should be further explored, together with *substance abuse*, that may co-occur with, and be a risk factor for, IUD. To address this gap, a comprehensive model involving alterations in the *affective domain* (depression, anxiety, stress symptoms), in the *impulsive-compulsive domain* (impulsivity and OCD-related symptoms), and the *abuse of substances* (alcohol and cannabis abuse) is presented and tested as a preliminary study that may encourage future longitudinal investigations. Moreover, to our knowledge, this is the first study to explore the existence of a specific network of relationships between alterations related to *affective* and *impulsive-compulsive domains* and *substance abuse* in individuals with IUD.

The goals of this preliminary study were: (i) to investigate in a comprehensive model the link between IUD and depression, anxiety, and stress (*affective domain* variables), impulsivity and obsessive-compulsive symptoms (*impulsive-compulsive* domain variables), and alcohol and cannabis abuse (*substance abuse* variables); (ii) to explore the efficiency of *affective domain, impulsive-compulsive domain*, and *substance abuse* variables in discerning individuals with IUD-related problems from controls; (iii) to examine whether a specific network of associations among these variables characterizes individuals with IUD-related problems vs controls. The following hypotheses were formulated: (i) *affective domain*, *impulsive-compulsive domain*, and *substance abuse* variables would each be positively linked to IUD severity; (ii) because the efficiency of study variables to discern groups was an empirical question to be answered by this study, we did not make specific predictions regarding how well each variable would discern individuals with IUD-related problems from controls; (iii) individuals with IUD-related problems would be characterized by positive stronger intercorrelations between *affective domain*, *impulsive-compulsive domain*, and *substance abuse* variables than controls.

METHODS

Participants

Participants were recruited via online and offline advertising. To be eligible for inclusion in the study, participants were required to be aged 18–30 years, to be Internet users, and to have no history of current or prior use of psychiatric medication (e.g., antipsychotics, antidepressants, mood stabilizers). Those who met the inclusion criteria and accepted to participate in the study were administered a paper-and-pencil version of the Italian versions of the Internet Addiction Test (Ferraro et al., 2007), the Depression Anxiety-Stress Scales (Bottesi et al., 2015), the Barratt Impulsiveness Scale (Fossati et al., 2001), the Obsessive-Compulsive Inventory-Revised (Sica et al., 2009), the Alcohol Use Disorders Identification Test (Addolorato et al., 1999), and the Cannabis Abuse Screening Test (Bastiani et al., 2013). More details about the recruitment process are reported in **Figure 1**.

Given that the present study is the first to describe in a single model the relationships of *affective domain*, *impulsive-compulsive domain*, and *substance abuse* variables with IUD severity, there was no related effect size to choose from for formal power analysis. The present study has been conducted as a first hypothesis testing and should be used to design larger confirmatory studies.

A total sample of 104 young adults ($F = 78$, mean age = 23.21 $\pm$ 2.97, mean years of education = 16.76 $\pm$ 2.11) participated in this study and, based on their Internet Addiction Test scores, 70 participants were classified as control group ($F = 54$, mean Internet Addiction Test score = 34.69 $\pm$ 7.30, mean age = 23.13 $\pm$ 2.89, mean years of education = 16.79 $\pm$ 2.21, sleep hours = 7.27 $\pm$ 0.71, daily cigarettes consumption = 1.73 $\pm$ 3.49), and 34 as individuals with mild to moderate IUD ($F = 24$, mean Internet Addiction Test score = 57.68 $\pm$ 7.00, mean age = 23.38 $\pm$ 3.17, mean years of education = 16.71 $\pm$ 1.90, sleep hours = 7.15 $\pm$ 0.80, daily cigarettes consumption = 1.97 $\pm$ 4.03). Internet Addiction Test scores among individuals with mild-moderate IUD were significantly higher than among those in the control group ($t = 15.3$, $p < 0.001$). No differences between

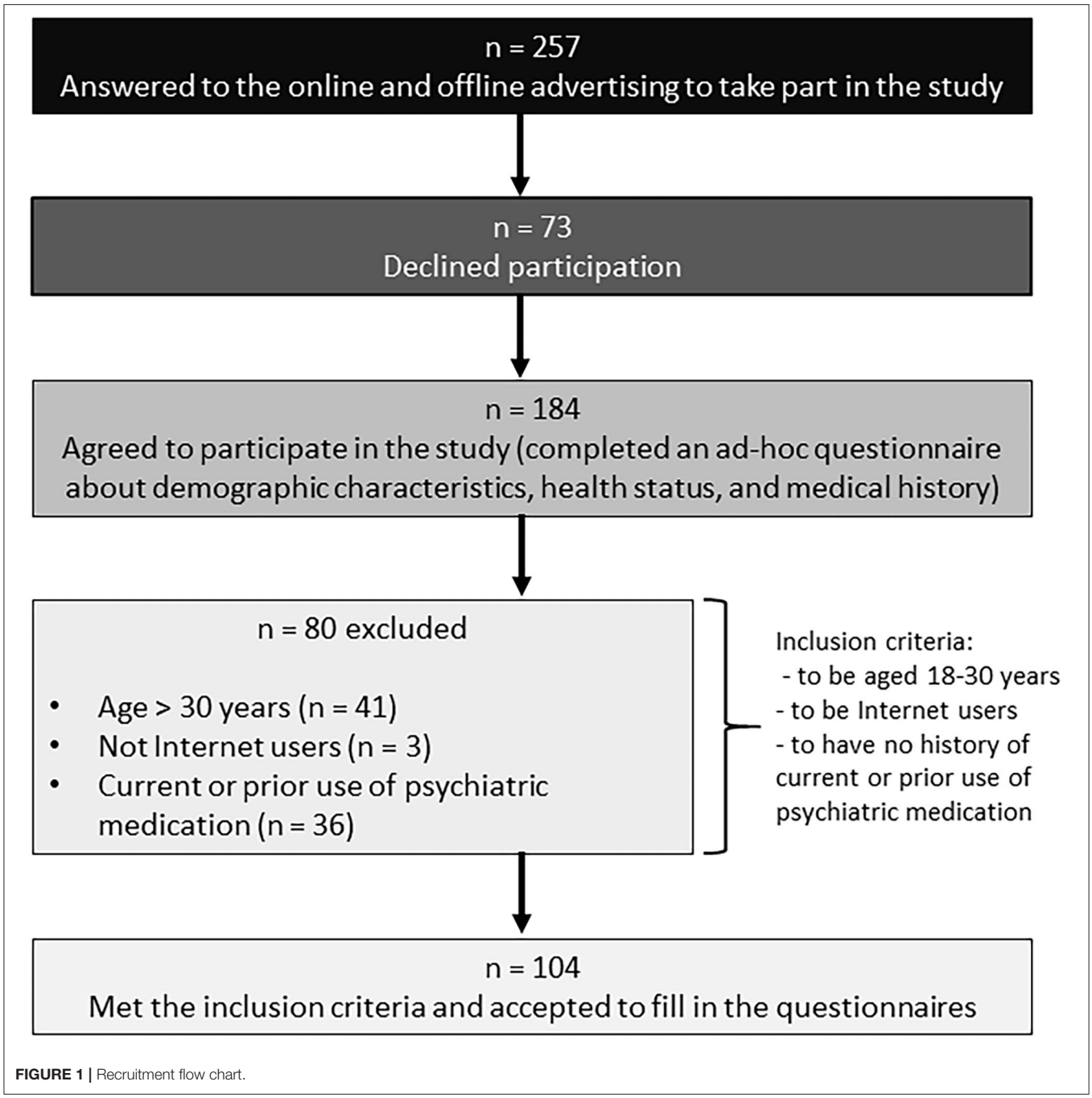

FIGURE 1 | Recruitment flow chart.

groups were found for age, sex, years of education, sleep hours, and cigarette consumption.

The present study was carried out with the adequate understanding and written consent of the participants in accordance with the Declaration of Helsinki. The study was approved by the local Ethics Committee.

Self-Report Measures

The Internet Addiction Test (IAT; Young, 1998; Italian version by Ferraro et al., 2007) was used to assess IUD severity, i.e., the extent to which Internet use affects social and individual quality of life, career, and time control, and excitatory/compensatory usage of the Internet. The score range is 20–100. Considering the Italian cut-off scores (Poli and Agrimi, 2012), Internet usage is defined as non-problematic (scores 20–50), mild to moderate problematic (scores 50–80), and severe problematic (scores 80–100). The reliability of the Italian version is good ($\alpha = 0.83$), for this study it was $\alpha = 0.84$.

The Depression Anxiety-Stress Scales (DASS-21; Lovibond and Lovibond, 1995; Italian version by Bottesi et al., 2015) is a

21-item self-report that assesses general distress through three separate subscales (i.e., anxiety, depression, and stress). Scores are considered clinically significant when equal to or over 5 for the depression subscale, equal to or over 4 for the anxiety subscale, and equal to or over 8 for the stress scale (Henry and Crawford, 2005). The reliability of the Italian version is $\alpha = 0.85$. For this study, the reliability was $\alpha = 0.92$.

The Barratt Impulsiveness Scale (BIS-11; Patton et al., 1995; Italian version by Fossati et al., 2001) was administered to assess impulsivity. It is a 30-item self-report, with scores ranging from 30 to 120. The higher the score, the higher the impulsiveness level. The reliability of the Italian version is $\alpha = 0.89$, in this study it was $\alpha = 0.75$.

The Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002; Italian version by Sica et al., 2009) was used to measure obsessive-compulsive symptoms. It is an 18-item self-report that provides separate scores on six subscales, i.e., washing, checking, ordering, obsessing, hoarding, and mental neutralizing, and a total score of Obsessive-Compulsive-related symptoms. Based on the cut-offs of the Italian version, scores in the range of 4–5 on the checking and ordering subscales indicate symptoms bordering on psychopathology that require clinical attention, while scores of 6 and above indicate the presence of clinically significant symptoms. Scores in the range of 3–4 on the washing subscale indicate symptoms bordering on psychopathology that require clinical attention, while scores of five and above indicate the presence of a clinically significant condition. As for the hoarding and the mental neutralizing subscales, scores greater than or equal to 6 and 3, respectively, indicate the presence of a clinically significant condition (Marchetti et al., 2010). The reliability of the Italian version is $\alpha = 0.85$, in this study it was $\alpha = 0.74$.

The Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993; Italian version by Addolorato et al., 1999) was used to assess the frequency and quantity of alcohol consumption. Scores range from 0 to 40, with higher scores indicating more problematic alcohol use. Based on Italian cut-offs, a score of 8–12 represents a medium level of alcohol-related problems, whereas scores of 13 and above represent a high level of alcohol-related problems. The Italian version showed good reliability. For this study, the reliability was $\alpha = 0.86$.

The Cannabis Abuse Screening Test (CAST; Legleye et al., 2011; Italian version by Bastiani et al., 2013) was administered to assess cannabis use with reference to the past 12 months. It is a seven-item self-report, with scores ranging from 0 to 24. Based on Italian cut-offs, scores of seven and above indicate problematic cannabis use. The reliability of the Italian version is $\alpha = 0.78$, for this study it was $\alpha = 0.86$.

Procedure

Upon arrival at the laboratory, participants signed an informed consent form and were asked to complete an *ad-hoc* questionnaire about their demographic characteristics, health status, and medical history, and the self-reports measuring IUD severity, impulsivity, anxiety/depression/stress, obsessive-compulsive symptoms, and use of alcohol and cannabis. The entire procedure took about 30 min.

Statistical Analysis

To study the relative statistical power of the associations of affective domain-, impulsive-compulsive domain-, and substance abuse-related variables with IUD severity, a multiple regression analysis was employed. The maximum likelihood method was employed to analyze the contribution of statistical predictors in explaining IUD severity, and effect sizes are reported in terms of partial Cohen's f^2. Multicollinearity was monitored by examining the variance inflation factor (VIF, Craney and Surles, 2002). In this study, the VIF indicated that multicollinearity was not a concern (Impulsivity, $VIF = 1.27$; Anxiety, $VIF = 2.33$; Depression, $VIF = 2.32$; Stress, $VIF = 2.37$; Washing, $VIF = 1.36$; Checking, $VIF = 2.12$; Ordering, $VIF = 1.85$; Obsessing, $VIF = 2.02$; Hoarding, $VIF = 1.86$; Mental neutralizing, $VIF = 1.36$; Alcohol abuse, $VIF = 1.30$; Cannabis abuse, $VIF = 1.20$). Moreover, before running the multiple regression analysis, data were examined for skewness, kurtosis, outliers, and normalcy. The normal Probability-Probability plot of the standardized residuals showed points that were not completely on the line, but close.

Given that the present preliminary study has been run on a convenience sample of 104 Italian young adults, the relative statistical power of the associations of affective domain-, impulsive-compulsive domain-, and substance abuse-related variables with IUD severity was also tested by a Bayesian approach, and the results are reported as Supplementary Material of the present manuscript (see **Supplementary Figure 1**).

Moreover, a receiver operating characteristic (ROC) analysis was conducted, and the area under the curve (AUC) was calculated as a measure of the accuracy of the diagnostic power of each study variable and each model. The larger the area, the more accurate the diagnostic power, with low AUC in the 0.50–0.70 range, moderate AUC in the 0.70–0.90 range, while an AUC over 0.90 indicates high accuracy (Pintea and Moldovan, 2009).

Intercorrelations among study variables within individuals with mild-moderate IUD and controls were visualized by a network plot (Csárdi and Nepusz, 2006). To test for differences between correlations higher than $r = 0.30$ in individuals with mild-moderate IUD and controls, the correlations were transformed into z-scores using Fisher's r-to-z transformation, and effect sizes were reported in terms of Cohen's q (Cohen, 1988).

All analyses were performed using R software (R Development Core Team, 2016).

RESULTS

Descriptive statistics and Pearson's correlations are reported in **Table 1**.

The multiple regression model including IUD severity as dependent variable and *affective domain-*, *impulsive-compulsive domain-* and *substance abuse*-related variables showed that only two *impulsive-compulsive domain* variables, i.e., hoarding and obsessing symptoms, and one *affective domain* variable, i.e., depression symptoms, were statistically significant predictors of IUD severity (Hoarding: $\beta = 0.37$, $p < 0.001$, *partial* $f^2 = 0.13$;

TABLE 1 | Descriptive statistics and Pearson's correlations in individuals with mild to moderate IUD and controls.

	Mean ± sd	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
Individuals with mild-moderate IUD (*n* = 34)													
1.Impulsivity	61.24 ± 8.63	1											
2.Anxiety	5.71 ± 3.93	0.32	1										
3.Depression	8.09 ± 5.62	0.19	**0.65**	1									
4.Stress	10.21 ± 4.75	0.15	**0.59**	**0.70**	1								
5.Washing	1.47 ± 1.81	0.00	0.17	0.07	0.10	1							
6.Checking	3.44 ± 3.74	0.06	**0.53**	**0.44**	**0.39**	**0.50**	1						
7.Ordering	4.50 ± 3.30	-0.15	0.14	0.19	0.26	**0.35**	**0.59**	1					
8.Obsessing	5.12 ± 3.33	0.20	**0.67**	**0.62**	**0.62**	**0.41**	0.33	0.22	1				
9.Hoarding	4.15 ± 2.82	0.23	0.32	0.25	**0.50**	0.25	**0.35**	0.30	**0.37**	1			
10.Mental neutralizing	1.71 ± 2.56	–0.14	0.18	0.26	0.27	**0.50**	0.26	0.28	**0.38**	–0.01	1		
11.Alcohol abuse	7.15 ± 4.55	0.32	–0.02	–0.06	–0.04	–0.19	–0.20	–0.07	–0.06	0.01	–0.01	1	
12.Cannabis abuse	1.24 ± 2.73	0.19	0.16	0.20	0.16	0.21	0.16	–0.25	0.25	–0.04	–0.05	0.18	1
Control group (*n* = 70)													
1.Impulsivity	57.91 ± 8.52	1											
2.Anxiety	2.91 ± 2.82	0.14	1										
3.Depression	4.54 ± 3.31	0.14	**0.48**	1									
4.Stress	7.69 ± 4.20	0.03	**0.64**	**0.57**	1								
5.Washing	0.91 ± 1.55	0.03	**0.29**	0.13	0.13	1							
6.Checking	1.76 ± 1.63	–0.21	0	–0.05	0.02	0.14	1						
7.Ordering	2.91 ± 2.47	–0.09	0.22	**0.26**	0.16	**0.26**	**0.48**	1					
8.Obsessing	2.51 ± 2.67	0.20	**0.30**	**0.29**	0.20	**0.32**	0.11	**0.23**	1				
9.Hoarding	1.84 ± 1.71	0.12	**0.27**	0.19	**0.27**	**0.30**	**0.40**	**0.26**	**0.30**	1			
10.Mental neutralizing	0.51 ± 1.48	0.04	0.13	0.07	0.12	0.01	0.12	0.24	**0.32**	0.10	1		
11.Alcohol abuse	5.61 ± 4.79	**0.27**	0.13	**0.27**	–0.01	0.19	0.06	0.10	0.22	**0.33**	0.14	1	
12.Cannabis abuse	0.63 ± 1.63	0.17	0.17	0.07	–0.02	0	–0.09	–0.07	–0.02	0.1	0.03	**0.33**	1

Bold indicates statistically significant correlations (p <0.05).

Obsessing: $\beta = 0.15$, $p = 0.01$, partial $f^2 = 0.02$; Depression symptoms: $\beta = 0.26$, $p < 0.02$, *partial* $f^2 = 0.05$). However, the effects of depression and obsessing symptoms were much smaller than those of hoarding symptoms. The regression model explained 40% of the variance ($R^2 = 0.40$).

When the accuracy of the diagnostic power of each study variable was tested, only hoarding ($AUC = 0.75$), obsessing ($AUC = 0.74$), and anxiety ($AUC = 0.72$) symptoms presented an AUC significantly different from 0.5 ($p = 0.009$, $p = 0.011$, and $p = 0.03$, respectively) and AUC > 0.70, indicating that these *impulsive-compulsive* and *affective domain* variables can distinguish between individuals with mild-moderate IUD and controls (see **Figure 2**).

In the correlation networks among individuals with mild-moderate IUD and controls, correlations were considered as meaningful when $p < 0.05$ and $r \geq |0.30|$ (Taylor, 1990, see **Figure 3**). The following correlations were stronger in individuals with mild-moderate IUD than controls: correlations between *affective* and *impulsive-compulsive domain* variables, stress and checking symptoms ($z = 1.80$, $p = 0.04$, Cohen's $q = 0.39$), stress and obsessing symptoms ($z = 2.40$, $p = 0.01$, Cohen's $q = 0.52$), anxiety and checking symptoms ($z = 2.72$, $p = 0.01$, Cohen's $q = 0.59$), anxiety and obsessing symptoms ($z = 2.31$, $p = 0.01$, Cohen's $q = 0.50$), depression and checking symptoms ($z = 1.94$, $p = 0.03$, Cohen's $q = 0.42$), depression and obsessing symptoms ($z = 1.96$, $p = 0.03$, Cohen's $q = 0.43$); and correlations between *impulsive-compulsive domain* variables, washing and checking symptoms ($z = 1.88$, $p = 0.03$, Cohen's $q = 0.41$), washing and mental neutralizing symptoms ($z = 2.48$, $p = 0.01$, Cohen's $q = 0.54$).

DISCUSSION

This study examined potential links between IUD and alterations related to the *affective domain*, the *impulsive-compulsive domain*, and *substance abuse*. As predicted, we found that two *impulsive-compulsive domain* variables, i.e., hoarding and obsessing symptoms, and one *affective domain* variable, i.e., depression symptoms, were positively linked to IUD severity, with hoarding having a higher power to statistically predict IUD severity and greater accuracy to discern individuals with IUD-related problems from controls. While several studies have focused on the relationship between OCD and IUD, this is the first study to our knowledge that investigated specific OCD dimensions in individuals with mild to moderate IUD. Hoarding has been previously reported to have a positive relationship with online/offline compulsive buying (Claes et al., 2016). Of

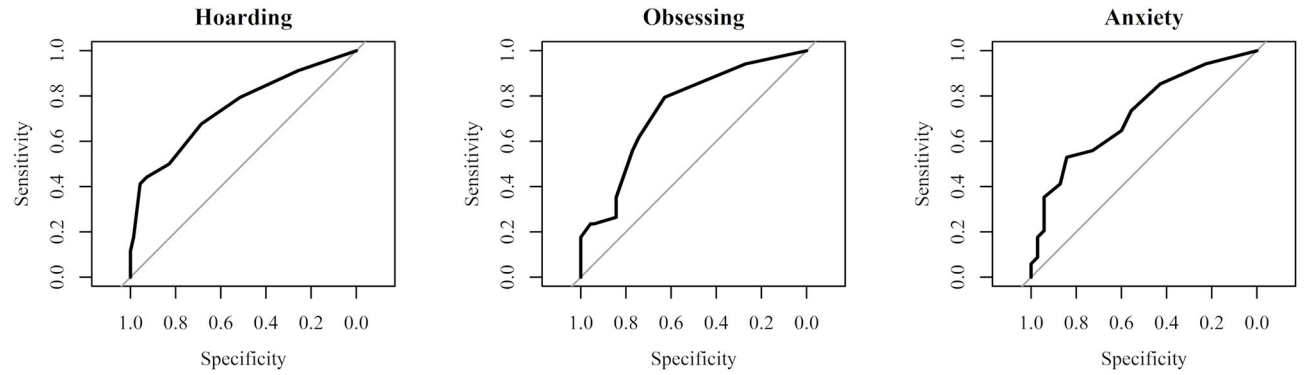

FIGURE 2 | Receiver Operating Characteristic (ROC) plots for hoarding, obsessing, and depression symptoms. Larger areas under the curve indicate better global performance of the variable in discriminating individuals with mild to moderate Internet Use Disorder (IUD) from controls.

note, despite Hoarding disorder is included among Obsessive-compulsive-related disorders (American Psychiatric Association, 2013), its appetitive aspects, e.g., the pleasure related to the inanimate objects to be hoarded, is thought to be more akin to behavioral addictions (Yap and Grisham, 2019). Moreover, similarly to behavioral addictions, hoarding seems to arise from the anticipation of pleasure and impaired self-regulation (Taylor et al., 2019). Quite recently, "digital hoarding" has been described as a subtype of hoarding disorder, characterized by the accumulation of digital information to the point of loss of perspective, eventually resulting in stress symptoms, with adverse consequences on the individual's functioning in daily life (van Bennekom et al., 2015). If hoarding or, more specifically, "digital hoarding," is one of the core elements that characterize IUD, and/or if it is a consequence of altered mechanisms that also determine IUD, should be determined given its potential relevance for the diagnosis of IUD. Our finding of a positive link between obsessing and IUD severity fits with previous studies that described obsessing as one of the main factors underlying IUD (Demetrovics et al., 2008). These findings are also similar to what is reported for IGD (Young, 2010), Substance Use Disorders (SUDs; Redish and Johnson, 2007), and sexual and food addiction (e.g., Pelchat, 2002), suggesting that obsessing might be a shared feature between IUD and other addictive behaviors. However, the Bayesian regression did not confirm a relationship between obsessing and IUD severity. Future larger confirmatory studies are needed to clarify this relationship.

Interestingly, among *affective domain*- and *substance abuse*-related variables, the compulsive component of the *impulsive-compulsive domain* seems to be strongly related to behavioral addictions (including IUD and other addictive behaviors), with neurobiological overlaps between SUDs, OCD, and behavioral addictions (Figee et al., 2016). However, evidence of shared dysfunctions in brain activity does not clarify whether these abnormalities are risk factors for IUD, or whether their onset is a consequence of IUD. Since the present study was cross-sectional, it does not allow discussing the results in terms of cause-effect relationships. However, it is noteworthy that a longitudinal study on the precursors and sequelae of IUD in Chinese people found that across several psychopathological symptoms, only OCD symptom levels were higher in Internet addicts than the norm values for Chinese people before these individuals developed Internet addiction. Therefore the Authors argued that OCD could be considered as a predictor for Internet addiction (Dong et al., 2011). Further longitudinal studies are needed to better characterize the timeline of symptom onset in IUD.

With regard to the relationship between IUD and alterations related to the *affective domain*, only depression was significantly positively linked to IUD severity, with a smaller effect size than hoarding. Moreover, anxiety showed a moderate accuracy to discern between individuals with mild to moderate IUD and controls. The associations between altered *affective domain* and IUD have been previously documented (e.g., Li et al., 2019), however, the association of IUD with the interaction between *affective*- and *impulsive-compulsive domain* has been less understood. Of note, while young people with social anxiety have been suggested to use the Internet as a means for interacting with others (i.e., positive reinforcer), young people with obsessive-compulsive symptoms would use the Internet excessively to modulate compulsive anxiety (negative reinforcer; Bernal-Ruiz et al., 2017). Future studies should further explore possible moderating roles of depression and anxiety in IUD as potentially useful variables in the context of clinical assessment and diagnosis formulation.

Overall, these findings suggest that IUD may be characterized by a pattern of symptoms resulting from a disturbance of networks and mechanisms underlying anxiety/mood disorders and OCD. Among such networks, the reward network might play a fundamental role. Functional alterations in the reward network are associated with addiction, depression, and OCD (Park et al., 2019). Similarly to behavioral addictions, it has been shown that both IUD and IGD are related to abnormalities in reward processing, inhibition, and impulse control (e.g., Brand et al., 2016), with increased reward sensitivity and sensitivity to punishment in individuals with IUD (Vargas et al., 2019). These speculations seem to be supported by the findings we obtained when exploring the possible patterns of relationships among *impulsive-compulsive domain, affective domain*, and *substance abuse* variables in the two groups. We found individuals with mild-moderate IUD to be characterized by a pattern of stronger

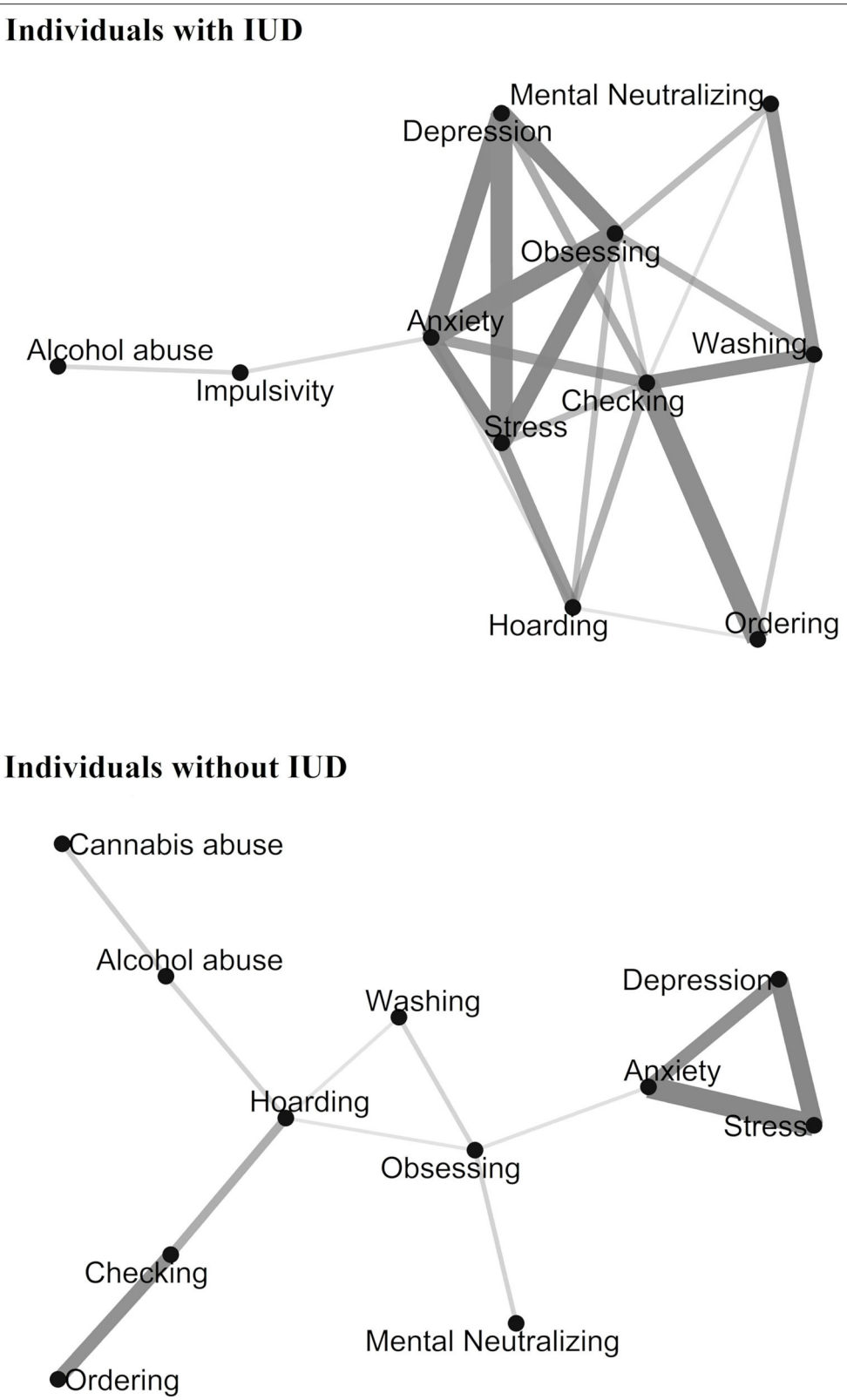

FIGURE 3 | Correlation network plot for individuals with mild to moderate Internet Use Disorder (IUD) and controls. Only Pearson's rs ≥ |0.30| were included. Variables that are more strongly correlated appear closer together and are connected by stronger paths. The proximity of the points is determined using multidimensional clustering.

and positive associations of *affective domain* variables with some OCD dimensions than controls. This finding supports the idea of a dysfunctional mechanism shared by altered *affective domain*, OCD, and IUD. Both OCD symptoms and mood disorders would share underlying psychopathological mechanisms, including aberrant activity in reward network/prefrontal-striatal/limbic circuits. As a consequence, maladaptive emotional and behavioral patterns would emerge, including IGD (Han et al., 2018), gambling (Potenza, 2013), and SUDs (Volkow et al., 2010).

Contrary to our expectations, we did not find the impulsivity component of the *impulsive-compulsive domain* to be positively linked to IUD severity. Similar results have been previously reported in some studies that assessed impulsivity in IUD (e.g., Lee et al., 2019). However, other studies have shown that individuals with IUD are characterized by high impulsivity/defective inhibitory control (e.g., Moretta et al., 2019; Moretta and Buodo, 2021). About inconsistent results on the role of impulsivity in IUD, it has been suggested that difficulties in inhibitory control may only emerge in IUD when prepotent responses must be inhibited in an emotional context. Emotional situations would impact behavioral control, with important consequences on effective impulse inhibition in the context of IUD (Moretta et al., 2019; Moretta and Buodo, 2021). We did not find any significant relationship between *substance abuse* variables and IUD severity. Despite the similarities between IUD and substance use disorders (SUDs) in the underlying psychobiological mechanisms, some neurobiological differences between addictions to substances as well as between IGD and SUDs have been extensively described (Park et al., 2017). It may be speculated that IUD shares core psychological and neurobiological aspects of psychostimulants use disorders rather than of Alcohol Use Disorder and Cannabis Use Disorder. Future studies should investigate similarities and differences between IUD and different SUDs.

Overall, our findings suggest that IUD is characterized by a network of interassociated psychopathological symptoms that may reflect a disturbance of mechanisms underlying OCD and affective disorders.

The present study has some important limitations. The first is the small sample size. A small sample size does not allow precise estimates and larger confirmatory studies are needed. Moreover, the sample of the present study was a convenience sample of young adults. Future studies with random sampling methods on other age ranges and cultural contexts are needed. Secondly, it was implemented using a cross-sectional design. This makes it difficult to infer cause-effect relationships between variables. Moreover, results from our exploratory analysis should be considered with caution since they are based on correlations. Third, participants were classified as having a mild to moderate IUD based on Internet Addiction Test scores, such that our sample may not be adequately representative of individuals with IUD. Fourth, we used self-report measures only. Future studies should address our research questions by including behavioral responses to disorder-related stimuli in conjunction with self-reported measures. Lastly, given that the present study is the first to describe the relative contribution of *affective domain*, *impulsive-compulsive domain*, and *substance abuse* variables to describe IUD severity, there was no related effect size to choose from for a formal power analysis. We believe that this study can be a starting point for considering alterations of *affective domain* and *impulsive-compulsive domain* in IUD for diagnostic and treatment purposes. Future studies are needed to further explore the relationships among these variables in IUD.

Despite these limitations, this study provides new insight into the characterization of IUD, which is the first step for a standardized diagnosis. A standardized and reliable diagnosis is a prerequisite for implementing effective treatments and prevention programs. Our findings may provide preliminary insight for the development of innovative prevention approaches that consider all the psychological aspects described in this study (i.e., *affective and impulsive-compulsive domains*, and *substance addictions*) and their reciprocal relationships. Reaching a consensus regarding the definition, clinical status, and assessment of IUD would upgrade prevention efforts targeting youth significantly, as it would allow the identification of factors that are critical in prevention and intervention programs.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Comitato Etico Della Ricerca Psicologica Area 17, Dipartimenti/Sezione di Psicologia, Università degli Studi di Padova, Padova (Italy), comitato.etico.area17@unipd.it. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

TM: conceptualization data curation, formal analysis, investigation, methodology, project administration, resources, software, visualization, and writing original draft. GB: conceptualization, methodology, resources, supervision, validation, visualization, and review and editing. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.700518/full#supplementary-material

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Development and Validation of the Teen Dating Aggression Measure Among Canadian Youth

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Teen dating violence (TDV) victimization is a traumatic experience that can have adverse consequences for adolescents. Current measures that assess TDV do not fully distinguish between psychological and relational forms of aggression, nor do they capture aggressive acts that are common within adolescent relationships. The purpose of this study was to evaluate the psychometric properties of the Teen Dating Aggression Measure (TeDAM) using a sample of 730 Canadian adolescents (M = 15.88 years, SD = 1.23). The measure is an expansion of the Conflict in Adolescent Dating Relationships Inventory and includes items that describe other forms of violence such as coercion and control, along with more traditional indicators of dating violence (e.g., sexual aggression). Factor analyses yielded three factors, namely psychological aggression, sexual and physical aggression, and relational aggression, which were correlated with more frequent cannabis and alcohol use as well as rape myth acceptance. These results provide initial support for the utility of the TeDAM for assessing TDV with adolescents.

Keywords: dating violence, adolescents, aggression, teen dating violence, adolescent dating aggression

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INTRODUCTION

Adolescence represents a developmental period marked by increased interest and involvement in extrafamilial romantic relationships with same or other-gender partners (Collins et al., 2009; Furman and Collins, 2009). Although teen dating is typically characterized by affectionate and anticipated or actual sexual behaviors, violence, and aggression can also occur (Wolfe et al., 2001; Collins et al., 2009). This type of aggression and violence is commonly referred to as teen dating violence (TDV) and is a prevalent social problem. In a recent study using the Health-Behavior in School-Aged Children (HBSC) survey, Exner-Cortens et al. (2021) found that one in three Canadian teenagers had some experience with dating violence in the past year. In particular, adolescents reported experiencing psychological aggression the most (27.8%), followed by cyber aggression (17.5%) and physical aggression (11.8%) (Exner-Cortens et al., 2021). Moreover, national statistics indicate that 20% of police-reported incidences included some form of dating violence among 15–24-year-olds (Statistics Canada, 2018). Finally, youth victims of TDV are more likely to experience adverse outcomes such as increased depression and anxiety (Garthe et al., 2021), engage in more substance abuse and risky sexual behavior (Alleyne et al., 2011), and are at greater

risk for future intimate partner violence (IPV) (Exner-Cortens et al., 2013). Despite being a public health concern, current measures of TDV are limited for various conceptual and methodological reasons. To address these limitations, the purpose of this study was to evaluate the psychometric properties of a more expansive measure that evaluates TDV victimization more broadly.

Teen dating violence is conceptually similar to IPV observed among adult populations (Espelage et al., 2020). For example, TDV incorporates actions and behaviors that are intended to hurt or manipulate a partner's social relationships and can be manifested in different ways (Linder et al., 2002; Breiding et al., 2015; Centers for Disease Control and Prevention, 2020). Instruments that assess TDV typically measure three types: (a) physical, (b) sexual, and (c) psychological violence (Smith et al., 2015; Exner-Cortens et al., 2016a,b). Physical dating violence refers to a range of behaviors in which an individual experiences physical injury such as hitting and kicking (Breiding et al., 2015). Sexual dating violence refers to behaviors in which a partner forces or attempts to force the partner to engage in physical or non-physical sexual acts (Breiding et al., 2015). Psychological dating violence denotes behaviors meant to humiliate or control the partner (e.g., name calling, restricting access to friends) (Breiding et al., 2015). However, what is unique to TDV is that it can differ based on the types of aggressive behaviors and actions that often take place amongst adolescent peer groups that may not be particularly salient among adults.

In general, victimization resulting from TDV is linked to various negative outcomes. For example, experiencing physical or verbal TDV is associated with recent alcohol and marijuana use (e.g., Parker et al., 2016). Moreover, adolescents who have been exposed to sexual assault have differential perceptions of rape myth acceptance, which refers to a stigmatic set of beliefs that victims are at fault for their assault or exposure to dating violence (e.g., Edwards et al., 2011; Dworkin et al., 2017). Subscales of rape myth acceptance include rape denial, which refers to attitudes reflective of victim-blaming or not believing rape victims, and traditional gender expectations, which represent typical roles of men and women in relationships (Dworkin et al., 2017). In Dworkin et al. (2017), positive associations between the two rape myth acceptance subscales and each of depressed mood and alcohol use among a sample of adolescents were evident. More broadly, positive associations were observed between rape myth acceptance as an overall measure and sexual dating aggression (Reyes and Foshee, 2013). Thus, the consequences of being victimized by a romantic partner has an effect on the ways in which adolescents might cope with and perceive such experiences.

Currently, there are several measures that assess TDV, each of which evaluate different aspects of teen dating perpetration and victimization (see Exner-Cortens et al., 2016a,b). A comprehensive review by Exner-Cortens et al. (2016a,b) highlights dating violence behaviors and attitudes as distinct themes for measuring TDV. Despite the breadth of these measures, there are two main limitations to note among them. First, many of the measures are adapted from adult scales that do not fully capture the adolescent experience (e.g., Conflict Tactics Scale; see Straus, 1979; Cascardi et al., 1999). Although adult-based dating violence measures could be adapted for use with adolescents, the nature of adapting remains problematic. From a developmental perspective, adolescent and adult intimate relationships differ in important ways (Knox et al., 2009). For example, adolescents are less likely to live with and be economically bound to their partner (Knox et al., 2009). Moreover, adolescents are also more likely to disclose victimization experiences with peers than adults, who are more likely to seek help from professionals (Knox et al., 2009). Furthermore, adolescents are likely to remain in contact with the partner because they often go to the same school or even attend the same class (Knox et al., 2009). Due to these differences, adult-based dating violence measures might not adequately capture the uniqueness of TDV. For example, including items that capture economic threats (e.g., removal of economic support) or failing to assess relational aggression (e.g., spreading rumors to friends) would not adequately capture adolescent developmental. As such, we argue that they do not fully capture the everyday aggressive acts that might be more common to the adolescent dating experience. This is especially the case for relationally and psychologically aggressive acts, as they are common during adolescence and occur in both dating and peer relationships (e.g., Linder et al., 2002; Ellis et al., 2009).

In adolescence, relationally and psychologically aggressive acts are common among teen dating partners relative to physical aggression (e.g., Morelli et al., 2018; Dosil et al., 2020; Asghari et al., 2021). In addition, psychological aggression appears to occur more frequently than relational aggression in the context of adolescent romantic relationships relative to those between adults (Morelli et al., 2018; Dosil et al., 2020). Similar to the aforementioned TDV experiences, adolescent victimization based on psychological or relational acts are associated with greater psychological distress in romantic relationships (Jouriles et al., 2009; Goncy et al., 2017), increased emotional and behavioral problems (e.g., Leadbeater et al., 2008), and alcohol use (Schad et al., 2008). As such, the inclusion of aggressive acts that adolescents commonly see in their romantic partners beyond what has been developed for adults is necessary.

Second, adolescent-based measures of TDV tend to have poor psychometric properties. For example, the Conflict in Adolescent Dating Relationships Inventory (CADRI) is a widely used instrument to measure teen dating perpetration and victimization and has been validated in many countries, including Canada, the United States, Spain, Mexico, among others (Wolfe et al., 2001; Smith et al., 2015; Exner-Cortens et al., 2016a,b). In terms of its factor structure, the CADRI includes five first-order factors, including threatening behavior, physical abuse, relational aggression, verbal emotional abuse, and sexual abuse, each of load onto a second-order latent factor called abuse. Moreover, internal consistency and test-retest reliability were adequate across adolescent sex and grade (>0.70) for verbal/emotional and physical abuse, but weaker for threatening behaviors (0.54–0.73), relational aggression (0.16–0.69), and sexual abuse (0.36–0.59) (Wolfe et al., 2001). Subsequent validation studies offered only partial psychometric evidence for the CADRI. For example, Fernández-Fuertes et al. (2006)

assessed the five-factor model for both TDV perpetration and victimization with Spanish adolescents using exploratory factor analysis (EFA) instead of confirmatory factor analysis (CFA). Hokoda et al. (2006) only considered the reliability of CADRI for both TDV perpetration and victimization with Mexican youth. Furthermore, although the short form of CADRI (CADRI-S) has demonstrated validity and reliability among general and high-risk adolescents, it has lower sensitivity compared with the full CADRI (Fernández-González et al., 2012). Importantly, the CADRI-S was assessed only from the perpetuator's perspective (Fernández-González et al., 2012). Thus, the extent to which CADRI or CADRI-S adequately measures TDV victimization experiences remains unclear.

The Measure of Adolescent Relationship Harassment and Abuse (MARSHA) is a recent and comprehensive instrument that aims to evaluate different aspects of TDV perpetration (i.e., social control, physical abuse, sexual abuse, isolation, cyber control, intimidation) and victimization (i.e., privacy control, social control, physical abuse, sexual abuse, and intimidation (Rothman et al., 2020, 2021). This measure was initially developed from focus groups and interviews with a group of adolescents and young adults (11–20 years old, M_{age} = 16.4) (Rothman et al., 2020), and its reliability and validity were evaluated with a culturally diverse sample (11–20 years old) that has a mean age of 18 (Rothman et al., 2021). Given that the validation group consisted mainly of older adolescents and young adults, the extent to which MARSHA adequately captures TDV victimization experiences during the period of *adolescence* is inconclusive.

Previous reviews have addressed several gaps in extant TDV measurements (Smith et al., 2015; Exner-Cortens, 2018). For example, items that measure sexual violence are often neglected or limited, possibly because of pressure from schools to avoid sexual related topics (Smith et al., 2015; Exner-Cortens, 2018). Moreover, psychological aggression (e.g., insulting) is often measured in a way that parallels physical aggression, which limits understanding on the nuances that distinguish the two constructs (Follingstad, 2007). To address these gaps, this study validated a comprehensive TDV victimization measure that was extended from the CADRI measure. This measure considers not only fundamental TDV constructs (i.e., physical abuse, psychological abuse, and sexual abuse), but also those that have not been adequately evaluated, such as relational forms of violence and aggression. The validation of the new measure was conducted in Canada, where TDV remains an alarming significant public health problem among adolescents (Shaffer et al., 2021).

The present study had three main objectives. First, we sought to extend the CADRI measure to include typical everyday actions and behaviors that could be experienced by adolescents who have been in a romantic relationship. Our second objective was to replicate the multidimensionality of TDV as observed in the other measures using exploratory and confirmatory factor analytical approaches. Finally, we aimed to establish concurrent validity with this measure using participants' ratings of alcohol overconsumption, cannabis use, and rape myth acceptance views as outcome variables.

MATERIALS AND METHODS

Participants

A total of 730 adolescents between grades 7 and 12 were recruited from high schools in three provinces (i.e., Quebec, Ontario, and Manitoba) in Canada (M_{age} = 15.88 years, *SD* = 1.23). Twelve schools participated in the study, four of which were from Quebec, six were from Ontario, and two from Manitoba. Demographic information for the full sample is presented in **Table 1**. The majority of participants identified their gender as female, followed by male, and non-binary. Half of the sample also identified their ethnicity as White/European (50.1%), and most of the participants did not have previous experiences with relationship violence (90.9%).

Procedure

Ethical approval was obtained from each of the relevant research ethics bodies at the universities and local school boards. The research team first visited each participating school to explain

TABLE 1 | Demographic information of samples.

	Sample 1	Sample 2	Total sample
n	353	377	730
Age *M* (*SD*)	15.89 (1.23)	15.89 (1.29)	15.89 (1.26)
Gender			
Woman	63.7%	62.3%	63.0%
Man	34.8%	34.7%	34.8%
Non-Binary	0.6%	1.6%	1.1%
No answer	0.8%	1.3%	1.1%
Grade			
7	0%	0.3%	0.1%
8	0%	0.8%	0.4%
9	26.9%	26.5%	26.7%
10	27.5%	26.3%	26.8%
11	26.9%	26.8%	26.8%
12	17.6%	17.5%	17.5%
No answer	1.1%	1.9%	1.5%
Ethnicity			
African/Caribbean	8.2%	11.9%	10.1%
East Asian	6.5%	4.0%	5.2%
First Nations	4.8%	6.4%	5.6%
Inuit	0%	0.5%	0.3%
Latin American	1.4%	2.4%	1.9%
Métis	2.0%	3.2%	2.6%
Middle Eastern/West Asian	3.4%	3.7%	3.6%
South Asian	6.2%	5.8%	6.0%
Southeast Asian	12.5%	15.9%	14.2%
White/European	50.1%	48.0%	49.0%
Different	6.2%	6.9%	6.6%
No answer	14.4%	12.2%	13.3%
Experiences with relationship violence			
Yes	7.6%	9.3%	8.5%
No	90.9%	87.8%	89.3%
No answer	1.4%	2.9%	2.2%

The percentage of ethnicity is greater than 100% because participants could identify with more than one ethnic group.

the purpose of the study and administer consent forms. Once a signed guardian consent form was returned, students were asked to provide assent to participate in the study. During the study, participants responded to various questionnaires that lasted approximately 1 h.

Measures

Teen Dating Aggression Measure

We modified the original CADRI to capture adolescent dating violence more adequately and to expand upon the types of violence assessed. Our modification included combining the two items assessing sexual violence to address potential concerns by schools and their respective boards, i.e., "Forced me to have sex with them when I didn't want to" and "Touched me sexually when I didn't want them to" were combined into one broad item: "Forced me to do something sexual that I didn't want to do." After the original CADRI items, 20 new statements were added that describe additional forms of violence such as coercion (e.g., "Kept pressuring me to do something even after I made it clear that I did not want to") and control (e.g., "Made me let them read my emails or texts when I didn't want them to"). For each of the 44 items on the adapted scale, participants rated how often the behavior occurred with a dating partner over the past three months using a Likert scale from 0 ("*never*") to 4 ("*most days of the week*").

Rape Myth Acceptance

Participants were asked to rate 10 items that assessed how much they agreed with statements regarding rape myths (RMA) on 4-point Likert scale ranging from 1 ("*Strongly Disagree*") to 4 ("*strongly agree*"). Items were adapted from established scales of this construct (e.g., Illinois Rape Myth Acceptance Scale; Payne et al., 1999). Consistent with Dworkin et al. (2017), two scores were computed. The first reflected a measure of traditional gender expectations (e.g., "Girls should have sex with the guy they are dating when he wants") while the second measured rape denial (e.g., "If a girl is sexually assaulted while drunk, she is to blame"). Items were summed for each score and higher scores indicated greater endorsement of RMA. Cronbach's alpha for traditional gender expectations (0.81) and rape denial (0.73) were high across both samples.

Cannabis and Alcohol Consumption

Participants were asked to assess how often they used cannabis or marijuana using a 6-point Likert scale, ranging from 1 ("*Never*") to 6 ("*About 6 or 7 times a week*") ($M = 1.48$, $SD = 1.06$). Similarly, alcohol overconsumption in the past month (i.e., drinking to the point of drunkenness) was rated on a 6-point Likert scale, ranging between 1 ("*Never*") and 6 ("*5 or more times*") ($M = 1.22$, $SD = 0.64$).

Plan of Analysis

The analytical plan followed five steps. First, we split the sample using complex sampling procedures (described below). Second, descriptive correlations and inter-item correlations were computed in SPSS to evaluate normality of the data. Third, an EFA of the first sample was conducted. Fourth, CFA to verify the factor structure that was derived from the EFA with the second sample. Finally, bivariate correlations were conducted to examine the associations among the scales and with adolescent rape myth acceptance, and cannabis and alcohol consumption. The EFA and CFA were analyzed with M*plus* 8 (Muthén and Muthén, 1998-2017). To evaluate the fit of the models, fit indices suggested by Hu and Bentler (1999) and Kline (2016), which includes the Comparative Fit Index (CFI; values of at least 0.90), the Tucker-Lewis Index (TLI; values of at least 0.95), the Root Mean Squared Error of Approximation (RMSEA; values no greater than 0.08), and the Weighted Root Mean Squared Error of Approximation (WRMR; values no greater than 1.00) were used.

Complex Sampling

In order to examine the factor structure and provide validation, complex random sampling in SPSS was used to split the main sample into two groups. Three strata were used to randomly assign participants into one of the two samples: (a) gender identity, (b) grade level, and (c) previous experience with relationship violence. Sample 1 (S1) was comprised of 353 participants (63.7% female) and Sample 2 (S2) included 377 participants (62.3% female).

RESULTS

Descriptive Statistics

Descriptive statistics including skewness and kurtosis were calculated for each item in both samples (see **Table 2**). In general, each of the items did not have a mean score above 2 but had skewness and kurtosis values that exceeded |1.50| (Tabachnick and Fidell, 2013). Given that these items were rarely endorsed by the participants, the data were treated as categorical rather than continuous, but maintained the original Likert scale options that were originally posed. Moreover, we conducted a missing values analysis and found that none of the items had a proportion of missing values that exceeded 5% (between 2.10 and 3.00%).

Exploratory Factor Analysis

An EFA was conducted on the first sample using the weighted least squares mean and variance adjusted (WLSMV) estimator and the geomin oblique rotation (epsilon = 0.50). Using the eigenvalue-greater-than-1 rule (Kaiser, 1960), results from this analysis suggest a 7-factor model (see **Table 3**). However, the increase in number of factors could also result in multiple cross-loadings, therefore, we also examined the changes in model fit to determine which factor structure best fit the data. Specifically, we calculated the change (Δ) in RMSEA, CFI, TLI, and SRMR by comparing each model with the model that preceded it. For example, the change in fit for a 2-factor solution was calculated by taking the difference between its fit and the fit from the 1-factor solution. In line with empirical suggestions for factor retention (e.g., Clark and Bowles, 2018), ΔCFI and ΔTLI improvements of at least 0.01 were considered in determining the final factor structure.

Upon examination of change in model fit as well as considering the overall conceptualization of the factors, a 3-factor solution appeared to be the best fitting model (see

TABLE 2 | Descriptive statistics of items.

	Sample 1			Sample 2		
Item	***M* (*SD*)**	**Skewness**	**Kurtosis**	***M* (*SD*)**	**Skewness**	**Kurtosis**
1. Tried to turn my friends against me.	1.14 (0.52)	4.827	26.266	1.08 (0.41)	6.704	52.934
2. Said or did something just to make me feel jealous.	1.47 (0.93)	2.280	4.754	1.30 (0.75)	3.097	10.439
3. Destroyed or threatened to destroy something I valued.	1.06 (0.33)	7.601	71.641	1.08 (0.46)	6.952	51.593
4. Brought up something bad I had done in the past.	1.37 (0.81)	2.605	7.068	1.32 (0.82)	2.982	8.684
5. Threw something at me.	1.06 (0.29)	4.925	25.558	1.06 (0.39)	8.034	69.774
6. Said or did something just to make me angry.	1.43 (0.88)	2.249	4.582	1.30 (0.79)	3.210	10.647
7. Spoke to me in a hostile or mean tone of voice.	1.31 (0.79)	2.963	8.701	1.23 (0.73)	3.869	15.505
8. Forced me to do something sexual that I didn't want to.	1.10 (0.48)	5.798	37.403	1.11 (0.48)	5.903	39.534
9. Threatened me to get me to do something sexual with him/her.	1.06 (0.38)	8.290	75.200	1.03 (0.27)	9.238	89.141
10. Insulted me.	1.31 (0.74)	2.879	8.722	1.24 (0.71)	3.390	11.834
11. Kissed me when I didn't want him/her to.	1.12 (0.52)	5.028	27.856	1.11 (0.50)	5.357	31.206
12. Said things to my friends about me to turn them against me.	1.10 (0.48)	5.628	35.374	1.07 (0.36)	6.800	55.719
13. Ridiculed or made fun of me in front of other people.	1.15 (0.50)	4.269	20.880	1.15 (0.58)	5.007	27.423
14. Kept track of who I was with and where I was.	1.46 (1.03)	2.419	4.908	1.32 (0.91)	3.244	9.749
15. Blamed me for a problem or fight we were having.	1.39 (0.90)	2.784	7.463	1.33 (0.84)	3.139	9.986
16. Kicked, hit, or punched me.	1.06 (0.33)	7.636	72.293	1.04 (0.27)	8.701	83.428
17. Accused me of flirting with someone else.	1.38 (0.89)	2.768	7.410	1.27 (0.76)	3.393	11.855
18. Tried to frighten me on purpose.	1.11 (0.46)	5.005	28.453	1.10 (0.48)	5.724	35.086
19. Slapped me or pulled my hair.	1.10 (0.43)	6.212	46.008	1.06 (0.35)	6.710	47.969
20. Threatened to hurt me.	1.04 (0.26)	7.739	68.247	1.04 (0.32)	9.080	92.644
21. Threatened to break up with me or end our friendship.	1.15 (0.52)	4.866	28.858	1.16 (0.64)	4.757	23.674
22. Threatened to hit or throw something at me.	1.03 (0.25)	10.331	115.005	1.03 (0.27)	10.823	135.353
23. Pushed, shoved, grabbed, or shook me.	1.07 (0.32)	6.146	44.956	1.08 (0.38)	5.768	41.353
24. Spread rumors about me.	1.11 (0.51)	5.754	35.926	1.11 (0.43)	4.357	19.650
25. Screamed or yelled at me.	1.18 (0.60)	4.298	21.027	1.16 (0.60)	4.648	23.063
26. Said mean things to me.	1.31 (0.75)	2.893	8.835	1.27 (0.77)	3.617	13.527
27. Left me out of an activity or a social group on purpose.	1.11 (0.46)	5.836	39.436	1.12 (0.51)	5.596	34.564
28. Told me that he/she would break up with me or end our friendship if I did not do something he/she wanted.	1.11 (0.53)	5.827	36.527	1.16 (0.60)	5.407	29.007
29. Said means things about me to other people.	1.12 (0.48)	5.401	34.067	1.27 (0.77)	4.386	20.275
30. Talked about how other people were better or more fun than me.	1.15 (0.58)	4.911	26.171	1.14 (0.57)	4.737	24.246
31. Told me that other people didn't like me.	1.16 (0.59)	4.458	21.801	1.13 (0.51)	4.749	25.825
32. Told me that I was not a good boyfriend/girlfriend or friend.	1.13 (0.51)	5.025	29.018	1.16 (0.62)	4.759	23.904
33. Gave me the silent treatment.	1.35 (0.76)	2.489	6.015	1.31 (0.78)	3.051	9.504
34. Got upset when I spent time with other people.	1.48 (1.01)	2.280	4.387	1.31 (0.82)	3.208	10.342
35. Said mean things to me about someone else who is important to me.	1.25 (0.73)	3.393	11.941	1.22 (0.72)	3.958	16.238
36. Got upset when I did really well on something.	1.09 (0.43)	6.006	39.999	1.05 (0.35)	9.136	95.263
37. Told me that I needed to spend more time with him/her.	1.47 (1.04)	2.321	4.374	1.33 (0.81)	3.023	9.474
38. Made me let them read my e-mails or texts when I didn't want them to.	1.18 (0.65)	4.132	17.189	1.11 (0.56)	5.937	36.925
39. Made me do something I really didn't want to do.	1.13 (0.55)	5.237	30.363	1.11 (0.52)	5.966	38.681
40. Was mean to me or insulted me to get me to do something for him/her.	1.10 (0.49)	5.958	38.831	1.09 (0.51)	6.746	47.175
41. Got mad at me when I said "no" to him/her about something.	1.25 (0.75)	3.525	12.582	1.20 (0.64)	4.214	19.880
42. Threatened me to try to get me to do something he/she wanted me to do.	1.10 (0.52)	6.180	40.223	1.07 (0.42)	7.353	58.502
43. Insulted me or said mean things to me when I said "no" to him/her about doing something.	1.14 (0.61)	5.129	27.284	1.09 (0.51)	6.593	46.002
44. Kept pressuring me to do something even after I made it clear that I did not want to.	1.22 (0.75)	3.762	13.993	1.17 (0.65)	4.734	23.186

Table 3). In this model, the change in model fit from a 2-factor solution to a 3-factor solution produced ΔRMSEA = 0.02, ΔCFI = 0.01, ΔTLI = 0.01, and ΔSRMR = 0.01. The change in the subsequent models did not necessarily improve the overall model fit. From there, the factor loadings of the items were evaluated; items that cross-loaded onto more than one factor were dropped if the standardized loading was < 0.32. The correlations between each of the three factors (F1, F2, F3) were

TABLE 3 | Exploratory factor analysis (EFA) model fit indices for the factor structure of the Teen Dating Aggression Measure (TeDAM).

			Chi-Square test of model fit											
Solution	**Eigenvalue**	**Δ**	**χ^2**	***df***	***p***	**RMSEA**	**Δ**	**CFI**	**Δ**	**TLI**	**Δ**	**SRMR**	**Δ**
1-Factor	25.46	0.71	1109.419	740	<0.001	0.038	–	0.972	–	0.971	–	0.112	–
2-Factor	3.051	0.08	897.463	701	<0.001	0.028	0.010	0.985	0.013	0.984	0.013	0.082	0.03
3-Factor	2.052	0.06	774.471	663	0.002	0.022	0.006	0.992	0.007	0.99	0.006	0.068	0.014
4-Factor	1.625	0.05	697.42	626	0.025	0.018	0.004	0.995	0.003	0.993	0.003	0.057	0.011
5-Factor	1.124	0.03	638.449	590	0.082	0.015	0.003	0.996	0.001	0.995	0.002	0.052	0.005
6-Factor	1.064	0.03	579.466	555	0.229	0.011	0.004	0.998	0.002	0.997	0.002	0.047	0.005
7-Factor	0.899	0.02	530.392	521	0.378	0.007	0.004	0.999	0.001	0.999	0.002	0.043	0.004

Analysis was performed on Sample 1 and items 13, 18, 28, and 43 were removed. All chi-square tests were statistically significant, $p < 0.05$. Δ represents the change between for each respective fit index from the current model and a previous model.

statistically significant ($p < 0.05$): F1-F2 = 0.46, F1-F3 = 0.52, F2 and F3 = 0.50.

Further investigation of the items showed that three items closely cross-loaded (difference between 0.02 and 0.06) onto two factors and did not quantitatively or conceptually fit with the factor in which it strongly loaded (discussed next). The three items were: (a) "Ridiculed or made fun of me in front of other people"; (b) "Told me that he/she would break up with me if I did not do something he/she wanted"; and (c) "Insulted me or said mean things to me when I said 'no' to him/her about doing something." Thus, we removed the items and reanalyzed the EFA, which still supported a 3-factor solution. **Table 3** provides fit indices and change (Δ) in model fit between each of the solutions. In this final model, there were fewer cross-loadings; when they did occur, there was discussion of the item in question and consensus was achieved if the authors agreed that it conceptually fit with the factor to which it was primarily loaded. The three factors consisted of constructs related to: (a) psychological aggression, (b) physical, sexual aggression, and (c) relational aggression. **Table 4** provides the standardized loadings for each of the three factors.

Factor 1: Psychological Aggression

The first factor was comprised of 17 items, with standardized loadings ranging from 0.37 to 0.82. These items appear to reflect a psychological or manipulative form of aggression perpetrated to victims. Example items include, "gave me the silent treatment," "insulted me," "brought up something bad I had done in the past," and "accused me of flirting with someone else." The Cronbach's alpha for this scale was 0.94.

Factor 2: Physical, Sexual Aggression

In the second factor, the standardized loadings of 14 items (factor loadings ranging between 0.42 and 0.87) suggest overt physical and sexual aggression acts committed toward a victim. Example items within this factor include, "threw something at me," "threatened to hurt me," "kicked, hit, or punched me," and "kissed me when I didn't want him/her to." Cronbach's alpha was 0.89.

Factor 3: Relational Aggression

In this last factor, 9 items with standardized loadings ranging between 0.53 and 0.86 reflect an indirectly applied form of relational aggression. In particular, the items reflected behaviors that a partner may do or say to others about a victim. Unlike the first factor that focused on psychological aggression targeted toward a victim, the items on this scale generally involved behaviors that implicated other individuals, such as a victims' friends. Some examples from this scale include, "talked about how other people were better or more fun than me," "left me out of an activity or social group on purpose," "spread rumors about me," and "said mean things about me to other people." Cronbach's alpha for this scale was 0.91.

Confirmatory Factor Analysis

Three separate CFAs were conducted with the second sample to compare a 3-factor model with a 2-factor model and 1-factor model, respectively. Given the use of the WLSMV estimator, the DIFFTEST function was employed using the 3-factor model as the initial comparison against the 2-factor and 1-factor models. In comparison to the 3-factor model, the 2-factor and 1-factor models each had statistically significant worse fit (all ps < 0.001). Thus, we retained the 3-factor model identified from the EFA used with the first sample (see **Table 5**). In general, model fit was acceptable, $\chi^2(737) = 1611.27$, $p < 0.001$, CFI = 0.94, RMSEA = 0.06 (0.05–0.06); standardized factor loadings were strong (>0.60) and statistically significant ($p < 0.001$) (see **Table 6** for loadings by factor). Further, reliability using McDonald's omega (ω), which does not assume equal factor loadings (see Hayes and Coutts, 2020), showed that the scales were highly reliable.

Mean-Level Differences by Gender Identity and Grade Level

Scores for each of the three dimensions were aggregated for each of the three scales and then compared as a function of participant gender identity and grade level. A one-way MANOVA with the three scores as the dependent variables did not yield a statistically significant multivariate effect of gender identity for Sample 1, Wilk's $\lambda = 0.97$, $F(9, 825.19) = 1.31$, $p = 0.23$, $\eta_p^2 = 0.01$, or Sample 2, Wilk's $\lambda = 0.97$, $F(9, 886.03) = 1.28$, $p = 0.24$, $\eta_p^2 = 0.01$. Additionally, there were no observed multivariate effects of grade level for Sample 1, Wilk's $\lambda = 0.98$, $F(12, 894.44) = 0.52$, $p = 0.90$, $\eta_p^2 = 0.01$, or Sample 2, Wilk's $\lambda = 0.95$, $F(18, 1021.55) = 1.00$,

TABLE 4 | Standardized factor loadings and descriptive statistics for the 3-factor solution of the Teen Dating Aggression Measure (TeDAM).

	3-Factor solution		
Item	**F1**	**F2**	**F3**
F1: Psychological aggression			
1. Tried to turn my friends against me.	0.37*		
2. Said or did something just to make me feel jealous.	0.58*		
3. Destroyed or threatened to destroy something I valued.	0.77*		
4. Brought up something bad I had done in the past.	0.74*		
6. Said or did something just to make me angry.	0.71*		
7. Spoke to me in a hostile or mean tone of voice.	0.63*		0.38*
10. Insulted me.	0.64*		
14. Kept track of who I was with and where I was.	0.76*		
15. Blamed me for a problem or fight we were having.	0.64*		0.40*
17. Accused me of flirting with someone else.	0.82*		
25. Screamed or yelled at me.	0.62*		
26. Said mean things to me.	0.52*		0.46*
33. Gave me the silent treatment.	0.54*		
34. Got upset when I spent time with other people.	0.72*		
35. Said mean things to me about someone else who is important to me.	0.42*	0.34*	
37. Told me that I needed to spend more time with him/her.	0.59*	0.45*	
38. Made me let them read my e-mails or texts when I didn't want them to.	0.65*	0.43*	
F2: Physical, sexual aggression			
5. Threw something at me.		0.42*	
8. Forced me to do something sexual that I didn't want to.		0.80*	
9. Threatened me to get me to do something sexual with him/her.		0.82*	
11. Kissed me when I didn't want him/her to.	0.45*	0.61*	
16. Kicked, hit, or punched me.		0.74*	
19. Slapped me or pulled my hair.		0.61*	
20. Threatened to hurt me.		0.64*	0.34*
22. Threatened to hit or throw something at me.		0.86*	
23. Pushed, shoved, grabbed, or shook me.		0.87*	
39. Made me do something I really didn't want to do.		0.58*	
40. Was mean to me or insulted me to get me to do something for him/her.		0.67*	0.40*
41. Got mad at me when I said "no" to him/her about something.	0.33*	0.56*	
42. Threatened me to try to get me to do something he/she wanted me to do.		0.65*	0.41*
44. Kept pressuring me to do something even after I made it clear that I did not want to.		0.67*	
F3: Relational aggression			
12. Said things to my friends about me to turn them against me.			0.65*
21. Threatened to break up with me or end our friendship.	0.39*		0.65*
24. Spread rumors about me.			0.86*
27. Left me out of an activity or a social group on purpose.			0.83*
29. Said means things about me to other people.			0.86*
30. Talked about how other people were better or more fun than me.			0.53*
31. Told me that other people didn't like me.			0.65*
32. Told me that I was not a good boyfriend/girlfriend			0.63*
36. Got upset when I did really well on something.		0.38*	0.62*

*Analysis was performed on Sample 1 and items 13, 18, 28, and 43 were removed. All factor loadings were statistically significant, *p < 0.05.*

TABLE 5 | Confirmatory factor analysis (CFA) model fit for the factor structure of the Teen Dating Aggression Measure (TeDAM).

	Chi-Square test of model fit											Chi-Square for difference test		
Solution	χ^2	***df***	***p***	**RMSEA**	**Δ**	**CFI**	**Δ**	**TLI**	**Δ**	**WRMR**	**Δ**	χ^2	***df***	***p***
3-Factor	1611.267	737	<0.001	0.057	0.000	0.941	0.001	0.938	0.002	1.588	0.019	–	–	–
2-Factor	1633.886	739	<0.001	0.057	0.000	0.940	0.001	0.936	0.000	1.607	0.009	36.069	2	<0.001
1-Factor	1644.878	740	<0.001	0.057	–	0.939	–	0.936	–	1.616	–	42.621	3	<0.001

Analysis was performed on Sample 2 and items 13, 18, 28, and 43 were removed All chi-square tests were statistically significant. Difference test uses the DIFFTEST option in Mplus using the 3-factor solution as the initial comparison (it has more free parameters). Statistically significant chi-square for difference tests mean that adding more restrictions (i.e., 2-factor and 1-factor) worsens model fit.

TABLE 6 | Confirmatory factor analysis standardized loadings and omega reliability estimates (ω).

		3-Factor solution		
Item	**ω**	**F1**	**F2**	**F3**
F1: Psychological aggression	0.98			
1. Tried to turn my friends against me.		0.85*		
2. Said or did something just to make me feel jealous.		0.84*		
3. Destroyed or threatened to destroy something I valued.		0.89*		
4. Brought up something bad I had done in the past.		0.86*		
6. Said or did something just to make me angry.		0.89*		
7. Spoke to me in a hostile or mean tone of voice.		0.89*		
10. Insulted me.		0.82*		
14. Kept track of who I was with and where I was.		0.80*		
15. Blamed me for a problem or fight we were having.		0.89*		
17. Accused me of flirting with someone else.		0.82*		
25. Screamed or yelled at me.		0.86*		
26. Said mean things to me.		0.92*		
33. Gave me the silent treatment.		0.84*		
34. Got upset when I spent time with other people.		0.90*		
35. Said mean things to me about someone else who is important to me.		0.84*		
37. Told me that I needed to spend more time with him/her.		0.78*		
38. Made me let them read my e-mails or texts when I didn't want them to.		0.89*		
F2: Physical, sexual aggression	0.98			
5. Threw something at me.			0.73*	
8. Forced me to do something sexual that I didn't want to.			0.87*	
9. Threatened me to get me to do something sexual with him/her.			0.78*	
11. Kissed me when I didn't want him/her to.			0.77*	
16. Kicked, hit, or punched me.			0.77*	
19. Slapped me or pulled my hair.			0.90*	
20. Threatened to hurt me.			0.87*	
22. Threatened to hit or throw something at me.			0.85*	
23. Pushed, shoved, grabbed, or shook me.			0.87*	
39. Made me do something I really didn't want to do.			0.95*	
40. Was mean to me or insulted me to get me to do something for him/her.			0.97*	
41. Got mad at me when I said "no" to him/her about something.			0.91*	
42. Threatened me to try to get me to do something he/she wanted me to do.			0.95*	
44. Kept pressuring me to do something even after I made it clear that I did not want to.			0.91*	
F3: Relational aggression	0.96			
12. Said things to my friends about me to turn them against me.				0.82*
21. Threatened to break up with me or end our friendship.				0.84*
24. Spread rumors about me.				0.88*
27. Left me out of an activity or a social group on purpose.				0.62*
29. Said means things about me to other people.				0.86*
30. Talked about how other people were better or more fun than me.				0.84*
31. Told me that other people didn't like me.				0.94*
32. Told me that I was not a good boyfriend/girlfriend				0.91*
36. Got upset when I did really well on something.				0.80*

*Analysis was performed on Sample 2 and items 13, 18, 28, and 43 were removed. All factor loadings were statistically significant, *p < 0.05.*

p = 0.46, η_p^2 = 0.02. The lack of significant group differences suggest that the means from each of the three dimensions did not significantly differ as a function of the participant's gender identity or their grade.

Concurrent Validity

In the last analysis, we tested concurrent associations between the TeDAM, perceptions of rape myths acceptance, cannabis use, and alcohol consumption (see **Table 7** for descriptive statistics). Accordingly, bivariate correlations including bootstrapping (n = 10,000) to estimate 95% confidence intervals were computed between the mean scores of the three factors along with cannabis use, alcohol overconsumption, and rape myth acceptance for the whole sample. Results showed similar findings across each of the three factors (see **Table 8**). Psychological aggression was positively associated with alcohol overconsumption, cannabis use, and rape denial. Physical and sexual aggression was also positively correlated with each of alcohol overconsumption, cannabis use, and rape denial. Similarly, relational aggression was positively related to alcohol overconsumption, cannabis use, and rape denial. There were no statistically significant associations

TABLE 7 | Descriptive statistics of study variables for the overall sample.

Variable	*M* (*SD*)	Minimum	Maximum
TeDAM			
Psychological aggression	1.29 (0.56)	1.00	4.28
Physical, sexual aggression	1.10 (0.32)	1.00	4.41
Relational aggression	1.12 (0.38)	1.00	4.89
Cannabis use	1.48 (1.06)	1.00	6.00
Alcohol overconsumption	1.22 (0.64)	1.00	6.00
Rape myth acceptance			
Traditional gender expectations	3.82 (1.40)	3.00	12.00
Rape denial	16.00 (6.80)	4.00	16.00

Scores on the TeDAM are an average of the number of items for each scale, while the rape myth acceptance scores are summed items.

between the TeDAM scales and traditional gender expectations ($ps > 0.05$).

DISCUSSION

Findings from this study provide initial psychometric support for the TeDAM and its use among adolescents. Specifically, factor analyses for the TeDAM suggested that a solution that included three factors, namely behaviors regarding (a) psychological aggression, (b) physical and sexual aggression, and (c) relational aggression, were most appropriate. This factor structure was further supported in a CFA and high reliability estimates.

Each of the factors represented the various ways in which adolescents might experience dating aggression. The first factor, physical and sexual aggression, is common among all measures within the TDV literature. In line with other measures of dating violence victimization, including the CADRI (Wolfe et al., 2001) and the MARSHA (Rothman et al., 2021), the TeDAM yielded a factor that incorporated elements of physical (e.g., slapped, hair pulled, objects thrown) as well as sexual aggression (e.g., threats to coerce sexual acts, sexual force). The second factor reflected psychological aggression, which are harmful verbal and/or emotional acts directed toward the victim (Follingstad et al., 2005). Previous work by Follingstad (2007) suggests that psychological aggression in the form of humiliation and insults differs from physically aggressive acts. Indeed, the factor structure of the TeDAM supports the claim that dating violence and aggression should not be limited to physical acts. Specifically, psychological aggression included items related to verbal and emotional aggression (e.g., making accusations, insulting, giving the silent treatment) as well as manipulative forms of aggression (e.g., made to allow to read social media, keeping track of a partner). Lastly, the third factor related to acts that were characterized as relational aggression. Although this factor could be interpreted similarly to the psychological aggression, the relational component referred to behaviors pertaining to the implicates the peer group (or others) to harm the relationship. For example, items within this scale included aggressive acts such as spreading rumors or using others (e.g., a victim's friends) to make threats or exclude a partner. Within the context of adolescent peer relations, psychological forms of aggression are distinct from relational aggression (see Linder et al., 2002). In particular, the target of psychological aggression is the victim while the target for relational aggression is the relationship. The methods employed within each form of aggression can vary, but the target remains consistent. The addition of a scale focused on relational aggression scale is supported by previous research on IPV, in which romantic relational victimization was found to be negatively correlated with romantic relationship quality (Linder et al., 2002).

There were three findings related to the validation of the measure. First, we found that each of the three factors was associated with adolescent cannabis use and the overconsumption of alcohol. Specifically, more frequent experiences with each of the three aggressive factors were associated with increased use of cannabis and drinking. These findings are in line with previous work that suggests that cannabis and alcohol are associated with victimization from TDV and assault (e.g., Dworkin et al., 2017; Johnson et al., 2017). The last two findings refer to the association between the TDV factors and rape myth acceptance. In particular, there were no significant associations with the traditional gender expectations scale, whereas each of the factors were positively correlated with rape denial. Previous studies have shown positive associations between rape myth acceptance and sexual dating aggression (Reyes and Foshee, 2013). Our findings are partially in line with these results, with the exception of traditional gender expectations. There are two potential methodological explanations for this. First, the IRMAS, the measure with which the items were derived and adapted, is known to produce floor effects, which could explain the lack of a significant association (Trottier et al., 2021). Moreover, with the exception of Dworkin et al. (2017), research on the association between TDV victimization and rape myth acceptance and its specific subscales have not been investigated with an adolescent population and therefore requires replication.

Broadly, the strengths of the TeDAM include the support for a scale on relational aggression. This addition is important because it incorporates the typical actions and behaviors that adolescents engage in with their peers as well as their romantic partners, thus making the measure more developmentally relevant. From a measurement perspective, the TeDAM is also straightforward to use, easy to score, and

TABLE 8 | Bivariate correlations between Teen Dating Aggression Measure (TeDAM) scales and outcome variables.

	Cannabis use	Alcohol overconsumption	RMA—Traditional gender expectations	RMA rape denial
Psychological aggression	0.28** (0.16–0.39)	0.17* (0.06–0.30)	0.02 (–0.06 to 0.16)	0.10* (0.01–0.21)
Physical, sexual aggression	0.21** (0.11–0.32)	0.12* (0.01–0.25)	0.03 (–0.10 to –0.21)	0.11* (–0.02 to 0.23)
Relational aggression	0.23** (0.11–0.35)	0.17** (0.11–0.35)	0.02 (–0.09 to –0.17)	0.08* (–0.03 to 0.20)

*95% confidence intervals are reported with bootstrapping = 10,000. RMA, rape myth acceptance scale. *$p < 0.05$; **$p < 0.001$.*

has strong reliability and validity. Nevertheless, this study acknowledges some limitations. First, although the large sample was obtained from three different provinces across Canada, these were not nationally representative, therefore we could not test for sociodemographic differences (e.g., ethnicity). Second, although our sample size was large enough to assess the factor structure of this measure, we were unable to fully evaluate the psychometric properties using measurement invariance, which would address the extent to which the items were interpreted in a similar manner across different groups. As such, replication of the factor structures and an analysis of the equivalence across sex, gender identity, and previous experiences with relationship violence would benefit the utility of the TeDAM. Finally, the present study was focused on dating victimization experiences of youth. However, it is also necessary to consider the extent to which dating partners perpetrate such acts. Given that the additional items were written similarly to the CADRI, we argue that the target of scale can change between the victim to the perpetrator, which would be in line with other measures, including the CADRI (Wolfe et al., 2001) and the MARSHA (Rothman et al., 2021, 2020). We speculate that a similar factor structure would emerge with dating violence perpetrators.

In summary, the goal of this study was to create an assessment of TDV that was designed to reflect the adolescent experience and include relevant forms of TDV. This measure begins to address the gaps in extant TDV measures by including items related to overt sexual violence, psychological aggression, and relationally aggressive behaviors. Results provided initial psychometric support for a developmentally relevant assessment of adolescent aggressive experiences in the context of romantic relationships. Given both the short- and long-term consequences of victimization from dating violence, there are meaningful implications for researchers, as this could provide more authentic findings when investigating the phenomenon of TDV, as well as have important implications for practitioners (e.g., clinicians) looking to obtain a more comprehensive view of the experiences of TDV victimization among the youth they service. Together, with further development and implementation of the TeDAM, this study has crucial theoretical implications as it could help increase our understanding in the field of TDV.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because there are ethical and consent restrictions that do not allow for the release of data outside of the research team. Requests to access the datasets should be directed to WC, wendy.craig@queensu.ca.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by 1. Research Ethics Board Office (McGill University) #20-07-044 - Research Ethics, 2. General Research Ethics Board (Queen's University) #GPSYC-997-20. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

WC, MD, AM-S, and CK conceptualized and designed the larger study which includes this study. ND coordinated data collection as well as cleaned the data. For this manuscript, RP, TW, LV-M, and CK contributed to the conceptualization and plan. RP organized the data. RP and LV-M conducted the statistical analyses. RP wrote the first draft of the manuscript. TW, LV-M, and ND wrote sections of the manuscript. CK oversaw the manuscript writing throughout the process. All authors contributed to manuscript revision, read, and approved the submitted version.

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Smartphone Addiction and Eysenck's Personality Traits Among Chinese Adolescents: A Meta-Analysis

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With the quickly rising popularity of smartphone among adolescents over the past decade, studies have begun to investigate the relationship between smartphone addiction and Eysenck's personality traits. Despite numerous studies on this topic, however, findings have been mixed and there is a lack of consensus regarding this relationship. Thus, this meta-analysis aimed to explore the relationship between smartphone addiction and Eysenck's personality traits in Chinese adolescents, as well as its possible moderators. Through literature search and screening, 33 studies were included, comprising 79 independent effect sizes with a total of 17, 737 subjects. A random effects model was selected, and it was found that smartphone addiction was positively associated with psychoticism ($r = 0.16$, $p < 0.001$) and neuroticism ($r = 0.32$, $p < 0.001$), but not significantly associated with extroversion ($r = -0.06$, $p = 0.079$). The moderating effect test showed that sex and year of study publication had significant influences on the relationship between smartphone addiction and psychoticism, and the year of study publication had a significant influence on the relationship between smartphone addiction and neuroticism. This study is the first meta-analysis on the relationship between smartphone addiction and Eysenck's personality traits among adolescents in China, and the results have helped to clarify the controversy of previous studies regarding this relationship.

Keywords: adolescent, smartphone addiction, personality traits, meta-analysis, moderators

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INTRODUCTION

According to the 47th Statistical Report on Internet Development released by the China Internet Network Information Center (2021), the number of Chinese mobile Internet users by the end of April 2021 amounted to 940 million. Mobile netizens at this time accounted for 99.2% of the total netizen population, and 10–20 year olds accounted for 20.3%. Smartphones bring numerous benefits to human beings, but they can also lead to smartphone addiction, an trend which has increased year by year, particularly among adolescents. The prevalence of smartphone addiction was found to be at 35% or higher in young smartphone users from different regions across China (Liu Q. X. et al., 2017; Xu and Sun, 2020). The increasing amount of time adolescents spend using smartphones can have many negative physical and mental impacts, such as sleep problems,

depression, and poor school performance (Lopez-Fernandez et al., 2014; Gao et al., 2020). As such, smartphone addiction has attracted increasing attention from both government and scholars.

Personality traits, as an important influencing factor of smartphone addiction, have also been a focus of concern (Desola et al., 2016; Zhang et al., 2017). Although there are plenty of studies on the relationship between smartphone addiction and specific personality traits, the findings are mixed (He et al., 2017; Liu Q. X. et al., 2017; Zhang et al., 2018). China as a country has the largest number of smartphone users in the world (Jin, 2018), which does provide researchers with an important data source in regards to analyzing the relationship between smartphone addiction and personality traits among adolescents. However, as far as we know, no meta-analysis has yet been conducted on this topic. Thus, this study aimed to analyze the relationship between smartphone addiction and Eysenck's personality traits among Chinese adolescents through meta-analysis research, and to explore a range of factors that may have contributed to observed inconsistencies in findings by moderating this relationship.

Concept and Measurement of Smartphone Addiction

Smartphone addiction is characterized by uncontrolled smartphone use that leads to adverse consequences on an individual's physical health, mental health, and social functioning (Billieux et al., 2015). Currently, internationally-used mainstream measuring tools include the Mobile Phone Problem Use Scale (MPPUS) developed by Bianchi and Phillips (2005), the Mobile Phone Addiction Index (MPAI) developed by Leung (2007), and the Smartphone Addiction Scale (SAS) developed by Kwon et al. (2013). In addition to these, Xiong et al. (2012) compiled the Mobile Phone Addiction Tendency Scale (MPATS) using an indigenist research methodology to address and overcome cultural and language issues to measure smartphone addiction in a Chinese context. The MPATS scale has since become widely used in measuring smartphone addiction in adolescents with a high reliability and validity, and the existence of cross-cultural differences can be excluded. There are four dimensions measure by the MPATS: withdrawal symptoms (a series of adverse physiological and psychological reactions when stopping smartphone use), salience (smartphone use occupies a central position in the user's thoughts and behavior), social comfort (the role of the smartphone in interpersonal communication), and mood changes (emotional changes caused by smartphone use).

There also exist some derived scales which are based on the MPATS and combined with results of interviews with respondents (Liu Q. X. et al., 2017). For example, the Smartphone Addiction Scale for College Students (SAS-C) was developed by Su et al. (2014) and includes six dimensions: withdrawal behavior, salience behavior, social comfort, negative effects, use of applications (apps), and renewals of apps. There is also the Smartphone Dependence Scale for College Students (SDS-C), which was developed by Wang et al. (2014) and measures five dimensions: withdrawal, salience, compulsion, tolerance, and harmfulness.

The Concept and Measurement of Personality Traits

Personality can be defined as a set of psychological qualities related to feelings, thoughts, and behaviors (Eysenck, 1991). Many theories regarding personality structure have been proposed, but the most widely known are the Big-Five Model and Eysenck's Three-Factor Mode. Of these two, Eysenck's Three-Factor Mode was developed earlier and is today the more widely used personality theory (Qian et al., 2000; Yang et al., 2018). It is also the most commonly used theory when evaluating personality traits of smartphone addicts in China. Thus, in this study, we focused on Eysenck's Three-Factor Mode. Eysenck's Three-Factor Mode has three dimensions: extraversion (individuals with high extraversion are more sensitive to external stimulation and more optimistic about their future), psychoticism (individuals with high psychoticism are more hostile toward others and more prone to psychological distress), and neuroticism (individuals with high neuroticism are emotionally unstable; Eysenck, 1991). Prior studies have found that Eysenck's Three-Factor Mode has a substantial empirical foundation (Barrett and Eysenck, 1984; Yang et al., 2018), solid evidence of reliability and construct validity (Yang and Gong, 1994; Qian et al., 2000), and maintains cross-cultural consistency (Bowden et al., 2016). Given that Eysenck's Three-Factor Model is the most widely accepted personality theory used in the Chinese scientific community, the scale was chosen to evaluate the personality traits in this study to perform an in-depth exploration of the relationship between smartphone addiction and Eysenck's personality traits.

The Relationship Between Smartphone Addiction and Eysenck's Personality Traits

A substantial number of studies have addressed the relationship between smartphone addiction and Eysenck's personality traits in recent years. However, the findings have been mixed, with contradictory results or, at the very least, inconsistency in the relationship strength, direction, and significance. For example, several studies have found that smartphone addiction had a moderately significant negative association with extraversion (Shi et al., 2017; Xu and Wang, 2018; Zhang et al., 2018). This has been framed using social reinforcement theory, which posits that for low extraversion adolescents, smartphone use can effectively enhance their contact with the outside world to make up for their lack of language expression skills and social skills, while simultaneously avoiding embarrassment from to actual interpersonal situation. This indirectly leads to individuals using smartphones more frequently or excessively and increases their risk of smartphone addiction (Bahtiyar, 2015). Meanwhile, others studies have found that extraversion was positively associated with smartphone addiction (Du et al., 2012; Zhang et al., 2016), explained as being due to the difference in individuals' optimal arousal levels. Compared with those with low extraversion, adolescents with high extraversion

have high levels of sensation-seeking and need more external stimulation to continuously meet their needs for arousal (Hussain et al., 2017). In terms of stimulus source, the vast amount of information and the rich, novel types of information the smartphone can provide meets those high extraversion stimulation demands.

With regards to the psychoticism dimension, some studies have found that smartphone addiction has a significant positive correlation with psychoticism (Zhang et al., 2016; Zhu and Zhi, 2016). From the perspective of evolutionary psychology, due to the limitations of human ability, people choose to live in groups to make up for their individual shortcomings, and socialization has gradually evolved to become a basic coping style through which individuals can deal with external crises (He et al., 2017). But high psychotic individuals with a low socialization level often have to bear the pressure of life alone due to their lack of effective positive coping strategies. As such, smartphones have gradually become a primary tool for such individuals to find respite from reality (Zhang et al., 2016). However, there have also been studies with opposing findings, that there was no significant correlation between psychoticism and smartphone addiction. For example, Qiu and Zhang (2014) investigated the differences in personality traits of adolescents either with or without smartphone addiction, and found that there was no significant difference in psychoticism between the two groups. Shi et al. (2017) conducted a scale test on 476 college students and also found no significant relationship between psychoticism and smartphone addiction. Consequently, the correlation between smartphone addiction and psychoticism is still uncertain.

Similarly, there is also considerable controversy about the relationship between smartphone addiction and neuroticism (He et al., 2017; Zhang et al., 2018; Xiong, 2019). The majority of studies have based themselves on the theory of emotional dissonance, which suggests that high neurotic individuals are more often in a state of emotional instability, and thus need to seek ways to cope with negative emotions more often (Li et al., 2017; Zhang et al., 2018). Naturally, the convenience and diverse entertainment options of smartphones provide them with more possibilities to regulate their emotions, and the results of these studies suggested a significant positive correlation between smartphone addiction and neuroticism. Nevertheless, there were large differences between these studies, with r values ranging from 0.03 to 0.50 (Gao, 2017; Xiong, 2019).

To sum up, as these and other existing studies show mixed results, the relationship between smartphone addiction and Eysenck's personality traits is ambiguous. What is the relationship between smartphone addiction and Eysenck's personality traits, and what are the moderating factors? To determine this, it is necessary to conduct a comprehensive and targeted meta-analysis study of the relevant literature.

Potential Moderators

It is possible that moderating variables might explain some of the above-mentioned inconsistencies in existing findings regarding smartphone addiction and Eysenck's personality traits. This section describes these potential moderators in detail.

Sex

In the field of smartphone addiction, virtually all studies have indicated that females spend significantly more time (Lopez-Fernandez et al., 2012) and money (Roberts et al., 2014) on their smartphones than males, and the proportion of addiction has also been shown to be higher in females (Billieux et al., 2015; Zhang et al., 2019). Meanwhile, there are considerable differences in the content of smartphone use between different the sexes. Some studies have shown that females use them more for voice calls, social networking, and online shopping, while males use them more for watching videos and game applications, and males also demonstrate a higher use risk (e.g., cyber violence) compared to females (Desola et al., 2016). Additionally, differences have been found in personality tendencies between the different sexes, for example, several studies have revealed significant sex differences in extraversion and neuroticism factors. Specifically, compared to males, females score higher on the neuroticism scale and, to a lesser degree, on the extraversion scale (Herrera et al., 2016; Nguyen et al., 2019). Given sex differences in both smartphones use and personality tendencies, then, the relationship between smartphone addiction and Eysenck personality traits could also be moderated by sex.

Age

From the perspective of lifelong development, younger ages are associated with having worse self-control. When younger people use a smartphone, it is more difficult for them to resist the temptation of applications such as videos and games, thus increasing their likelihood of developing smartphone addiction (Desola et al., 2016). Several empirical studies have found that the time an individual spends using smartphones declines with age (Desola et al., 2016; Ding and Zhao, 2018; Xiong, 2019). Additionally, Hayes et al. (2015) found that time length, frequency, and intensity of mobile social media use in adolescents were significantly higher than in adults. Therefore, the current study speculated that there might be differences in susceptibility for smartphone addiction among adolescents of different ages, which would affect the relationship between smartphone addiction and Eysenck's personality traits.

Year of Publication

Demographic information pertaining to smartphone ownership indicates a steady increase in ownership over the last decade, with the penetration rate of smartphones rising from 74.5 to 99.2% from 2012 to 2021 (China Internet Network Information Center, 2021). With such growth in numbers of users, it is only logical that the problem of smartphone addiction has also become increasingly prominent. A previous meta-analysis on behavioral addiction showed that the year of publication plays an important moderating role in findings (Gao et al., 2020; Pan et al., 2020). Therefore, the current study speculated that year of publication might moderate the relationship between smartphone addiction and Eysenck's personality traits.

Measuring Tools

Currently, there is lack of uniform regulations or evaluation standards regarding the measurement tools for smartphone

addiction. The different tools have differences in dimension division, item numbering, and scoring methods, all of which may affect study results. Eisenberg and Miller (1987) pointed out that differences in measurement tools can directly affect the strength of the relationship between different variables. Therefore, the relationship between smartphone addiction and Eysenck's personality traits could be affected by differences between measurement tools used to evaluate smartphone addiction. Finally, in addition to the possible moderators already mentioned in this section, the current study also attempted to explore the potential impacts of certain demographic variables that have been ignored in the past, such as sample region, with a view to fill these voids in the existing empirical research.

Purpose of This Study

Great differences exist between the results of different studies despite the fact that substantial empirical research has already been accumulated on the relationship between smartphone addiction and Eysenck's personality traits, which is vital for researchers to conduct accurate quantitative analysis. A meta-analysis (quantitative systematic review) is a statistical technique for amalgamating, summarizing and reviewing primary quantitative research. By combining information from all relevant studies, meta-analyses can provide more accurate estimates than those derived from the individual studies included within a review (Glass, 1976). Two previous studies have tried to conduct meta-analyses on the association between smartphone addiction and personality traits, but one of these studies included only 16 articles, which might not effectively represent the actual levels of smartphone addiction and Eysenck's personality traits. Moreover, the samples used were college students only, and the moderator only examined the measurement tools and literature types, but did not analyze the reasons for the inconsistencies between previous study results (Guo, 2017). The second existing meta-analysis investigated the relationship between smartphone addiction and the Big Five personality traits rather than Eysenck's personality traits, and the samples were not focused on the adolescent population in China (Gao et al., 2020). This study therefore aims to clarify the utility of the relationship between smartphone addiction and Eysenck's personality traits in consideration of Chinese adolescents by using meta-analysis techniques, while also investigating a range of factors that may have contributed to the observed inconsistencies between previous findings by moderating this relationship. The intent of the current study is to clarify the controversy in existing research conclusions, and to provide explanations and evidence from a Chinese adolescent population regarding the relationship between smartphone addiction and Eysenck's personality traits.

METHODS

Literature Search

Due to the fact that the smartphone was only popularized in Chinese mainland in 2012 (Xie, 2013), the study publishing dates included in this meta-analysis ranged from 2012 to 2021 to eliminate interference caused by studies looking at non-smartphone mobile phones. We searched for empirical studies focused on the relationship between smartphone addiction and Eysenck's personality traits published between January 2012 and June 2021. Chinese databases used included: China National Knowledge Infrastructure (CNKI), Chongqing VIP Information Co., Ltd (CQVIP), and Wan-Fang DATA. English databases used included: EBSCO, Web of Science, Psy INFO, and Google Scholar. The following keywords were used: for smartphone addiction, "smartphone addiction," "mobile phone addiction," and "mobile phone dependence;" for Eysenck's personality traits, "Eysenck personality," "neuroticism," "extraversion," and "psychoticism." To avoid unintentional omissions, we then conducted a "backward search," where the reference sections of the studies found in the initial searches were used to find other relevant articles. Each article was screened according to the following criteria: (1) It must have reported on quantitative research between smartphone addiction and at least one dimension of Eysenck's personality traits; (2) The study reported sufficient statistical detail (e.g., r, t, F, and χ^2) to allow the calculation of correlations between smartphone addiction and Eysenck's personality traits; (3) All studies must have reported sample size, and each sample must have been independent, excluding cross-samples or duplicate publications; (4) The sample used is made up of Chinese adolescents, excluding mentally ill, left-behind adolescents, or other special individuals; (5) Low quality literature was not included. The current meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews (PRISMA), which provides detailed guidelines describing the methods involving eligibility criteria, information sources, search strategy, etc. for performing a meta-analysis (Moher et al., 2009).

Literature Quality Assessment and Coding

Two reviewers independently assessed the quality of each of the studies using an assessment tool for cross-sectional studies that applies to correlational study design (Ivie et al., 2020). If there was a dispute in the process of the screening an article, the two reviewers would review the article together and differences of opinion would be discussed until an agreement was found. The quality assessment tool consisted of nine items which were each rated as poor (0), fair (1), or good (2) by each independent reviewer. The final score for each article ranged from 0 to 18. An article with a final score of 1–5 was considered to be of low quality, 6–13 was considered to be of moderate quality, and 14–18 was considered to be of high quality. Agreement between the two reviewers' evaluations was determined using a kappa value, with a kappa value of < 0.40 indicating weak consistency, from <0.40 to <0.70 indicating common consistency, and > 0.75 indicating high consistency (Orwin, 1994). The current study showed a high kappa value at 0.87.

The collected articles were coded as follows: first author, year of publication, sex ratio (female), sample size, average age, sample region (i.e., Eastern China, Northeastern China, Central China, and Western China), and the scale used to measure smartphone addiction. Effect size was calculated based on each independent sample only once. If an article included multiple independent sample sizes or outcome indicators, these were divided into a multiple effect size estimates. If sample sizes or outcome

indicators were not reported in the article, or if it was not clear about most of the moderated variables in the study, the article would be excluded in order to maintain accuracy of results in the current study.

The coding process had three phases. First, the corresponding author referred to the article data and encoded the article information. Second, based on the inclusion criteria, the primary studies were independently coded by two of the authors of this current study. Finally, the two coders cross-checked the coding results to verified the accuracy of the data. The comparisons in this final step showed high consistency (98%). The **Appendix** presents the details of all studies included in this meta-analysis.

Computation of Effect Sizes

The correlation coefficient r evaluates the relationship between smartphone addiction and Eysenck's personality traits. Some articles did not report the correlation coefficient but did report t, F, and χ^2, which we converted into a correlation coefficient based on the corresponding formula, namely $r = [t^2/(t^2 + df)]^{1/2}$, $df = n_1 + n_2 - 2$; $r = [F/(F + df)]^{1/2}$, $df = n_1 + n_2 - 2$; $r = [\chi^2/(\chi^2 + N)]^{1/2}$ (Rosenthal, 1991; Lipsey and Wilson, 2001; Zheng et al., 2011). After obtaining the original correlation coefficient r between smartphone addiction and Eysenck's personality traits, all correlation coefficients were transformed into Fisher's z-values to avoid the problematic standard error formulation of the r-values. Next, the Fisher's z-values and confidence intervals were converted back to correlation coefficients to make their interpretation easier (Lipsey and Wilson, 2001).

Data Processing and Analysis

The statistical analysis was conducted using comprehensive meta-analysis software (CMA Version 2.0), which is a program developed specifically for use in meta-analysis. It mainly includes three modules—Data entry, Data Analysis, and High resolution plots. The specific operation method of CMA 2.0 is detailed in the website https://www.meta-analysis.com. Heterogeneity tests were used to determine whether each result was significantly different from the overall effect size. Heterogeneity among effect sizes were determined by computing a Q statistic (Lipsey and Wilson, 2001), and effect sizes were determined to be heterogenous when the Q statistic was significant. Statistical heterogeneity was also assessed using I^2 statistic (Huedo-Medina et al., 2006); a value of 25, 50, or 75% was considered as having low, moderate, or high levels of heterogeneity, respectively. If heterogeneity was high between studies, a random-effects model was used; if instead there was homogeneity, a fixed-effects model was used (Berkeljon and Baldwin, 2009). To further analyze the origin of heterogeneity, moderator variables that contribute to heterogeneity were looked for using the subgroup analysis (categorical variables) and meta-regression analyses (continuous variables; Huedo-Medina et al., 2006).

Publication bias refers to the potential issue that true or full results may not include in a study due to the fear of it not being published if the results lack strength, resulting in a lack of representativeness of the sample or the article not including statistically non-significant findings. The current study employed a funnel plot, Rosenthal's fail-safe N (N_{fs}), and Egger's regression test to assess publication bias. First, if the effect sizes (small circles) observed in the funnel plot were distributed symmetrically around the vertical line, this suggested that potential publication bias was negligible (Viechtbauer, 2007). Second, Rosenthal's fail-safe N (N_{fs}) was used to report a significance level based on k studies, with larger N_{fs} meaning that results were less prone to publication bias. An N_{fs} of $> 5k + 10$ (k is the number of studies included) suggested no publication bias (Borenstein et al., 2009). Finally, using the Egger's regression test, and if the results of the Egger's intercept were not significant, it was determined that publication bias did not exist.

RESULTS

Results of the Literature Search

A flowchart that visually depicts the selection procedure is provided in **Figure 1**. In total, 33 studies ($N = 17{,}737$) yielding 79 independent samples were included in the current meta-analysis, based on the previously outlined selection criteria. Among them were two English publications (Chinese mainland sample) and 31 Chinese publications. Sample sizes ranged 168–2,092 individuals. Participants were from the Eastern, Northeastern, Western, and Central regions of China, covering a total of 15 provincial administrative regions. Sample participants were all Chinese mainland adolescents with sample age means ranging from 16.00 to 21.43 years. The quality assessment scores of all the studies ranged from 11 to 18 with an average score of 15.11, and the overall quality was relatively good.

All studies used self-report scales to measure both smartphone addiction and Eysenck's personality traits. Of the 33 studies, 22 studies used Mobile Phone Addiction Tendency Scale (MPATS) to assess mobile phone addiction in Chinese adolescents. The remaining studies used a variety of other measures such as the Smartphone Addiction Scale for College Students (SAS-C) and the Smartphone Dependence Scale for College Students (SDS-C). According to the suggestion of Card (2012), statistical differences between subgroups were only assessed when subgroups contained at least six independent studies per subgroup. As a consequence, the number of literatures using the SAS-C and SDS-C as measurement tools was too small to calculate the individual effects of these measures. Given the effectiveness and comprehensiveness of the study, SAS-C and SDS-C were referred to collectively as others.

Effect Size and Homogeneity Tests

As shown in **Table 1**, the results of the Q statistic for heterogeneity were statistically significant for each trait, and all I^2 were over 75%, suggesting that the observed dispersion of effect sizes was mostly due to true heterogeneity, which therefore warranted the use of the random effect model (Berkeljon and Baldwin, 2009). Lipsey and Wilson (2001) have suggested that an effect size of $r \leq 0.10$ can be regarded as having a low correlation, while <0.10 r <0.40 and $r \geq 0.40$ can be regarded as having moderate and high correlations, respectively. The average cumulative effect size in the current study indicated that extraversion ($r = -0.06$, $p = 0.079$) was not significantly associated with smartphone addiction, but that psychoticism (r

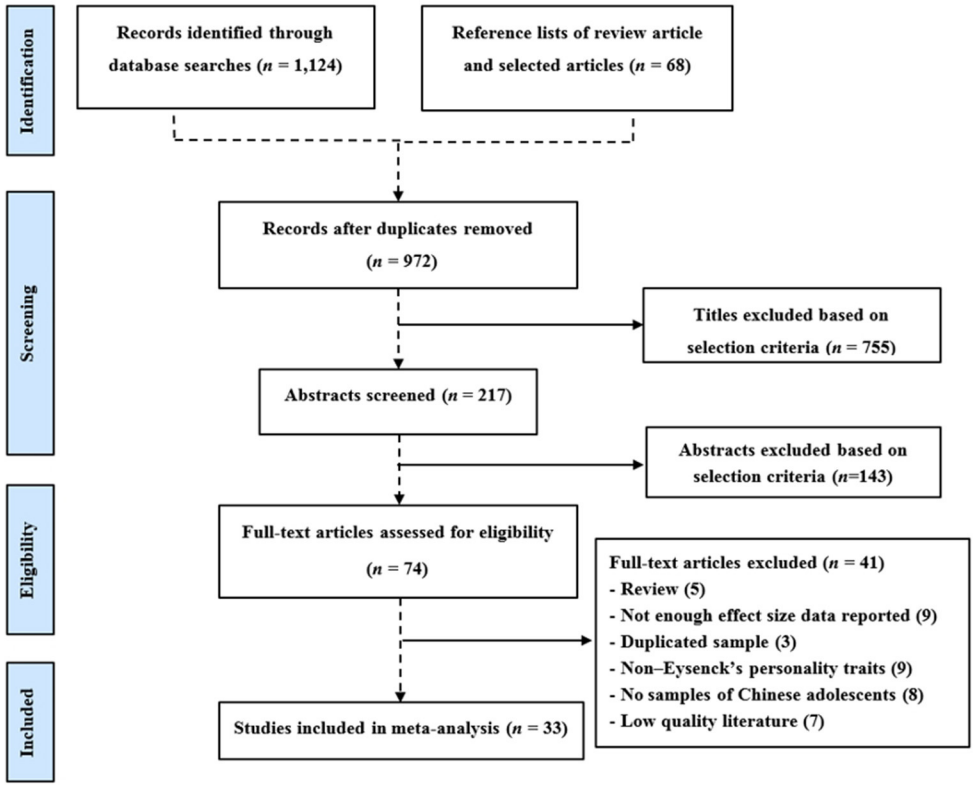

FIGURE 1 | Flowchart describing study selection process.

TABLE 1 | Heterogeneity of effect sizes and publication bias.

Outcome measures	*k*	*N*	*R*	Heterogeneity tests			Publication bias			
				Q	*Df*	I^2	N_{fs}	Egger's intercept	*SE*	95%CI
Extraversion	23	13,261	−0.06	407.32***	22	94.59	504	6.25	3.03	[−0.05, 12.56]
Psychoticism	25	12,281	0.16***	200.11***	24	88.01	1,931	−1.63	1.96	[−5.67, 2.41]
Neuroticism	31	16,980	0.32***	242.54***	30	87.63	4,220	−2.84	1.79	[−6.50, 0.81]

k, number of effect sizes; N, Sample size.
**p <0.05, **p <0.01, ***p <0.001.*

$= 0.16$, $p < 0.001$) and neuroticism ($r = 0.32$, $p < 0.001$) were moderately positively associated with smartphone addiction.

Publication Bias

The funnel plots (**Figures 2–4**) of each of the Eysenck's personality traits were nearly symmetrical, which can be understood as indicating that there was no publication bias (Viechtbauer, 2007). Given the subjectivity involved in interpreting a funnel plot, however, we used Rosenthal's fail-safe N (N_{fs}) as well as Egger's regression test to further assess publication bias (Egger and Smith, 1998; Borenstein et al., 2009). As **Table 1** shows, the N_{fs} of extraversion, psychoticism, and neuroticism was calculated to be 504, 1,931, and 4,220, respectively, and each of these were larger than the criteria of $5k + 10$, which suggests no presence of publication bias. Similarly, Egger's regression test showed that the 95% confidence interval for the intercept of each of Eysenck's personality traits included zero, further indicating that the studies included in the meta-analysis did not show significant publication bias.

Sensitivity Analysis

It is important to keep in mind that outlying literature could disturb the results of a meta-analysis (Lipsey and Wilson, 2001). As such, sensitivity analyses were used to evaluate the robustness of the studies' research results by calculating how the average cumulative effect size changed by removing one study at a time (Borenstein et al., 2009; Li et al., 2019). The results showed that in the relationship between smartphone addiction and each of Eysenck's personality traits, the significance level of average cumulative effect size of deleting any one piece of literature had

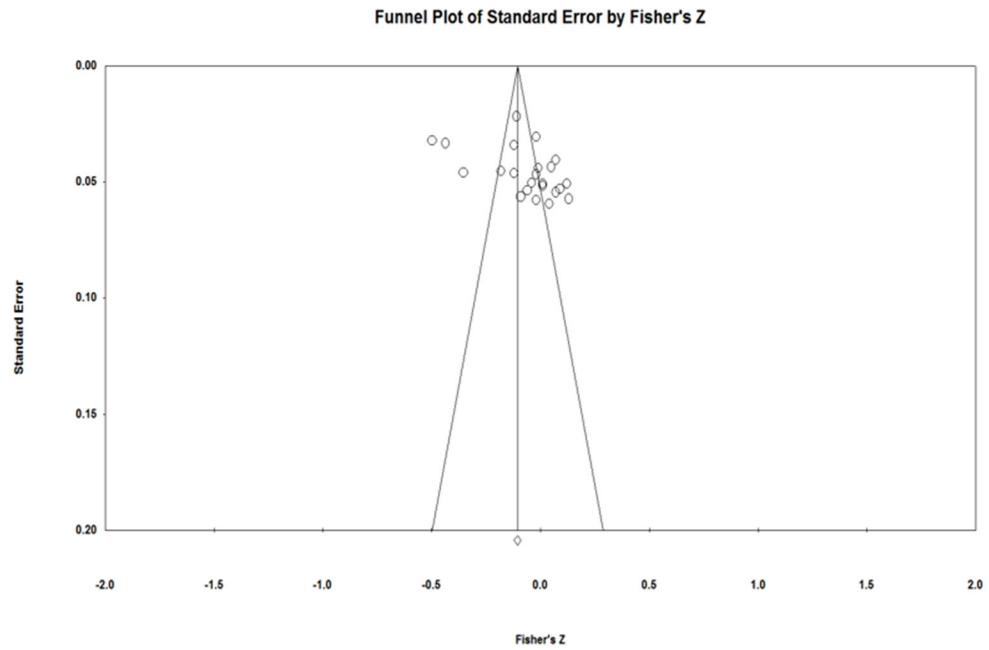

FIGURE 2 | Funnel plot for Eysenck's extraversion.

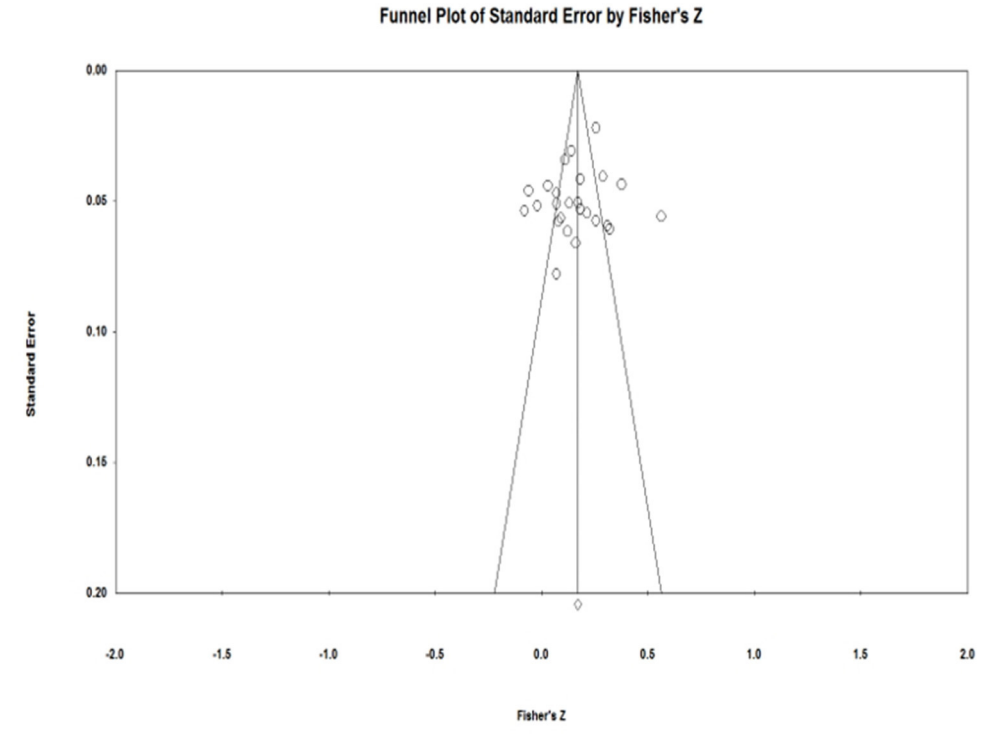

FIGURE 3 | Funnel plot for Eysenck's psychoticism.

no change. In performing this analysis, the maximum change in effect size of extraversion was 0.014, the maximum change of effect size of both psychoticism and neuroticism was 0.010. The absolute difference of average cumulative effect size was <20% both before and after eliminating any data, indicating that the meta-analysis results were quite robust (Field et al., 2020).

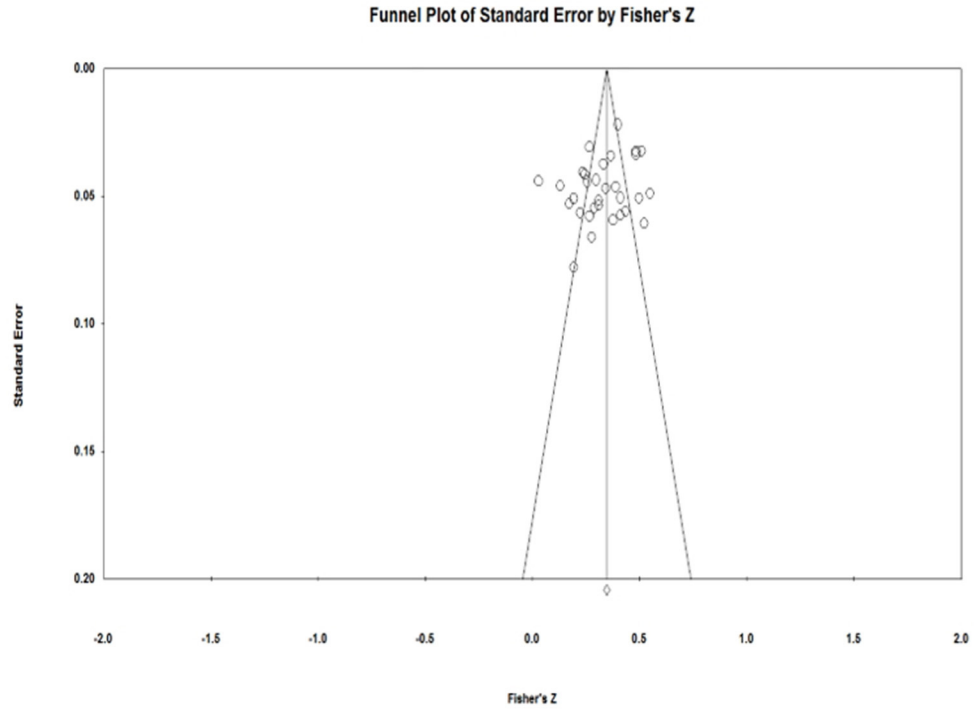

FIGURE 4 | Funnel plot for Eysenck's neuroticism.

Moderation Analyses

The results thus far showed significantly large heterogeneity in the effect size, which suggested the need for exploring potential moderators. Given that the effect size of smartphone addiction and extroversion are not significant, it was of no practical significance to analyze the moderating effects (Lu and Hang, 2007). Consequently, the current study instead explored whether potential moderators affected the relationships between smartphone addiction and both psychoticism and neuroticism, as shown above in **Tables 2**, **3**.

Subgroup and meta-regression analyses showed that sex had a negative moderating effect on the relationships between smartphone addiction and both psychoticism and neuroticism which indicated that, as the number of females in a sample increased, the relationships between smartphone addiction and both psychoticism and neuroticism gradually decreased. Year of publication was found to have a negative moderating effect on the relationship between smartphone addiction and psychoticism, which indicated that as the publication year became more recent, the relationship between smartphone addiction and psychoticism gradually decreased. The remaining hypothesized moderators did not account for significant heterogeneity.

DISCUSSION

The current meta-analysis aimed to determine the relationship between smartphone addiction and Eysenck's personality traits in Chinese adolescents and evaluate possible moderators of this relationship. The results show that smartphone addiction has a positive association with both psychoticism and neuroticism, but no association with extraversion. In addition, the data revealed that sex and year of study publication had significant influences on the relationship between smartphone addiction and psychoticism, and the year of study publication had a significant influence on the relationship between smartphone addiction and neuroticism.

The Relationship Between Smartphone Addiction and Eysenck's Personality Traits

This study revealed that smartphone addiction has a non-significant correlation with extraversion in Chinese adolescents ($r = -0.06$, $p = 0.079$). This illustrates that following the growth in popularity of smartphones in China, and their continuous development toward the current 5G (fifth-generation), the unique draw as well as practicality of smartphones has been highly attractive to Chinese adolescents, both introverted and extroverted. Low extraversion adolescents can effectively enhance their social skills and improve their interpersonal environment through frequent use of smartphones, while adolescents with higher extraversion find that smartphones can meet their needs for increased external stimulation and improve their levels of arousal *via* access to massive amounts of information and tempting application software (Bahtiyar, 2015; Hussain et al., 2017). As a result, there appears to be little difference in the risk of smartphone addiction between introverted and extroverted Chinese adolescents. An additional point worth noting is that

TABLE 2 | Results of categorical and continuous moderators for the association between smartphone addiction and psychoticism.

Moderators		*k*	*N*	*r*/slope	95% CI	Heterogeneity *Q*
Region	Eastern	6	3,548	0.19	[0.13, 0.26]	1.62
	Northeastern	4	1,777	0.14	[−0.01, 0.28]	
	Central	9	4,059	0.13	[0.04, 0.21]	
	Western	3	1,231	0.21	[−0.10, 0.49]	
Measurement tools	MPATS	19	10,543	0.15	[0.10, 0.20]	0.29
	Others	6	1,738	0.19	[0.04, 0.34]	
Year of publication		25	12,281	−0.01	[−0.02, −0.01]	8.02**
Mean age		8	5,108	−0.01	[−0.02, 0.02]	0.01
Sex (% female)		22	11,172	−0.31	[−0.49, −0.13]	11.06***

*r, effect sizes of categorical variables; slope, effect sizes of continuous variable. *p < 0.05, **p < 0.01, ***p < 0.001.*

TABLE 3 | Results of categorical and continuous moderators for the association between smartphone addiction and neuroticism.

Moderators		*k*	*N*	*r*/slope	95% CI	Heterogeneity *Q*
Region	Eastern	8	4,965	0.30	[0.23, 0.37]	2.42
	Northeastern	6	3,467	0.31	[0.22, 0.39]	
	Central	10	4,685	0.35	[0.29, 0.41]	
	Western	3	1,231	0.21	[−0.01, 0.42]	
Measurement tools	MPATS	21	11,980	0.31	[0.27, 0.36]	0.11
	Others	9	4,278	0.33	[0.24, 0.41]	
Year of publication		31	16,980	−0.01	[−0.01, 0.01]	0.05
Mean age		12	8,390	0.02	[−0.01, 0.03]	2.72
Sex (% female)		28	15,871	−0.25	[−0.39, −0.11]	12.01***

*p < 0.05, **p < 0.01, ***p < 0.001.*

this result is inconsistent with the meta-analysis conclusion of Gao et al. (2020), which reported a low correlation between smartphone addiction and extraversion ($r = 0.07$, $p < 0.05$). Two interpretations can be made of these findings. First, that in the current study, the subjects in focus are Chinese adolescents, while Gao et al.' s research subjects came from multiple countries and were primarily adults. Second, although Gao et al. (2020) found that extraversion was significantly positively correlated with smartphone addiction, the effect size is small, reflecting that the relationship between smartphone addiction and extraversion is also weak if it even exists.

Consistent with the perspective of evolutionary psychology, the current study found that there was a moderate positive correlation between smartphone addiction and psychoticism ($r = 0.16$, $p < 0.001$). As a basic human need, socialization is also a primary coping tactic in helping individuals deal with external crises (He et al., 2017). Compared to those with low psychoticism, individuals with high psychoticism generally have more hostility toward others, which in turn causes them to suffer from isolation (Dunlop et al., 2012). Consequently, individuals with high psychoticism find it difficult to integrate into their surrounding environment due to their lack of effective positive coping strategies. This further deepens their antisocial tendencies, and can lead them to vent their resentment through violent or destructive behaviors when confronted with external conflict (Wang et al., 2014). Such behavior does generate a higher risk of social cost in regular society due to the existence of laws, regulations, and the consequential punishment given for breaking these, however by making use of cyber aggression, these individuals with high psychoticism can act on their impulses with a relatively reduced social risk cost (He et al., 2017). Therefore, violent videos, graphic games, and horror movies on the Internet have become popular ways for such individuals to vent themselves (Zhang et al., 2016), which in turn increases their frequency of smartphone and other network media usage.

The current study also found a moderate positive correlation between smartphone addiction and neuroticism ($r = 0.32$, $p < 0.001$), which supports the theory of emotional dissonance (Li et al., 2017). This suggests that individuals high in neuroticism lack emotional regulation abilities and consequently suffer from frequent emotional fluctuations. For this reason, the virtual world provided by smartphones can provide them with comfort from these stressful emotions (Gao et al., 2017). Particularly in regards to education, Chinese parents attach great importance to their adolescents' academic performance as the parents generally believe that education is their child's best way to success, and Chinese traditional culture encourages adolescents to strive to achieve good grades, for themselves but also for their parents. Thus, Chinese adolescents usually face enormous academic

pressure and an excessive amount of homework, the stress of which makes them more vulnerable to extreme emotions (Edward et al., 2017). Furthermore, adolescents' abilities in self-management and willpower are generally weak at this point in their development, and smartphones are portable, extensive, and covert, particularly when compared with other types of media or devices. This could explain why smartphone addiction and neuroticism are more closely connected in Chinese adolescents (Xiong, 2019).

Significant Moderators

As the strength of the relationship between smartphone addiction and Eysenck's personality traits may differ between the various sexes, measurement tools, ages, publication years, and regions, one single study cannot accurately reflect the accurate strength of this relationship. Therefore, the current study explored the possible moderators that could affect this relationship through subgroup and meta-regression analyses.

With regards to moderation due to sex, the current study found that the proportion of females in a sample significantly negatively moderated the relationship between smartphone addiction and psychoticism, which indicates that this relationship was found to be stronger in samples containing more males. This is in line with previous findings which have suggested that variation exists between sexes due to differences in their use of smartphone content, as well as the fact that females have been shown to prioritize social interaction and online shopping in their smartphone use while males are more likely to play games and watch videos (Desola et al., 2016). Meanwhile, males are exposed to more violent games or videos and are thus more likely to exhibit higher levels of aggressive behavior than females (Vangeel et al., 2017). Therefore, males with high psychoticism are also more likely to relieve their stress through playing violent games than females with high psychoticism, thus increasing the possibility of smartphone addiction and resulting in a stronger relationship between smartphone addiction and psychoticism in males than females. Similarly, the current study also found that females had a lower correlation between smartphone addiction and neuroticism than males. It is possible that females' emotional intelligence level and emotion regulation strategies are generally better than males' (Zhang et al., 2018). As a result, females would have more ways to regulate their emotions (e.g., talking to people, crying, etc.) rather than simply turning to their smartphones when experiencing mood fluctuations.

Regarding the year of publication, this meta-analysis included only papers published from 2012 to 2021, and found that the year of publication significantly negatively moderated the relationship between smartphone addiction and psychoticism. In other words, this positive relationship weakened with the increase of the year of publication. In recent years, the Chinese government has developed and refined what's termed the "Clean Network," where administrative organs in the areas of cyberspace management were ordered to step up efforts to restrict or limit online access to violent games and videos and other information perceived as harmful, resulting in a gradual decrease in the probability of individuals coming in contact with violent videos and games while using the Internet (Sun, 2016). Therefore, this Clean Network has likely reduced the frequency of high psychotic individuals being able to access violent games or videos through smartphone to a certain extent. At the same time, this study also found that the relationship between smartphone addiction and neuroticism did not change significantly with the year of publication. This illustrates that the smartphone, as a primary tool of today's society, can be used to adjust or manage personal emotions or pressures, but can also easily lead to smartphone dependency, particularly in individuals with emotional instability, and that this state then remains unchanged over time (Billieux et al., 2015).

Non-significant Moderators

Contrary to expectations, the relationships between smartphone addiction and both psychoticism and neuroticism were not shown to be moderated by region, suggesting that these relationships remains similar across different regions in China. This study divided the Chinese mainland into four regions based on levels of economic development. The economic level in the Eastern China is the highest, followed by Central and Northeastern China, with Western China as the lowest (Wang and Jin, 2002). The moderation effect of regional economies is not significant on the relationship between smartphone addiction and either psychoticism or neuroticism, which may be because smartphones have essentially achieved universal coverage across the Chinese mainland, and most smartphone applications in China today, such as WeChat and QQ, are free of charge or low cost. As a result of such accessibility, then, regional economic level as a moderating variable is reduced.

Inconsistent with most prior studies, certain studies have investigated whether smartphone addiction tends to decrease with the age of individuals (Desola et al., 2016; Hwang and Park, 2017; Ding and Zhao, 2018). The current study found that the relationships between smartphone addiction and both psychoticism and neuroticism were not moderated by an individual's age, which may be because previous studies have been mainly focused on whole age ranges of individual development (Desola et al., 2016; Liu Q. X. et al., 2017). In the current study, the sample in focus was only adolescents, which suggests that the relationships between smartphone addiction and both psychoticism and neuroticism may have stage stability in adolescence. Meanwhile, it should also be noted that the age range of samples included in this study is 16.00–21.43 years, which does not encompass the whole stage of adolescence. In the future, this age range focus should be further expanded to verify whether the conclusion is robust.

Further, smartphone measurement tools were not found to be a significant moderator of the relationships between smartphone addiction and psychoticism or neuroticism, which reflects the high consistency between smartphone measurement tools. It could be that, despite the differences between MPATS and other tools in terms of item numbers, dimensions, or scoring methods, the theoretical basis of each of the smartphone measurement tools is based on the Internet addiction standard as established by Young (2009). Consequently, differences between different smartphone addiction measurement tools used in a Chinese context are more reflected in the form, while the actual test

content may not be different (Liu Q. X. et al., 2017). There is a strong consistency between them, which eliminated the concern regarding interference of measurement tools on the results of the current study.

LIMITATIONS AND FUTURE DIRECTIONS

This study is the first meta-analysis on the relationship between smartphone addiction and Eysenck's personality traits among adolescents in China. The results have helped to clarify the controversy of previous studies regarding this relationship, and have identified potential moderators affecting this relationship. We believe that the focus on Chinese adolescents also makes a special and important contribution to the existing literature. However, some limitations should be noted: (1) This study investigated the relationship between smartphone addiction and Eysenck's personality traits in Chinese adolescents, but failed to take into account all personality types, such as those included in the Big Five Personality framework. Future research should further expand its scope to comprehensively understand the relationship between smartphone addiction and a wider range of personality dimensions of Chinese adolescents. (2) In the subgroup analysis, the distribution of the number of regulatory variables was not balanced, and some sample sizes were too small, which may have affected the research results. (3) Few longitudinal studies were available to evaluate changes in the relationship between smartphone addiction and Eysenck's personality traits over time. (4) Finally, as not all the primary studies provided sufficient data points and information from reviewed studies, we were unable to test potential moderators such as rural/urban areas or educational attainment. We think that these moderators are important for the relationship between smartphone addiction and Eysenck's personality traits in the context of Chinese society and, as such, warrant further investigation.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

SX started the original study conceptualization and drafted the Introduction and Discussion sections. YX, LZ, and JX conducted data collection, quality assessment, and coding of the studies. BZ conducted the data analysis and made a draft for the Results and Methodology section. All authors read and approved the manuscript. All authors contributed to the article and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2021.794112/full#supplementary-material

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Gambling, Gaming, and Internet Behavior in a Sexual Minority Perspective. A Cross-Sectional Study in Seven European Countries

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Background: Addictive behavior of gambling, gaming and internet activity is partly a new research domain and has not been well investigated with regard to sexual minority populations. Although health disparities between sexual minorities and the general population are well documented, there is a lack of inclusion of sexual minorities in both research and clinic. Among lesbian, gay and bisexual populations certain features could be present that play a role for the development of addictive behaviors, such as social isolation and increased risk of other psychiatric problems. The aim of this study was to investigate problem gambling, problem gaming and problematic internet behavior in a European context and if it is affected by sexual orientation status.

Methods: An online web-survey was distributed among web-panels in England, Poland, Switzerland, Italy, Spain, Denmark, and Sweden in 2017–2018.

Result: 10 983 complete answers were collected. 7.1% of the participants had a sexual minority status (n = 774). Regression models found that there was no difference in gambling, gaming and internet behavior among heterosexual and sexual minority men. Sexual minority women were associated with problematic gambling and gaming behavior, when also controlling for age and nationality. When also controlling for psychological distress, women defining as having another sexual minority status than lesbian and bisexual remained significant for having a problematic gaming behavior (AOR = 2.3).

Conclusion: An awareness of female sexual minority perspectives is relevant in facilities treating behavioral addiction as well as in future research in behavioral addiction. More research is needed in problematic gambling and gaming behavior in different sexual minority populations with regard to psychiatric comorbidity and living conditions. An

inclusion of sexual minority groups defining as other than gay and bisexual is needed in future research. No significant differences were found between heterosexual and sexual minority men in adjusted analysis in this study.

Keywords: gambling, gaming, sexual minorities, Europe, lesbian, gay, bisexual, internet behavior

BACKGROUND

Gambling with money is an activity that for some individuals could lead to a problematic behavior, with different levels of severity. Pathological forms of gambling have shown great similarities with substance dependence in literature with a development of a tolerance, withdrawal symptoms, failed efforts to stop gambling and severe social and relational consequences, according to the American Psychiatric Association (American Psychiatric Association [APA], 2013). Despite the similarities in gambling disorder and substance dependence, it was not until 2013 that pathological gambling was moved to the chapter of addiction disorders in the DSM-5 manual (American Psychiatric Association [APA], 2013). Earlier, it had been categorized as an impulse control disorder. Gambling disorder has not been as well documented as other addiction disorders in a global perspective, although it has been associated with a difficult psycho-social and socio-economic situation (Muggleton et al., 2021), a high comorbidity with other psychiatric conditions (Castrén et al., 2013; Dowling et al., 2015; Håkansson et al., 2018) and suicidal behavior (Black et al., 2015), including completed suicide (Karlsson and Håkansson, 2018). Past-year prevalence of any kind of gambling problem is varying between 0.1 and 5.8% globally in an overview article by Calado and Griffiths (2016). Gambling problems have been associated with a lower degree of education, male gender and a risky alcohol consumption (Wong et al., 2003; Abbott et al., 2014; Del Pino-Gutiérrez et al., 2017). Globally, gambling problems among women seem to have a later onset than among men, and may be associated with a higher psychiatric comorbidity than in men with gambling problems (Díez et al., 2014; Carneiro et al., 2019). Gambling is an activity that in some settings is showing a rapid movement from mainly land-based gambling forms, into online forms such as casinos and online betting forms (McCormack et al., 2013; Håkansson et al., 2017). Online gambling could contain certain features that are suggested to increase the risk of developing a pathological gambling, and a regular participation in online casino and betting has been correlated with a higher rate of gambling problems (McCormack et al., 2013).

The most recent addiction disorder in ICD-11 (World Health Organization [WHO], 2018) is the internet gaming disorder, i.e., a pathological use of electronical games which is still a tentative diagnosis in DSM-5 (American Psychiatric Association [APA], 2013), due to an insufficient amount of research at the time. Playing electronical games is a common activity among adolescents and young adults, that could be related to positive features such as improved short-term memory (Adachi and Willoughby, 2013). For the large majority of users, it is a leisure activity with no relation to a problematic behavior. A low to moderate participation in electronical games (1–5 h per week) has even been associated with lower substance usage than among non-players in a recent publication (Turel and Bechara, 2019). A qualitative interview study also supports the theory that electronical games could be protective factor against substance use among adolescents (Törrönen et al., 2019). Bearing this knowledge in mind, it still seems as for a minor part of the population the gaming activity has been suggested to develop into an addictive behavior. The prevalence of gaming disorder is suggested to range from 1.2 to 1.7% among adolescents in European contexts (Rehbein et al., 2015; Vadlin et al., 2015; Wichstrøm et al., 2019). Excessive gaming involves spending a large amount of time on gaming, loss of control, aggressive behavior, conflicts with family members and withdrawal symptoms, related to sudden stops in gaming activity (Lemmens et al., 2009; Gentile et al., 2017). Individuals with gaming problems have been associated with personal traits that could be a challenge for establishing "real-life" relations, such as neuroticism, shyness and low self-esteem (Peters and Malesky, 2008; van Rooij et al., 2014; Laconi et al., 2017). Though gaming could involve both offline and online games, specific types of online games have been associated with gaming problems to a higher degree than offline games. Massive multiplayer online role-playing games (MMORPG) are the type of games that often are mentioned, where the players interact with each other during the game session (Peters and Malesky, 2008; American Psychiatric Association [APA], 2013). Given the fast development of the gaming culture and multiplayer online games, the research within the field is still scarce. As with gambling disorder and substance-related disorders, gaming problems seem to be overrepresented among men in the general population (Lemmens et al., 2015; Vadlin et al., 2016).

Research in behavioral addictions is still scarce and the area is somewhat controversial. There is an ongoing dialogue on which behaviors that might be included in the future where social media and other electronical activities than games and potential health effects are discussed (Kuss and Griffiths, 2011; Yau and Potenza, 2015; Chamberlain et al., 2016; Grant et al., 2017). Although it seems as it is the kind of online activity that could be problematic and in some cases addictive (Young, 1999; Kuss and Griffiths, 2011), an excessive use of the internet in general has been related to a poorer mental health status. A problematic use of the internet could be defined as an excessive use leading to emotional, physical, social or functional impairment (Moreno et al., 2016). In a publication exploring addictive internet behavior in a psychiatric population, excessive internet usage was 3.29 times higher in the group with psychiatric conditions compared to the control group (Yar et al., 2019).

Prevalence of mental health problems, suicidal thoughts and behavior and substance use problems have been more

extensive among lesbian, gay and bisexual individuals, compared to heterosexual groups (Cochran et al., 2004; Marshal et al., 2009; Corliss et al., 2010; Lucassen et al., 2017; Di Giacomo et al., 2018). Substance use problems seem to have an earlier age of onset than among heterosexual youth and persist into adulthood in a larger extent (Marshal et al., 2009; Dermody et al., 2014; Schuler and Collins, 2020). Most research is conducted in Northern American settings, although the same pattern in health disparities for substance use and mental health problems has been demonstrated for sexual minorities in Europe in studies and reports (Russell and Fish, 2016; Björkenstam et al., 2017; Bränström and Pachankis, 2018; Di Giacomo et al., 2018). Substance use problems have been more prevalent among lesbian and bisexual women compared to heterosexual women in several studies (Roxburgh et al., 2016; Drabble et al., 2018; Schuler and Collins, 2020). Bisexual women might have a higher risk for substance use problems compared to lesbian women in some settings (Schuler and Collins, 2020).

Research on gambling and gaming activities in among lesbian/gay, bisexual and other sexual minority populations is scarce. Two studies have examined gambling behavior and sexual orientation in Northern American settings, where of both studies revealed a higher prevalence of gambling problems among sexual minorities (Grant and Potenza, 2006; Richard et al., 2019). For gaming, previous literature is lacking, but a few publications have shown a higher prevalence of gaming problems among sexual minority populations, including a pilot project to this study in a Swedish setting (Broman and Håkansson, 2018). Historically, the LGBTQ-population has faced several challenges considering how sexual and gender minorities have been criminalized, considered perverted and pathologized (Drescher, 2015). Living conditions still differ immensely in different European settings (European Union Agency for Fundamental Rights [FRA], 2013), reasonably affecting the willingness of openness in different settings. Although health disparities between sexual and gender minorities and the general population are well documented, there is still a lack of inclusion of these minority groups within research concerning medicine and health.

The minority stress theory (Meyer, 2003) is a theoretical framework for understanding how stigma due to sexual or gender minority status could explain the disparities in health between the LGBT-population and the general population. Living conditions for the LGBTQ-population and the general population might impact the degree of openness and trust for health care system and social services (Röndahl, 2009; Ramos et al., 2019). The living conditions also seem to differ depending on the sexual orientation status. Discrimination and experience of psychological and physical violence has been more frequently reported among the lesbian, gay, and bisexual populations than in the general population in several settings (Blosnich et al., 2015; Bränström, 2017; McKay et al., 2017), which supports the theory that the disparities in health could be a result of minority stress. In some settings, homosexual and bisexual women more frequently report experiences of stigma and victimization and more mental health problems compared to heterosexual women (Hequembourg and Brallier, 2009; Roxburgh et al., 2016; Björkenstam et al., 2017). Bisexual women have also presented more substance-related problems and psychological distress compared to heterosexual women (Bränström and Pachankis, 2018). A number of publications have shown an association between stigma in forms of discrimination, violence, less satisfying economic and social features and a higher risk for mental health and substance use problems among lesbian, gay and bisexual populations (Lehavot and Simoni, 2011; Hatzenbuehler and Pachankis, 2016; Gustafsson et al., 2017; Bränström and Pachankis, 2018; Bränström et al., 2020).

The health disparities between these groups and the general population are well documented; yet, sexual minorities are typically reached to a lesser extent than others by clinical interventions and in research (Ash and Mackereth, 2013; Russell and Fish, 2016). Among sexual minorities certain features could be present that play a role for the development of addictive behaviors, such as social isolation and increased risk of other psychiatric problems. Based on these knowledges, and due to the fact that behavioral addiction is still a young research field, the aim of this study was to analyze whether problem gambling, problem gaming and problematic internet behavior are more common in individuals belonging to sexual minorities in a number of European countries.

MATERIALS AND METHODS

The investigation was designed as a web survey and was performed in seven European countries; Sweden, Denmark, England, Spain, Italy, Poland, and Switzerland. All data was self-reported. The investigation was carried out between August 2017 and June 2018. The researchers cooperated with a company called Userneeds.[1] Userneeds is a company operating in several European countries, providing web panels of voluntary online users that have agreed to participate in different types of surveys, normally within marketing research. The participants in the web panels are given credits for completing a survey, based upon the time it takes to fill in the questionnaire. The credit had a monetary value, which in this survey corresponded to 1 euro. Userneeds provided the researchers with approximately 1,500 complete answers in each country, representable for age and biological gender compared to the general population in each country or province. All participants had to fill out an electronical informed consent, by clicking a box where they confirmed to be > 15 years of age and that they had understood the information, before gaining access to the survey. Fifteen years of age was the age limit for when a parental consent was not needed for participation in most included countries. The exceptions were England and Poland, where the age limit for participation without parental consent was 16 years and Italy, where 18 years of age was the legal age for participation. No information was gathered about names, social security number or geographical whereabouts that made the participants identifiable by any of the companies or the researchers. IP-addresses were not accessible for the researchers. In order to complete the survey, all questions were decided to be mandatory. Ethical approval was collected from the regional

[1]https://userneeds.com/en/

ethics committee from each country where this was required (Sweden, Italy, Poland and Spain). A direct dialogue was held with the regional ethics committee in Denmark, England and Switzerland who informed the researchers that the survey was not considered to require an approval from them.

Instrument and Measures

All measures in this investigation were self-reported. Sociodemographic variables collected in the survey were age, occupation, sexual orientation (heterosexual, homosexual, bisexual and other) and gender (male, female, transgender). Apart from the three instruments screening for behavioral addictions and sociodemographic variables, three additional questions were asked. The first question aimed to describe social isolation, asking whether the respondents had a satisfying number of social contacts (outside the internet), had too many social contacts, or felt lonely and wished to have more social contacts. The participants were then asked if they had ever felt the need to seek professional help due to psychological distress, a question that was optional (the alternative "I do not wish to answer" was added). Finally, the survey contained a question investigating how many hours that was normally spent communicating with others online per day, including social medias, WhatsApp, Skype, online rooms (including chat rooms in games). The response alternatives were less than 1, 1–2, 2–3, 3–4, or 4 h or more, where 3–4 h or more was used as a cut-off indicating a high use of online communications. Sexual orientation was categorized into two groups (heterosexual vs. homosexual, bisexual and other). All variables were dichotomized for the bivariate analysis. Gender was categorized into male and female. Due to requirements from the regional ethics committee in Italy, sexual orientation was optional in the Italian survey ("I prefer not to say was added as response alternative"). Apart from the question about sexual orientation in the Italian survey and the question about psychological distress (in all countries), remaining questions were mandatory in order to complete the survey. Since the number of transgender participants were few in the whole material ($n = 16$), they were excluded from the analyses. The Italian respondents who chose not to reveal their sexual orientation ($n = 21$), and answers that were partial, were also excluded from the final analysis ($n = 966$).

The three following instruments were used to assess the three different addictive behaviors. A back-translation into English, carried out by an independent person with native level of Swedish and English, was judged to yield satisfactory results.

1. The NODS-CLiP screening instrument, consisting of 3 questions with a "yes" or "no" response alternative, was used to assess gambling problems. The cut-off used for gambling problems, was one point or more on the NODS-CliP instrument. The instrument is suitable for epidemiological population surveys as well as in clinical settings, and with a documented high sensitivity and specificity (Toce-Gerstein et al., 2009). Internal consistency was calculated with Cronbach's alpha value of 0.68.
2. Gaming problems were identified using the game addiction scale (GAS) for adolescents. The instrument consisted of a Likert scale with 1–5 points on each of the 7 items, ranging from never to very often. For a problematic gaming behavior, having at least 3 points on 4 of the 7 items was used as a cut-off, in accordance with Lemmens et al. (2009). Internal consistency was calculated with Cronbach's alpha value of 0.89.
3. The original version of the Problematic and risky internet use screening scale (PRIUSS) contains 18 items. A problematic internet behavior in this survey was assessed with the 3-items PRIUSS Likert scale, a shorter version of the original 18 items scale, ranging from never to very often. The completed score for an individual was 1–12 points and 9 points or more was used as a cut-off for a problematic behavior, the higher cut-off defined by Moreno et al. (2016). Internal consistency was calculated with Cronbach's alpha value of 0.81.

At the end of the survey, a recommendation was provided to the respondents; risk behavior (and an additional message for higher risk) was communicated, along with a recommendation to seek help, and with a stronger emphasis for participants reaching the higher problem level. The higher problem level for gambling problems was defined as 3 points on the NODS-CLiP instrument, > 3 points on at least 4 items on the GAS-scale for gaming problems, and 9–12 points on the PRIUSS scale for a problematic internet use.

Statistics

Analyses were performed in SPSS version 24. Chi-square test was used for all categorical variables and bivariate analysis, to describe differences between the groups reaching the threshold for a problematic gambling, gaming or internet behavior with the groups with no problematic behavior. All of the three dependent variables (problematic gambling, gaming and internet behavior) were controlled for age, country affiliation, loneliness and a wish for having more social contacts (outside the internet), having considered seeking professional help due to psychological distress, gender and sexual orientation (a heterosexual group and one minority group) in a binary regression analysis. Applying binary regression analysis, country affiliation was added as an independent, categorical variable. First, analyses were conducted separately for women, and men, respectively. For each of the addictive behaviors assessed (gambling, gaming, internet use), we finally conducted a full logistic regression analysis including all eligible subjects and controlling for gender (male vs. female).

Analyses were performed in the whole material, where all seven countries were included in the same analysis. Due to translation problems in the Polish gambling screening protocol, the Polish gambling result was excluded from the gambling analysis. In the Italian survey, > 50% of the participants fulfilled criteria for gambling problems for reasons that were not evident to the researchers. It was considered to bias the gambling result and the Italian gambling result was excluded from the analysis. A higher proportion than expected chose "other" as occupational status (see **Table 1**) in the whole material, considered to entail a risk for a bias by the researchers and occupation was excluded from chi square tests and regression analysis. Separate analysis

was performed for women and men. Associations with a p-value less than 0.05 were considered significant, and the binary regression model was analyzed with 95% confidence intervals (CI) for each of the potential correlates of problem gambling.

RESULTS

Sample Characteristics

A total of 11 955 participants were included, where of 10 983 answers were complete and included in the final analysis. Among these, 16 defined as transgender. No result is presented in the study specifically for the transgender group since it was considered too small to perform any comparing analysis. A total of 392 subjects (3.5 percent) were in the youngest age group (15–18 years), nine percent (n = 1,013) were 19–24 years old, 10 percent (n = 1,106) 25–29 years, 19 percent (n = 2,121) 30–39 years, 20 percent (n = 2,266) 40–49 years, 19 percent (n = 2,171) were 50–59 years old, and 19 percent (n = 2,144) were 60 years of age or older. The socio-demographic characteristics are summarized in **Tables 1A–C**.

Result Gambling

In the five included countries (Sweden, Denmark, Switzerland, England, Spain, n = 7,982), gambling problems were positively correlated with loneliness (14.5 vs. 19.1% among problem gamblers, $p < 0.001$), psychological distress (22.3 vs. 32.7% among problem gamblers, $p < 0.001$), male gender (14.0% reached the threshold for gambling problems among women vs. 23.8% among men, $p < 0.001$) and having a sexual minority status (18.6% in the heterosexual population fulfilled criteria for gambling problems vs. 23.1% in the minority population, $p = 0.004$).

When analyzing the female population in the five included countries (n = 3,949), 14% (n = 552) had 1–3 points on the NODS-CLiP instrument, indicating gambling problems. Female problem gamblers were significantly more likely to have experienced loneliness (15.4 vs. 21.6% among problem gamblers, $p < 0.001$), have experienced psychological distress (28.4 vs. 42.9% among problem gamblers, $p < 0.001$) and have a sexual minority status (13.5% in the heterosexual group fulfilled criteria for a gambling problem vs. 20.4% in the minority group $p = 0.001$).

In the male population (n = 4,019), 23.8% reached the level for having a gambling problem on the NODS-CLiP instrument. Problem gambling in the male population was associated with loneliness (13.4 vs. 17.8% among problem gamblers, $p < 0.001$) and psychological distress (15.4 vs. 26.9% among problem gamblers, $p < 0.001$). No statistical significance was found for sexual orientation; 23.6% (n = 874) reached the threshold for gambling problems in the heterosexual group vs. 26.2% (n = 84) in sexual minority group ($p = 0.164$).

In logistic regression, controlling for age, country, social isolation and a need to seek professional help due to psychological distress, a sexual minority status did not have a statistical significance for gambling problems among women (**Table 2**) or among men (**Table 3**). When including women and men in a full, adjusted analysis, problem gambling was significantly associated with younger age, social isolation, need to seek treatment, and with male gender, whereas no association was seen with sexual minority status (**Table 4**).

TABLE 1B | Number of individuals with scores above cut-off for problem gambling, problem gaming, and problematic internet use, per country.

	Gambling (NODS-CLiP), above cut-off	Gaming (GAS), above cut-off	Problematic internet use (PRIUSS value)
All countries	18.9% (n = 1,508)	12.6% (n = 1,385)	3.7% (n = 403)
Median value	0	8.0 (IQR 7–13)	2.0 (IQR 0–4)
Sweden	9.9% (n = 154)	6.1% (n = 95)	2.1% (n = 33)
Denmark	12.2% (n = 196)	4.1% (n = 66)	1.0% (n = 16)
England	23.9% (n = 362)	18.8% (n = 285)	5.5% (n = 84)
Italy	–	16.1% (n = 239)	4.3% (n = 63)
Spain	28.7% (n = 433)	20.7% (n = 313)	5.5% (n = 83)
Poland	–	18.4% (n = 274)	6.4% (n = 97)
Switzerland	20.4% (n = 363)	6.1% (n = 110)	1.1% (n = 28)

Result Gaming

Including all seven countries (n = 10 983) the prevalence of gaming problems in this study was 9.9% [n = 626, median 8.0 (IQR 7–13)] among the women and 13.8% [n = 765, median 9.0 (IQR 7–13)] in the male population with a statistical significance between the groups ($p < 0.001$). The largest proportion of problematic gaming behavior was found among individuals aged 15–18 years (25.4%, n = 99). In descriptive analysis, problematic gaming behavior was associated with loneliness (14.6 vs. 26.3% in the problematic gaming-group, $p < 0.001$), psychological distress (20.3 vs. 38.6% in the problematic gaming-group, $p < 0.001$), gender (11.4% among women vs. 13.8% among men, $p < 0.001$) and having a sexual minority status (12.2% reached the threshold for a problematic gaming behavior in the heterosexual group vs. 18.8% in the minority group, $p < 0.001$).

TABLE 1A | Descriptive data, gender and sexual orientation.

Sexual orientation	All (N = 10,983)	Women (n = 5,448)	Men (n = 5,519)	Transgender (n = 16)
Heterosexual	92.9% (n = 10,199)	93.2% (n = 5,079)	92.7% (n = 5,114)	37.5%(n = 6)
Sexual minority status	7.1% (n = 774)	6.7% (n = 366)	7.4% (n = 405)	
Homosexual	2.7% (n = 294)	1.5% (n = 84)	3.8% (n = 207)	18.8% (n = 3)
Bisexual	2.8% (n = 309)	3.5% (n = 191)	2.1% (n = 117)	6.3% (n = 1)
Other	1.6% (n = 181)	1.7% (n = 94)	1.5% (n = 81)	37.5% (n = 6)

TABLE 1C | Social isolation and psychological distress in groups with different sexual orientation.

Number of social contacts outside the internet	All	Heterosexual	Gay/lesbian	Bisexual	Other
Would have wished for more, feeling lonely	16.1% ($n = 1,765$)	15.6%($n = 1,586$)	22.4%($n = 66$)	24.6%($n = 76$)	22.1%($n = 40$)
Satisfactory or too many social contacts	83.9% ($n = 9,204$)	84.4%($n = 8,613$)	77.6%($n = 141$)	75.4%($n = 233$)	77.9%($n = 228$)
Ever felt need to seek professional help for psychological distress					
Yes	22.6% ($n = 2,481$)	21.7%($n = 2,211$)	33.7%($n = 99$)	44.3%($n = 137$)	21%($n = 38$)
No	77.4% ($n = 8,488$)	78.3%($n = 7,988$)	66.3%($n = 195$)	55.7%($n = 172$)	79%($n = 143$)

Among women, those with a problematic gaming behavior were significantly more likely to have experienced loneliness (15.6 vs. 28.3% in the problematic gaming-group, $p < 0.00$) and have a sexual minority status (10.7 vs. 20.6% in the minority group, $p < 0.001$). The largest proportion of women with a problematic gaming behavior was found among those aged 19–24 years (16.0%, $n = 83$) in the heterosexual group and in the minority group among 15–18 years old (37.2%, $n = 42$). In logistic regression analysis, age, social isolation, psychological distress and other sexual orientation remained significant (see **Table 5**).

TABLE 2 | Problematic gambling women ($n = 3,948$).

	Odds ratio (OR)	Confidence interval (CI)	*p*-value
Sweden	1		
Denmark	1.411	0.947–2.103	0.090
England	3.729	2.620–5.309	<0.001
Spain	6.159	4.352–8.714	<0.001
Switzerland	3.692	2.597–5.247	<0.001
Social isolation	1.245	0.977–1.586	0.076
Experienced need for seeking health care	2.072	1.694–2.533	<0.001
Age	0.869	0.823–0.918	<0.001
Heterosexual	1		
Gay/lesbian	1.338	0.706–2.539	0.372
Bisexual	1.213	0.786–1.874	0.384
Other sexual orientation	1.390	0.750–2.576	0.296

TABLE 3 | Problematic gambling men ($n = 4,019$).

	Odds ratio (OR)	Confidence interval (CI)	*p*-value
Sweden	1		
Denmark	1.287	0.972–1.705	0.078
England	2.718	2.090–3.535	<0.001
Spain	3.136	2.411–4.079	<0.001
Switzerland	2.356	1.815–3.058	<0.001
Social isolation	1.182	0.954–1.465	0.125
Experienced need for seeking health care	1.897	1.574–2.288	<0.001
Age	0.820	0.783–0.860	<0.001
Heterosexual	1		
Gay/lesbian	0.758	0.517–1.110	0.154
Bisexual	0.903	0.548–1.488	0.689
Other sexual orientation	1.342	0.761–2.366	0.310

In the male population, those with a problematic gaming behavior were significantly more likely to have experienced loneliness (13.6 vs. 24.6% in the problematic gaming- group, $p < 0.001$), psychological distress (15.0 vs. 35.6% in the problematic gaming- group, $p < 0.001$) and have a sexual minority status (13.6 vs. 17.1% in the sexual minority group, $p = 0.033$). The age group where a problematic gaming behavior was most common, was among 15–18 years in both the heterosexual (37.0%, $n = 44$) and minority group (28.6%, $n = 4$). Applying binary regression analysis, sexual minority status was not significantly associated with problem gaming in women (**Table 5**) or men (**Table 6**). In a full adjusted analysis including both women and men, problem gaming remained significantly associated with social isolation, need to seek treatment, male gender and with reporting the sexual minority status "other," but not with other sexual minority identifications (**Table 7**).

Result Problematic Internet Behavior

Including all seven countries ($n = 10\,983$), 3.9% ($n = 212$) of the women and 3.5% ($n = 191$) of the men reached the threshold for having a problematic internet behavior. No statistical significance was found between the groups ($p = 0.125$). The median value was 2 in both groups, [(IQR 0–5) among women and (IQR 0–4) among men]. The largest proportion of problematic internet behavior was found among those aged 15–18 years old (9.3%, $n = 36$). In the whole group, a problematic internet behavior was associated with loneliness (15.3 vs. 37.5% in the group with a problematic internet behavior, $p < 0.001$), psychological distress (21.7 vs. 47.6% in the group with a problematic internet behavior, $p < 0.001$) and sexual orientation (3.5 vs. 6.3% in the minority group, $p < 0.001$).

In the female population, those with a problematic internet behavior were significantly more likely to have experienced loneliness (16.2 vs. 38.7% in the group with a problematic internet behavior, $p < 0.001$), have experienced psychological distress (26.6 vs. 46.7%, $p < 0.001$) and have a sexual minority status (3.7 vs. 6.8% in the sexual minority group fulfilled criteria, $p = 0.004$). In the binary regression analysis, having too few social contacts, psychological distress remained significant.

Among men, problematic internet behavior was associated with having too few social contacts and experience loneliness (14.4 vs. 36.1% in the group with a problematic internet behavior, $p < 0.001$), psychological distress 16.8 vs. 48.7% in the group with a problematic internet behavior, $p < 0.001$) and having a sexual

TABLE 4 | Variables potentially associated with problem gambling.

	Odds ratio (OR)	Confidence interval (CI)	*p*-value
Sweden	1		
Denmark	1.351	1.076–1.697	0.010
England	3.070	2.491–3.783	<0.001
Spain	4.140	3.366–5.092	<0.001
Switzerland	2.781	2.258–3.425	<0.001
Male gender	2.375	2.098–2.687	<0.001
Social isolation	1.215	1.036–1.426	0.017
Experienced need for seeking health care	1.951	1.702–2.237	<0.001
Age	0.844	0.815–0.874	<0.001
Heterosexual	1		
Gay/lesbian	0.867	0.623–1.207	0.398
Bisexual	1.039	0.751–1.438	0.817
Other sexual orientation	1.372	0.905–2.079	0.136

Full adjusted analysis controlling for gender (male vs. female gender). N = 7,967.

TABLE 5 | Problematic gaming women ($n = 5,448$).

	Odds ratio (OR)	Confidence interval (CI)	*p*-value
Sweden	1		
Denmark	0.635	0.391–1.031	0.066
England	3.416	2.393–4.876	<0.001
Italy	3.310	2.272–4.820	<0.001
Spain	4.987	3.504–7.097	<0.001
Poland	3.905	2.744–5.558	<0.001
Switzerland	1.386	0.927–2.073	0.111
Social isolation	1.611	1.308–1.983	<0.001
Experienced need for seeking health care	2.184	1.807–2.640	<0.001
Age	0.817	0.776–0.860	<0.001
Heterosexual	1		
Gay/lesbian	1.383	0.770–2.487	0.278
Bisexual	1.377	0.930–2.039	0.110
Other sexual orientation	2.323	1.367–3.946	0.001

TABLE 6 | Problematic gaming men ($n = 5,519$).

	Odds ratio (OR)	Confidence interval (CI)	*p*-value
Sweden	1		
Denmark	0.779	0.493–1.229	0.283
England	4.572	3.172–6.590	<0.001
Italy	4.391	3.031–6.360	<0.001
Spain	4.685	3.246–6.763	<0.001
Poland	3.343	2.310–4.837	<0.001
Switzerland	1.285	0.839–1.969	0.249
Social isolation	1.554	1.261–1.915	<0.001
Experienced need for seeking health care	2.785	2.305–3.366	<0.001
Age	0.668	0.635–0.704	<0.001
Heterosexual	1		
Gay/lesbian	0.727	0.483–1.094	0.126
Bisexual	1.265	0.750–2.136	0.378
Other sexual orientation	1.318	0.679–2.561	0.415

TABLE 7 | Variables potentially associated with problem gaming.

	Odds ratio (OR)	Confidence interval (CI)	*p*-value
Sweden	1		
Denmark	0.745	0.536–1.035	0.079
England	4.165	3.233–5.366	<0.001
Italy	5.135	3.988–6.611	<0.001
Spain	3.810	2.956–4.910	<0.001
Poland	1.357	1.013–1.817	0.041
Switzerland	1.428	0.671–3.039	0.355
Male gender	1.574	1.392–1.779	<0.001
Social isolation	1.562	1.349–1.809	<0.001
Experienced need for seeking health care	2.453	2.147–2.803	<0.001
Age	2.431	0.894–6.611	0.082
Sexual orientation			
Heterosexual	1		
Gay/lesbian	0.902	0.645–1.260	0.544
Bisexual	1.236	0.905–1.688	0.184
Other sexual orientation	1.810	1.196–2.738	0.005

Full adjusted analysis controlling for gender (male vs. female gender). N = 10,967.

minority status (3.3% fulfilled criteria for a problematic internet behavior in the heterosexual group vs. 5.9% in the minority group, $p = 0.006$). In the binary regression analysis, sexual minority status was not associated with problematic internet use in women (**Table 8**) or men (**Table 9**). When including both women and men in a full, adjusted analysis, problematic internet behaviors was significantly associated with younger age, social isolation, and with need to seek treatment, but not with gender or sexual minority status (**Table 10**).

DISCUSSION

The present study did not reveal independent associations between belonging to a sexual minority and screening positive for a problem gambling, problem gaming or problematic internet use behavior. Thus, this study could not confirm the hypothesis of an over-representation of behavioral addiction in sexual minority groups when controlling for a number of demographic and psycho-social variables. However, screening positive was more common in individuals belonging to a sexual minority, both with respect to gaming, problem internet use, and (for women) problem gambling. Thus, based on the present study, there is reason to highlight behavioral addictions in sexual minority group, although it is likely that their over-representation is due to the influence of co-factors.

Problematic internet behavior did not differ between women and men. All three behavioral addictions were significantly overrepresented in the sexual minority group in descriptive analyses, problematic gambling, gaming and internet use. The differences were greater between minority women and women

TABLE 8 | Problematic internet use women ($n = 5,448$).

	Odds ratio (OR)	Confidence interval (CI)	*p*-value
Sweden	1		
Denmark	0.550	0.238–1.274	0.163
England	2.659	1.503–4.704	0.001
Italy	3.171	1.752–5.739	<0.001
Spain	4.483	2.571–7.815	<0.001
Poland	3.738	2.150–6.500	<0.001
Switzerland	0.842	0.402–1.764	0.649
Social isolation	2.435	1.791–3.310	<0.001
Experienced need for seeking health care	2.153	1.593–2.911	<0.001
Age	0.770	0.708–0.837	<0.001
Heterosexual	1		
Gay/lesbian	1.590	0.669–3.780	0.294
Bisexual	1.132	0.623–2.058	0.683
Other sexual orientation	1.011	0.386–2.643	0.983

TABLE 9 | Problematic internet use men ($n = 5,519$).

	Odds ratio (OR)	Confidence interval (CI)	*p*-value
Sweden	1		
Denmark	0.558	0.227–1.370	0.203
England	3.392	1.792–6.422	<0.001
Italy	2.673	1.358–5.260	0.004
Spain	2.795	1.432–5.454	0.003
Poland	3.385	1.790–6.403	<0.001
Switzerland	1.373	0.647–2.916	0.409
Social isolation	2.244	1.615–3.118	<0.001
Experienced need for seeking health care	3.472	2.540–4.745	<0.001
Age	0.760	0.694–0.833	<0.001
Heterosexual	1		
Gay/lesbian	1.235	0.672–2.268	0.497
Bisexual	1.102	0.455–2.666	0.830
Other sexual orientation	2.134	0.814–5.593	0.123

TABLE 10 | Variables potentially associated with problematic internet behavior.

	Odds ratio (OR)	Confidence interval (CI)	*p*-value
Sweden	1		
Denmark	0.569	0.309–1.047	0.070
England	3.089	2.026–4.709	<0.001
Italy	3.010	1.932–4.690	<0.001
Spain	3.725	2.434–5.700	<0.001
Poland	3.724	2.458–5.641	<0.001
Switzerland	1.103	0.656–1.856	0.711
Male gender	1.071	0.869–1.319	0.519
Social isolation	2.345	1.876–2.932	<0.001
Experienced need for seeking health care	2.684	2.161–3.333	<0.001
Age	0.771	0.725–0.819	<0.001
Heterosexual	1		
Gay/lesbian	1.362	0.830–2.235	0.221
Bisexual	1.118	0.684–1.828	0.655
Other sexual orientation	1.442	0.730–2.848	0.292

Full adjusted analysis controlling for gender (male vs. female gender). N = 10,967.

with a heterosexual identity, compared to among men. In binary regression analysis, sexual orientation status was not significantly associated with excessive gambling, gaming or internet behavior when controlling for nationality, age, psychological distress and social isolation among men. Among women, having a sexual minority status in general was significantly associated with gambling and gaming behavior when controlling for age and nationality. When also controlling for psychological distress, social isolation and dividing sexual orientation into gay/lesbian, bisexual and other, only the minority group defining as other remained statistically significant for having a problematic gaming behavior among women.

In descriptive analyses, reaching the threshold for having an excessive gambling, gaming or internet behavior was positively associated with social isolation and psychological distress in the whole study population as well as within each gender (female and male). Problematic gambling and gaming behavior were overrepresented among men in the whole study population, in concordance with earlier publications (Abbott et al., 2014; Lemmens et al., 2015; Calado and Griffiths, 2016).

The result partially confirms the pilot study performed prior to this study, in a Swedish setting. The study revealed a higher proportion of a problematic gaming and internet behavior in the sexual minority population (Broman and Håkansson, 2018). Understanding the impact of gaming habits and psychological health and wellbeing is complex. While a low usage of electronical games has been associated as a protective factor against substance use, a problematic gaming behavior has inversely been associated with a higher substance use of nicotine, alcohol and cannabis along with ADHD, depression and anxiety (Vadlin et al., 2016; Feng et al., 2017; van Rooij et al., 2017; Yen et al., 2017; Turel and Bechara, 2019). Seeing that the field of behavioral addictions have shown an association with problems establishing meaningful relations outside of internet (Peters and Malesky, 2008; van Rooij et al., 2014; Laconi et al., 2017), minority populations with a higher risk for encountering discriminating behavior could find the online arenas attracting.

There is reason to further highlight and examine significance of problematic internet behavior. While this construct describes a maladaptive behavior with respect to internet itself, it does not specify the content of online behavior and thereby also not the specific consequences and correlates of specific actions and experiences made online. Scoring about the cut-off for a problematic online behavior may, therefore, reflect behavioral patterns which are addictive disorders or which constitute other maladaptive behaviors *per se* (Griffiths, 2020). It also has been highlighted by researchers that for an addictive internet behavior, it may be difficult to establish a clear-cut difference between an extensive leisure activity and an addictive disorder (Ng and Wiemer-Hastings, 2005). It is also possible

that this may contribute to the sometimes wide range of prevalence figures reported for this condition (Mihara and Higuchi, 2017; Dahl and Helmersson Bergmark, 2020). The construct of problematic internet use, in the present study, was not associated with sexual minority status in the adjusted analyses, but was markedly more common in unadjusted analyses in sexual minorities as well as in individuals with poor mental health. Thus, altogether, there is reason for further study of online behavior in a broader sense than gambling for money or typical video-gaming, and to further outline, in future study designs, which components make up this potentially diagnostic construct.

In those few earlier publications that exist in behavioral addiction and sexual identity and behavior, gambling disorder was more prevalent among gay and bisexual men in an Northern American setting (Grant and Potenza, 2006) and in a Canadian study sample of college-students, where gambling problems were more prevalent among both sexual minority men and women (Richard et al., 2019). A possible explanation is that there might be differences between American and Canadian settings, in comparison to the European context in this survey. In the Canadian study, the specific study population could make it difficult to compare with this survey that was performed in a broader study sample. Seeing that several mental health problems have been overrepresented among both lesbian, gay and bisexual men and women, it is of importance to highlight if there are no significant differences in this study between gay and bisexual men, in comparison to heterosexual men for behavioral addictions.

Further, another finding was a statistical significance for having experienced psychological distress among those with a gaming problem and sexual minority status, in comparison to the heterosexual participants with gaming problems ($n = 1{,}389$, 52.4% in the minority group vs. 37%, $p < 0.001$). Psychological distress partially explained the variations in gambling and gaming problems in this study among sexual minority women, in adjusted analysis. Earlier research, even if the number of studies is limited within the field, have indicated a higher proportion of self-reported psychiatric symptoms among those with a gaming disorder (Vadlin et al., 2016; Wang H. R. et al., 2018). Although, in a Norwegian study with clinical interviews, a problematic gaming behavior among adolescents was not strongly associated with psychiatric comorbidity (Stenseng et al., 2019). Studies among LGBT-youth have revealed higher rates of depressive symptoms and disorders, anxiety and suicide attempts than among heterosexual populations (Lucassen et al., 2017; Di Giacomo et al., 2018). In this study there is no further assessment of psychiatric symptoms, limiting the opportunity to examine whether mental health problems could explain the prevalence of gambling and gaming problems among the participants in this study.

Women with a gambling disorder in the general population have been found to have a higher level of psychiatric comorbidity than men (Potenza et al., 2001; Grant et al., 2012; Håkansson et al., 2018). It is an indication that women with gambling problems have other characteristics compared with men, and with possible greater psychiatric needs. Since gambling disorder is overrepresented among men globally (Wong et al., 2003; Abbott et al., 2014; Del Pino-Gutiérrez et al., 2017), there is a risk of underrepresentation in female perspectives in both research and treatment facilities. Gender aspects on gambling disorder have been increasingly addressed in recent years, pointing out the importance of addressing gambling with a gendered approach (Bowden-Jones and Prever, 2017). If treatment facilities are based upon the knowledge from gambling patterns typically occurring in men, it could possibly affect the treatment availability for women with gambling disorder. For individuals with gambling or gaming problems that are both female and have a sexual minority status, the treatment availability might be an even greater challenge. The result in this study highlights the need of including sexual minority perspectives of women in further research and treatment facilities in behavioral addiction.

Sexual minority women have been associated with higher rates of depressive symptoms (Lucassen et al., 2017), possibly explaining the higher prevalence of gambling and gaming problems among bisexual women and women with other sexual orientation in this study. Among sexual minority women in this study, both having experienced psychological distress and social isolation explained the variation in problematic gambling behavior. It is suggested that anxiety problems, depression, and substance use problems are more common for bisexual populations in comparison to homo- and heterosexual individuals and specifically among bisexual women, and partially explained by victimization and stigma (Hequembourg and Brallier, 2009; Björkenstam et al., 2017; Bränström and Pachankis, 2018; Charlton et al., 2018; Johns et al., 2018). These factors could potentially explain a greater interest for online platforms such as gaming. Although, as described above, no assessment of either psychiatric comorbidity, experiences of stigma or victimization were performed in this study. Earlier studies have also indicated difficulties for lesbian and bisexual women gaining access to health care (Corliss et al., 2010; Munson and Cook, 2016).

Knowing that stigma is affecting the health in sexual minority populations to a greater extent than in heterosexual populations, it is reasonable to think that the online world is attractive for its anonymity and in search of relevant information (Lucassen et al., 2018) when having a sexual minority status. Hussein and Griffiths (2008) found that 57% of the participants in their study had engaged in gender swapping within games. It supports the hypothesis that the gaming world could be platform used explore sexual and gender identity, independent of the sexual or gender identity. There seems to be a complexity to the online world in a LGBT-perspective as online games also have been described to be typically hetero-normative (Shaw, 2009; Krobová et al., 2015). Sexism and homophobia is described in online chat forums in a report on gaming in a LGBT-perspective from the Swedish Federation for Lesbian, Gay, Bisexual, Transgender, Queer and Intersex Rights (Wennlund, 2014). This dualism may add to the complexity of sexual identification and gaming behavior. It brings up the question whether there is a greater risk for developing behavioral addictions, among lesbian, gay and bisexual populations. Gaming activities but to a certain

degree also gambling with money, takes place in the electronical and online world (McCormack et al., 2013; Håkansson et al., 2017). Online activities have been described in qualitative research as a part of social isolation among young LGBT-individuals, when experiencing stigma from the surrounding society (Steinke et al., 2017). The result in this study, indicating a higher proportion of problematic gambling and gaming behavior among sexual minority women, raises the question whether sexual minority women engage in electronical activities as a way of coping with psychological distress, stigma and isolation.

Implications for Future Research

The result in this study, indicating that there are no differences between sexual minority men and heterosexual men in behavioral addiction problems is of importance to highlight in the discussion about sexual minority health. Earlier research within the field of substance use has indicated similar results, whit less apparent differences in substance use between men with a heterosexual orientation and sexual minority men, in comparison to heterosexual and sexual minority women (Marshal et al., 2008; Coulter et al., 2018). A possibility is that there is a similar pattern for substance behavior and behavioral addiction among sexual minority men. In future research on behavioral addictions, it would be of value to include sexual orientation to further investigate whether minority women are overrepresented compared to heterosexual women, and investigate a possible correlation with substance use, other psychiatric conditions, social isolation and experiences of discrimination and stigma. More research is needed in other orientations than heterosexual, gay/lesbian and bisexual. For clinical settings treating behavioral addiction, an inclusion of the sexual minority perspective could be of importance, especially for sexual minority women. Researchers have underlined the lack of knowledge about the sexual minority women in clinical health care (Munson and Cook, 2016). A few LGBTQ-interventions have addressed coping mechanisms against stigma and minority stress in a psychiatric and psychological context (Pachankis et al., 2015; Lucassen et al., 2018) and could be a relevant alternative for clinical settings (Wang K. et al., 2018) when treating behavioral addiction. Treatment interventions via internet have been suggested to be a way of including sexual and gender minority populations (Schwinn et al., 2015; Steinke et al., 2017). If the online world is attracting bisexual individuals due to a decreased risk of discrimination and stigma, it could be of importance for clinicians to also consider it an opportunity to study online treatments within sexual and gender minority populations in clinical research projects (Schwinn et al., 2015; Steinke et al., 2017).

In future research on behavioral addictions, it would be of value to include sexual orientation to further investigate whether minority women are overrepresented compared to heterosexual women, and investigate a possible correlation with substance use, other psychiatric conditions and experiences of discriminating behavior. It is of importance to be able to differentiate between different sexual minority groups in future studies, seeing that living conditions could differ between the groups and influence the risk for excessive gambling or gaming. Qualitative studies would be of value to better understand the meaning of online activities such as gambling and gaming among sexual minority women. In addition, it can be argued that a screening tool used for problematic internet behavior does not provide in-depth descriptions about the nature of that internet behavior, and that the nature and content of such online behavior is likely to differ between women and men, and potentially across sexual identifications. Thus, future studies should further address how a potentially problematic online behavior may differ between groups with separate sexual or gender identifications.

In addition, future research should assess a more in-depth picture of psycho-social situation as a co-factor in studies of the association between behavioral addictions and gender and sexual identity. For example, gambling behaviors are closely associated with socio-economic and social situation, such as indebtedness and private financial situation. While such data cannot be interpreted from the present data, such variables are of value to study in the future.

Limitations

Sexual minority populations are groups with a large heterogeneity and living conditions for LGBTQ-individuals are probable to differ in the included countries in this study. These living conditions includes social and economic factors that reasonably have different impacts on psychological health and mental health problems, although not controlled for in this study. On the other hand, country affiliation is controlled for in this study. This study had a cross-sectional study design and to draw further conclusions on behavioral addiction, studies with a longitudinal design are needed where sexual orientation status is included. The web survey design, even if cooperating with the company providing web panels, could have attracted individuals answering with an interest in gambling and gaming behavior to a higher extent than in the general population. It could have contributed to the high prevalence of problematic behavior in this study. The anonymous web-survey design applied in the study could include a risk of individuals responding more than once on the survey. In an earlier web-survey in a Swedish setting, no more than 0.7% of the answers were possible duplicates (Håkansson and Henzel, 2020). In a survey on gambling behavior in a Danish setting, 1.5% of the answers came from the same IP-address with possibility of being duplicates (Håkansson, 2021). These earlier studies indicate that duplicates in web-surveys are not common.

The gambling result in this study may have been affected by the exclusion of the Polish and Italian gambling result. In the Polish survey, the high proportion of problem gamblers might have been a result of a translation problem. Online surveys and surveys offering any form of compensation might be apprehended differently in the included settings, possibly affecting the high rates of problem gamblers in this study. Considering that the target of the survey was to examine excessive behaviors in minority populations which are already few, the exclusion of two countries could also have led to other effects

on the result. It might conceal differences between the minority population and the heterosexual population, considering the limitation in number of participants with a minority status.

The acceptance for other orientations than heterosexual might differ between the included countries, which could have affected how people chose to define their orientation in the study. Although, the prevalence of sexual minorities in this study was varying between 6.7 and 8.7% in all included countries apart from Italy, where the prevalence was lower (4.3%). There is a lack of information about those defining as having *other* sexual orientation in this study. It limits the opportunity to draw any conclusions about the group in this study. It could be that they are a diverse group with individuals defining as asexual, pansexual or mostly heterosexual. Although, defining as pansexual or mostly heterosexual could still mean being attracted to others regardless of the sex (Fu et al., 2019) and might share similar features with those defining as bisexual. Further, in this study no differentiation was made for sexual or emotional attraction, as well as for sexual behavior.

CONCLUSION

This study emphasizes the importance of including the sexual minority perspective in clinical settings, with a certain focus in sexual minority women. It is one of the first studies investigating behavioral addiction of gambling and gaming and how it presents in groups with different sexual orientation status, in a European setting. Associations were found among sexual minority women for problematic gambling and gaming behavior. Psychological distress and loneliness explained most of these associations, while a problematic gaming behavior was associated with those women defining as having another sexual orientation than hetero-, homo, or bisexual in adjusted analysis. More research is needed in problematic gambling and gaming behavior in different sexual minority populations with regard to psychiatric comorbidity and living conditions. An awareness of female sexual minority perspectives is relevant in facilities treating behavioral addiction.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Swedish Ethical Review Authority, from the Bioethics Committee of the Medical University of Silesia in Katowice, Poland, from the Ethics Committee from the Milan-Bicocca University, Milan, Italy, and from the Ethics Comittee of the Bellvitge University Hospital, L'Hospitalet de Llobregat, Spain. Written informed consent for participation was not provided by the participants' legal guardians/next of kin because: The type of data that was collected in this study was anonymous and no biological samples were collected. Parental consent for participation in this type of study was not needed from the age of 15 in all countries but England and Poland where the age limit was 16. No data was collected from participants below that age in respective country.

AUTHOR CONTRIBUTIONS

NB and AH applied for the Swedish permission. FP and EG applied for the Italian ethical permission. SJ-M applied for the Spanish approval. AS applied for the Polish permission. NB and AH were responsible for data collection and statistical analysis. NB wrote the draft. All authors contributed with reviewing and changing the draft into the final version, participated in the interpretation of the result, approved the final version, and participated in the procedure of ethical approval from the ethical board in each country that required such permission.

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To Be Ethical and Responsible Digital Citizens or Not: A Linguistic Analysis of Cyberbullying on Social Media

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As a worldwide epidemic in the digital age, cyberbullying is a pertinent but understudied concern—especially from the perspective of language. Elucidating the linguistic features of cyberbullying is critical both to preventing it and to cultivating ethical and responsible digital citizens. In this study, a mixed-method approach integrating lexical feature analysis, sentiment polarity analysis, and semantic network analysis was adopted to develop a deeper understanding of cyberbullying language. Five cyberbullying cases on Chinese social media were analyzed to uncover explicit and implicit linguistic features. Results indicated that cyberbullying comments had significantly different linguistic profiles than non-bullying comments and that explicit and implicit bullying were distinct. The content of cases further suggested that cyberbullying language varied in the use of words, types of cyberbullying, and sentiment polarity. These findings offer useful insight for designing automatic cyberbullying detection tools for Chinese social networking platforms. Implications also offer guidance for regulating cyberbullying and fostering ethical and responsible digital citizens.

Keywords: linguistic analysis, cyberbullying, digital citizen, social media, content analysis

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INTRODUCTION

The development of information and communications technology (ICT), and accompanying popularity of the Internet, mobile phones, and social media platforms, has increasingly led people to socialize online vs. in person. The COVID-19 pandemic has amplified this phenomenon. Figures suggest that more than 4.88 billion people use the Internet worldwide (nearly 62% of the global population), of whom 4.55 billion (57.6%) use social media frequently (DataReportal, 2021). People in China rely heavily on social media sites, such as Weibo (microblogs), WeChat, QQ, Toutiao (Today's Headlines), and TikTok. A report from China Internet Network Information Center indicated that over 1 billion people in the country use the Internet, accounting for more than 1 in 5 of the world's Internet user base. Current trends indicate that social media users in China will surpass the equivalent of 60% of the global population in the first half of 2022 (DataReportal, 2021).

However, people's excessive screen time, insufficient digital knowledge, and poor awareness of rights and responsibilities in cyberspace have spurred cyberbullying on nearly all social media platforms. Cyberbullying refers to aggressive behavior, which may include jokes, threats, and disinformation, that repeatedly harms people (Smith et al., 2008; Patchin and Hinduja,

2010). Social media enables these actions within a convenient environment that attracts a wide audience (Huang and Chou, 2010). Cyberbullying has thus come to pose a new threat to social media users, especially teenagers aged 6–18. Repeated harm from cyberbullying marked by power imbalances can lead victims to display low self-esteem, anxiety, depression, and even suicidal ideation (Olweus, 2012). A growing number of reports (John et al., 2018; BJNEWS, 2021; Limbana et al., 2021) have indicated that cyberbullying brings grave physical and psychological harm to victims. As a serious global problem, cyberbullying has come to the attention of researchers, administrators, teachers, and parents.

To address this cyber threat, many studies—from theoretical analysis to law promulgation—have focused on the topic and ways to detect it. Mining textual information is a common approach and has shown utility in identifying and predicting human behavior (Davahli et al., 2020). Text features extracted from social media posts were found to be significantly correlated with individuals' characteristics (Farnadi et al., 2016). Numerous studies have attempted to link textual information with human behavior, including in emotional, social, and cognitive respects (Liu, 2012; Gutierrez et al., 2021). For example, Tausczik and Pennebaker (2010) argued that determining the physiological meaning of textual information can provide insight into people's thought processes, emotional states, intentions, and motivations. Semenov et al. (2010) analyzed users' social media posts to try to identify potential school shooters. Negative words in users' comments on social media may also be related to socially aggressive behavior (Gutierrez et al., 2021). The Sapir–Whorf hypothesis suggests that language use influences human behavior, such that a shift in language use can unconsciously influence one's thoughts and actions (Kihlstrom and Park, 2018).

Many factors influence cyberbullying. Individual-level factors have direct impacts, especially in terms of literacy related to digital citizenship (Zhong et al., 2021). Digital citizenship refers to using technology in a safe, responsible, and ethical manner; the concept is closely related to socializing online. A person's level of digital citizenship partly determines their awareness, preferences (e.g., word choice), and behavior. Ideally, if all Internet users are qualified digital citizens, then the incidence of cyberbullying should decline substantially. In other words, cyberbullying can be curbed if people are educated to behave at their best; such habits include pondering how technology might affect others (Ribble, 2015). For instance, one should show respect to others online, be cautious when sharing information or opinions, and pay attention to the wording of posts. Given that many people rely heavily on social networking, which is mainly text-based, digital citizenship is mediated through language. Persistent posting behavior (and the accompanying text, as a form of digital footprints) can inform norms and guidance to improve digital citizenship based on fine-grained analysis of social language. This information can help to mitigate unethical behavior, such as cyberbullying.

To this end, we examine people's use of social language online *via* a linguistic analysis of cyberbullying. Most relevant research has addressed explicit cyberbullying in English contexts (Ying et al., 2012; Ptaszynski et al., 2016; Balakrishnan et al., 2019; Mladenović et al., 2021). Little is known about cyberbullying conducted in Chinese (Li, 2019, 2020; Xu, 2021) or with implicit language (e.g., with positive wording but negative connotations). Ambiguity also pervades Chinese contexts due to polysemy, incompleteness, and abbreviations in sentences. The language is therefore highly likely to be misunderstood or used with ulterior motives, leading to uncertainty or conflict that can gradually evolve into cyberbullying. Therefore, we extract the linguistic features of cyberbullying in a Chinese context from explicit and implicit perspectives on social media to provide guidance for detecting and governing cyberbullying as well as shaping ethical and responsible digital citizens. Specifically, researchers can refer to the study results to formulate automatic cyberbullying detection; administrators can better understand how people behave on social media and develop pertinent guidelines. The findings are also expected to raise the awareness of users, most of whom are digital natives, about ethical standards and codes of conduct on social networks. The following research questions (RQs) guide this work:

RQ1: What are the linguistic features of cyberbullying on social media in the Chinese context?
RQ2: Do cyberbullying incidents occurring in different domains possess distinct linguistic features?
RQ3: What implications do these features have for (a) the detection and governance of cyberbullying and (b) the shaping of ethical and responsible digital citizens?

RELATED WORK

Cyberbullying

Cyberbullying is an emerging form of bullying carried out *via* the internet and digital technologies (Diamanduros et al., 2008); it represents an increasingly serious online moral failure in the internet age. Scholars have often defined cyberbullying in relation to traditional bullying (Smith et al., 2008; Patchin and Hinduja, 2010). Olweus (1995) stated that cyberbullying involves repetition, intentionality, and power imbalance. Yet these attributes are subject to change given the nature of the digital world. For example, repeated aggression may not apply to cyberbullying; rather, retweets of and "likes" on an image or video may perpetuate a victim's bullying experience (Alsawalqa, 2021) and increase exposure through tags and hashtags (Chan et al., 2021). Accordingly cyberbullying can be defined as aggressive behavior (e.g., jokes, threats, and disinformation) intended to harm other people and communities on the internet.

Cyberbullying can take numerous forms, including flaming, harassment, denigration, impersonation, outing and trickery, exclusion, and cyberstalking (Willard, 2007). The most common types are insults, ridicule, provocation, and ostracism. Literal attacks on others are especially frequent on social media. Typical linguistic features of cyberbullying consist of name-calling,

denigration, and mockery. Such language can lead to adverse social, physical, and psychological effects (Nixon, 2014; John et al., 2018; Martínez-Monteagudo et al., 2020). Even so, cyberbullies rarely realize that their harsh or aggressive behavior could be considered bullying, instead perceiving it as humor (Alsawalqa, 2021).

Many methods have been proposed to detect cyberbullying. Machine learning and natural language processing (NLP) techniques are typically used for automatic detection by matching textual data with identified features. Researchers initially applied the bag-of-words approach, part-of-speech tagging, n-gram features, or a combination thereof for feature detection (Dinakar et al., 2011). Most recent studies have focused on content-based features, such as lexical, syntactic, and sentiment information; findings have demonstrated the importance of these words in the automatic detection of cyberbullying (Ptaszynski et al., 2016; Zhao et al., 2016; Zhao and Mao, 2017; Perera and Fernando, 2021).

Even with these advances, cyberbullying detection is inherently difficult and extends beyond simply discerning the negative sentiments or abusive content in a message (Ptaszynski et al., 2016). Online forms of communication are prone to misinterpretation (Tan, 2019), and not all bullying consists of insults (Li, 2020). Additionally, words can be masked (e.g., through metaphors, homophones, and abbreviations) to obscure negative expressions or profanity (Chen et al., 2013; Caselli et al., 2020). Tan et al. (2019) highlighted that spelling alterations are prevalent in cyberbullying, as people tend to simplify words to avoid being caught by the system. Cyberbullying can thus be classified as either explicit or implicit depending on clarity (Tan, 2019; Zeng et al., 2019; Caselli et al., 2020; Li, 2020). In outlining which words did and did not indicate bullying, Waseem et al. (2017) distinguished abusive language by its degree of explicitness. Li (2020) classified words into a cyberbullying word category and sensitive cyberbullying category. Explicit cyberbullying language has a clear negative meaning and no hidden meaning; implicit cyberbullying language often contains ambiguous words, sarcasm, and/or an absence of profanity or hateful terms (Waseem et al., 2017). Existing methods can only identify specific types of cyberbullying, such as threats, sexual harassment, and aggression (Chatzakou et al., 2017; Hee et al., 2018); sarcasm and euphemisms are more difficult to detect (Dinakar et al., 2011). The rapid evolution of Internet language will affect keyword-based cyberbullying detection as well (Ali et al., 2018; Tan, 2019).

Given the limitations of relevant studies, meta-information—covering characteristics, such as a user's age, gender, location, and posting history—has been considered for cyberbullying detection (Al-garadi et al., 2016; Chatzakou et al., 2017; Hee et al., 2018). More remains to be learned about the linguistic attributes of cyberbullying in addition to expanding the dimensions of and approaches to detection. Much of the extant cyberbullying detection literature has addressed linguistic features; however, a lack of clarity persists around linguistic characteristics and their meanings in this context.

Linguistic Features of Cyberbullying

Cyberbullying represents a language-related problem in interpersonal communication. The language used online reflects people's internal thoughts, emotional states, and intentions (Habsah et al., 2016) and may contain directly or indirectly offensive words (Fortuna and Nunes, 2018). Cyberbullying is conventionally detected based on linguistic features. Early researchers used n-grams, the bag-of-words approach, and similar techniques to make coarse-grained predictions about cyberbullying content (Dinakar et al., 2011; Reynolds et al., 2011) by analyzing certain linguistic features (e.g., personal words, pronouns). Grammatical and sentimental features have been widely used more recently (Zhao and Mao, 2017; Hee et al., 2018), suggesting the utility of lexical features for cyberbullying detection.

Most studies on cyberbullying detection revolve around two linguistic attributes: lexical features and grammatical features. In terms of lexicality, a trademark of cyberbullying is a high density of vulgar words (Ptaszynski et al., 2016). Most offensive sentences include not only offensive words but also user identifiers (i.e., second-person pronouns, the victim's screen name, and other person-centered terms). Punctuation, such as exclamation points, can also predict offensive content by indicating users' feelings or volume of speaking (Ying et al., 2012). Nobata et al. (2016) summarized 13 types of linguistic features to identify abusive language, such as the number of polite expressions and modal words in text. The politeness principle posits that one's politeness can be measured by the extent of indirectness in discourse; that is, the number of indirect words can be used to evaluate the degree of euphemism and credibility in a sentence. Regarding grammatical features, syntactic characteristics (e.g., dependency relationships between words) are of primary interest. The linguistics of cyberbullying involve the tone and syntax of speech. Scholars have found that speakers who frequently use imperative sentences tend to be more insulting as they deliver stronger sentiments (Ying et al., 2012). Text length can also predict cyberbullying (Nobata et al., 2016). Ying et al. (2012) argued that user-level features (e.g., one's writing style, posting patterns, or reputation) can improve the cyberbullying detection rate.

Linguistic forms of cyberbullying can be influenced by cultural contexts (Saengprang and Gadavanij, 2021). Much of the associated literature has analyzed linguistic features of cyberbullying in Western cultures, especially in English; few studies have concentrated on non-English language cyberbullying in Eastern cultures. Saengprang and Gadavanij (2021) compared the linguistic features of cyberbullying between the United Kingdom and Korea. They discovered that indirect speech acts, usually manifesting as one's adoption of the interrogative mood, were more common in Eastern settings than direct speech acts. Zhang et al. (2019) found that bullying words were useful for classifying cyberbullying in Japan, with informal language and emerging words in tweets affecting the results of sentiment analysis. Research from Pakistan showed that cyberbullies attacked the victim's appearance through comparisons and certain discourse markers (e.g., capitalization, punctuation, and mathematical symbols; Rafi, 2019). Tan et al.

(2019) examined linguistic features of cyberbullying among Malaysian youth from the perspectives of victims, perpetrators, and bystanders. Results indicated that the words these groups used spanned three categories of insults: intellect, physical appearance, and value. Also in Malaysia, language use was found to correlate with people's intentions: insults did more than degrade and belittle in self-deprecating body-shaming posts; insults also helped posters save face and reduced backlash from other netizens (Tan, 2019). Mohd et al. (2021) revealed that the profane words used in different cyberbullying roles were somewhat similar but featured distinct weights and percentages, which could guide cyberbullying detection. In the Chinese language specifically, a linguistic analysis of a Chinese cyberbullying incident revealed that bullies tended to use negative words, derogatory nouns, and more second-person pronouns (e.g., "you") or the victim's real name to accuse the victim. In terms of sentence patterns, posters tended to use exclamatory sentences to convey a certain emotion and use affirmative sentences to judge the victim (Xu, 2021). Li (2019) divided insulting words on Weibo into levels of offensiveness; for example, words in Level 5 were inherently insulting and widely used, whereas those in Level 1 were context-dependent. However, not all cyberbullying comments contain directly offensive words. Terms can be further classified as cyberbullying words (e.g., abusive words, sexual words, and swear words) or as sensitive cyberbullying (e.g., emotional words, emphatic and cathartic words, newly emerging words, idiomatic set phrases, and ordinary words with special meanings; Li, 2020). Li (2020) additionally discovered that cyberbullying words in Chinese and English differed in the use of verbs, adjectives, and nouns. Overall, Chinese cyberbullying words appear more complex than those in English.

Cyberbullying and Digital Citizenship

Cyberbullying is a form of online anomie related to technology misuse, spurred by the ubiquity of the Internet and social networking. Cyberbullying incidents are tied to a lack of digital citizenship education: many people are unaware of how to use technology safely, legally, and responsibly and lack an adequate understanding of what constitutes sound digital citizenship. Unsurprisingly, individuals can be less inhibited and present a unique virtual self under ineffective supervision without realizing whether their behavior has hurt others. A growing number of people are misusing technology or using it freely to the neglect of others' feelings. Confrontation and even cyberbullying have thus become unavoidable. In essence, cyberbullying on social media is closely related to one's level of digital citizenship (Zhong et al., 2021).

From a digital citizenship standpoint, refraining from cyberbullying is an important social skill. The International Society for Technology in Education (ISTE) defines a digital citizen as a person who "recognizes the rights, responsibilities, and opportunities of living, learning and working in an interconnected digital world and acts and models in ways that are safe, legal and ethical" (Brooks-Young, 2017; International Society for Technology in Education, 2019). It is crucial to respect others and to protect oneself and others (Ribble, 2015) when using online social networks. Digital citizenship education is crucial to this aim and has become popular in many countries (e.g., the United States, Singapore, and Australia). We found cyberbullying to be a required module in many online courses, including *Cyberbullying, Digital Drama & Hate Speech* from Common Sense Media; *Ethics and Empathy* from MediaSmarts; and the *Interland* gaming module from Google. Cyberbullying, as a global issue and common online behavior, will likely continue to be a vital aspect of digital citizenship education.

Cyberbullying entails three elements of digital citizenship: digital etiquette, digital law, and digital rights and responsibilities (Ribble, 2015). Instead of merely improving existing laws and regulations, cultivating ethical digital natives can more effectively combat cyberbullying. Researchers have conducted empirical investigation (Chai et al., 2013; Abd Rahman et al., 2014) but have paid limited attention to devising specific behavioral guidelines (Anderson, 2016; Mangkhang and Kaewpanya, 2021). In a digital society, the civility of language is the most direct and explicit manifestation of a person's level of digital citizenship. Digital citizenship education, supplemented with online social standards based on linguistic analysis, will likely be conducive to developing qualified digital citizens.

METHODOLOGY

As depicted in **Figure 1**, we applied a four-step methodology to explore the linguistic characteristics of cyberbullying on Chinese social media. We first gathered data from Sina Weibo

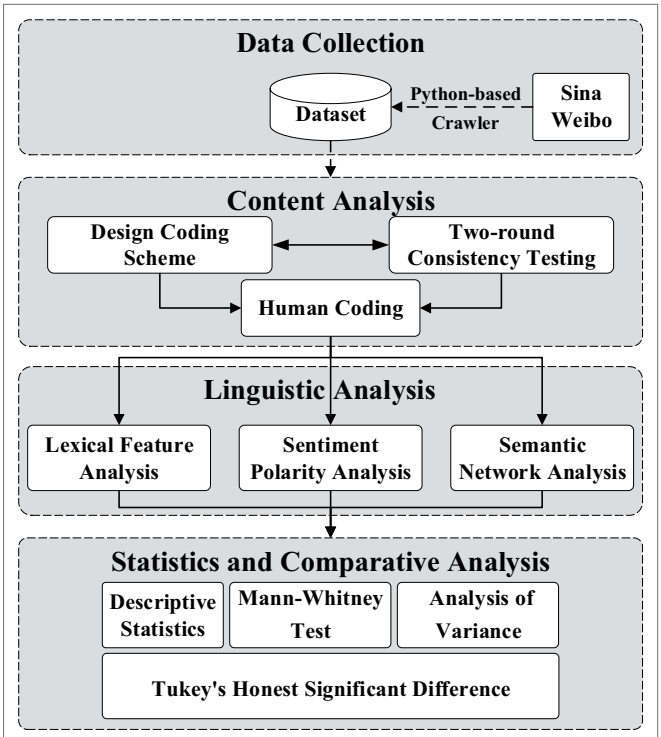

FIGURE 1 | Methodological framework.

using a Python-based web crawler. We next established a MySQL database to store the dataset after removing blank text and emojis. Each data record contained the following information: user ID, comment content, posting time, and other post-related information. Second, 23,980 comments were extracted from the database *via* stratified sampling, after which we performed content analysis to sort selected comments and discern users' intentions in cyberbullying incidents. Third, to address RQ1 and RQ2, the categorized comments were fed as input into a data preprocessing program and submitted for linguistic analysis using traditional natural language processing techniques. Linguistic analysis consisted of three steps: lexical feature analysis, sentiment polarity analysis, and semantic network analysis. The analysis results were then compared in SPSS.

Data Collection

To avoid interference from invalid or unclear data, the following criteria were applied to choose representative cyberbullying incidents: (1) generality, such that the incidents related to several aspects of daily life; (2) time validity, ensuring that the chosen incidents were timely (i.e., had occurred no earlier than 2019); and (3) notability, in that the incidents aroused widespread public concern (i.e., as indicated by more than 500 retweets). We searched Sina Weibo using these criteria and identified five cyberbullying incidents that spanned multiple domains of social life, including education, entertainment, society, finance, and sports. All incidents took place between October 2020 and October 2021 and collectively garnered more than 100 million reads and over 60,000 discussions. Posts and comments about each incident were jointly screened and grabbed by a Python-based crawler we developed. These data were stored in MySQL database tables, labeled with the original hashtag referring to each incident. Our dataset included 43,111 elements; detailed information is listed in **Table 1**.

Content Analysis

Content analysis is an umbrella term for forms of textual analysis that typically involve ranking, comparing, and categorizing a diverse collection of data (Schwandt, 1997). In previous studies, content analysis was generally used to distinguish cyberbullying content (Saengprang and Gadavanij, 2021), in order to provide training data for machine learning (Dinakar et al., 2011) or to identify cyberbullying vocabulary (Li, 2019, 2020). We adopted content analysis to provide a holistic view of cyberbullying on social media. This analytical approach is based on a well-designed coding scheme; as such, we devised a two-dimensional scheme

TABLE 1 | Basic information about selected cyberbullying incidents.

Identifier	Domain	Public concern	Summary	Conflict focus	Random sampling
Case 1	Education	1.44 Billion reads; 272,000 discussions	On November 20, 2020, a female student from the Academy of Arts and Design of Tsinghua University claimed that a male student had harassed her and then publicized his private information on social media, causing the male student to be cyberbullied. A subsequent check of the video recording revealed a misunderstanding: the man had not touched the woman at all. Although the woman clarified the situation immediately, the incident continued to be reposted and gained wide attention on Sina Weibo.	Gender antagonism	8,185
Case 2	Entertainment	980 Million reads; 128,000 discussions	On January 14, 2021, a singer from Tianhao Shengshi Entertainment Company called Y (youngest daughter of the president of a famous company) announced her formal debut under the label "Unconventional Princess." Her father's company was facing pressure from international politics at the time. The video of her interview drew extensive criticism from viewers, as Y had publicly expressed jealousy toward her older sister. She began to be bullied and was forced to stay indoors.	Gap between rich and poor	10,337
Case 3	Society	370 Million reads; 67,000 discussions	On August 5, 2020, Mr. T was diagnosed with COVID-19. His profile and that of a close contact were spread online, along with their epidemiological survey records, minutes later. They were accused of endangering public safety, with some people even claiming that they were a couple and had their own sexual partners. Mr. T was dubbed "Wuhan Hai Wang" and was ridiculed by many netizens. He later stated that the rumors were not true.	Personal privacy and public safety	3,669
Case 4	Finance	570 Million reads; 77,000 discussions	In November 2020, an Internet celebrity known as Mr. X sold a company-produced bird's nest *via* a livestream. Consumers later questioned whether the product was a fake replica. They were extremely angry and abused Mr. X on Sina Weibo. Finally, Mr. X recalled the product and made a payout.	Disputes between consumers and businesses	5,919
Case 5	Sports	250 Million reads; 84,000 discussions	At the 2021 Tokyo Olympics, Japanese table tennis player Miss M and her partner defeated the Chinese team in a match. However, Chinese audiences heavily ridiculed and spoofed her unusual facial expressions and posture on social media.	National and religious contradictions	15,001
Total					43,111

to categorize our dataset and to capture the overall characteristics of cyberbullying. Coding dimensions included verbal meaning (i.e., explicit bullying, implicit bullying, and non-bullying) and speech intention (i.e., supporting, opposing, and neutral). Explicit bullying is associated with negative connotations and aggression, such as insults, attacks, curses, threats, and sexual harassment (Chatzakou et al., 2017; Hee et al., 2018). Implicit bullying often takes complex linguistic forms that disguise cyberbullying behind instructional, persuasive, speculative, judgmental, imputed, and exaggerated language (Zeng et al., 2019). Non-bullying refers to comments that are unrelated to the incident, used to comfort the victim, or are rational. To promote a more in-depth analysis, we also considered speech intention as proposed in speech act theory (Austin, 1962), which posits that speakers express their intentions *via* utterances (Saengprang and Gadavanij, 2021). The three types of verbal meaning and speech intentions reflected nine comment types in our dataset and constituted the preliminary coding scheme.

Next, seven trained coders were invited to perform content analysis on our dataset using the above scheme. Analysis proceeded through two phases. In the reliability testing phase, we conducted a two-round consistency test to prevent errors caused by an inconsistent understanding of cyberbullying (see **Figure 1**). Coders were grouped by case in each round and coded the content of sample data (2% of the full sample) separately, after which inter-rater reliability was examined by calculating Cohen's Kappa coefficient. We next revised our coding scheme based on this coefficient and coders' feedback to enhance quality. In the formal coding phase, a random sample of selected posts and comments was manually coded ($n = 23{,}980$, accounting for 55.6% of the full sample), with inter-rater agreement computed as shown in **Table 2**. The average Kappa coefficient was greater than 0.86, indicating significantly high consistency among coders.

TABLE 2 | Consistency test results.

Case	Composite reliability	
	Round 1	Round 2
Case 1	0.77	0.87
Case 2	0.76	0.90
Case 3	0.75	0.92
Case 4	0.90	0.86
Case 5	0.78	0.92

Linguistic Analysis

Figure 1 depicts the three steps of linguistic analysis: lexical feature analysis (Step 1), sentiment polarity analysis (Step 2), and semantic network analysis (Step 3). The aim of Step 1 is to explore the lexical features of cyberbullying on Chinese social media. Previous studies used Linguistic Inquiry and Word Count (LIWC) to identify these features of cyberbullying. For example, Hosseinmardi et al. (2015) explored the pattern of linguistic and psychological measurements of four cyberbullying classes through their LIWC values; Singh et al. (2017) found that text-based features outperformed visual features; Salminen et al. (2020) investigated hateful and non-hateful language by LIWC. In this study, we employed a computational linguistic tool called TextMind (Gao et al., 2013), which was developed based on the 2007 version of the LIWC application and C-LIWC (Chinese LIWC) and offers an all-in-one solution from automatic Chinese word segmentation to psychological analysis. One benefit of TextMind is that it provides greater coverage of popular Chinese words that are trending on social media, thus enabling effective textual analysis in Chinese. This tool is also compatible with LIWC2007 and C-LIWC. It defines five general categories of linguistic variables (i.e., linguistic processes, psychological processes, personal concern, spoken categories, and punctuation categories) containing 101 linguistic variables in total. These variables reflect different levels of language use from simple (e.g., word count, use of dictionary words, and number of hashtags) to complex (e.g., psychological constructs and tone of voice). TextMind automatically calculated the proportion of total words in each comment that matched each dictionary category. Results were stored in a CSV file, which allowed for further statistical analysis and data visualization in R or SPSS.

Scholars have deemed sentiment a distinguishing trait among bullies, victims, and non-bullies (Dani et al., 2017; Rosa et al., 2019; Balakrishnan et al., 2020). Most of their sentiment analysis was implemented using NLP (Maskat et al., 2020; Almutairi and Al-Hagery, 2021). Drawing upon such work, we performed sentiment analysis in Step 2 to quantify positive and negative comments. Each comment's sentiment polarity was analyzed *via* an open and corpus-based application program interface (API) for NLP provided by Baidu, a Chinese artificial intelligence service platform. This API can report affective scores and determine sentiment polarity categories (i.e., positive, negative, and neutral) of various types of content. We accessed the API in accordance with APPID, API Key, and Secret Key and input each comment as the URL request data for sentiment analysis. Results revealed comments' sentiment polarity categories and probability distribution (e.g., positive prob).

The effectiveness of NLP based on semantic models in cyberbullying detection has been confirmed previously, such as latent semantic index (LSI) and late semantic analysis (LSA; Zhao et al., 2016; Zhao and Mao, 2017). Semantic network analysis can be leveraged to explore group awareness in cyberbullying incidents (Xiong et al., 2019), which is highly applicable to our study given the aim to quantify cyberbullying and non-bullying comments related to specific incidents. In Step 3, we used the software program ROST Content Mining (ROSTCM) to extract high-frequency keywords and generate co-occurrence networks. Different from most semantic network analysis programs which can only analyze English words, ROSTCM is specifically intended for Chinese semantic network analysis and has been widely used in the social sciences (Shen, 2008).

Statistical and Comparative Analyses

Following content analysis and linguistic analysis, data were fed as input into SPSS for statistical tests. To address RQ1 and RQ2, we first tested the distribution of variables for normality using the Kolmogorov–Smirnov test, which revealed

a non-normal distribution ($p < 0.01$). The Mann–Whitney U test was subsequently conducted to determine which linguistic features strongly differentiated cyberbullying; comments' cyberbullying categories (i.e., explicit bullying vs. implicit bullying) were entered as dependent variables, and linguistic features were entered as independent variables. We next performed analysis of variance on the sentiment polarity variables followed by Tukey's honest significant difference test to compare cyberbullying incidents' sentiment polarity. Ten pairwise comparisons were carried out across the five cyberbullying incidents. The statistical results are described in Results section.

RESULTS

Content Analysis

Table 3 summarizes the descriptive statistics of content analysis. Approximately 55% of comments in all cases were classified as cyberbullying. People mainly attacked the victims through implicit bullying (accounting for more than 46% of the data); explicit bullying was the least common, appearing in 10.75% of the data. Some seemingly neutral posts also involved bullying, totaling roughly 15% on average in each case.

Across the five cases, Case 5—with national antagonism as the conflict focus—had the highest rate of cyberbullying, with nearly 70% of posts related to violence. Case 3 concerned personal privacy and public safety; this incident elicited the most neutral views, as over half (56.33%) of comments did not mention violence. The gender antagonism case (Case 1) was most clearly associated with cyberbullying: nearly 18% of comments included explicit bullying.

Lexical Feature Analysis

Comparison of Cyberbullying and Non-bullying Comments

Results of the linguistic analysis for all cases are summarized in **Table 4**. Marked differences were observed among comment types in all linguistic feature dimensions. Regarding linguistic processes, cyberbullying comments had significantly higher word counts, contained more tags, and applied dictionary terms involving personal pronouns (e.g., second-person pronouns and third-person singular pronouns), swear words, and adjunct words (e.g., auxiliary verbs, prepositions, quantifiers, tense markers, and numbers). Non-bullying comments comparatively contained more functions and multi-functional words, interjections, personal pronouns (e.g., first-person plural pronouns) and impersonal pronouns, and other words used as modifiers (e.g., negations, verbs, adverbs, and conjunctions).

In the psychological processes dimension, cyberbullying comments featured more family words as well as more affective processes and biological processes. The mean value of positive emotion-related words was higher than that of negative emotion-related words in cyberbullying comments. Conversely, non-bullying comments mainly revolved around psychology, cognitive processes, perceptual processes, and terms indicating

TABLE 3 | Descriptive statistics of content analysis.

Case	Domain	Speech intention	Categories of language			*n*
			Explicit	Implicit	Non-bullying	
Case 1	Education	Supporting	22	89	110	4,782
		Opposing	676	1,675	292	
		Neutral	154	455	1,309	
		Total	852	2,199	1,711	
			17.82%	46.40%	35.78%	
Case2	Entertainment	Supporting	8	10	810	5,075
		Opposing	357	1,962	225	
		Neutral	18	134	1,551	
		Total	383	2,106	2,586	
			7.55%	41.50%	50.96%	
Case 3	Society	Supporting	22	53	371	3,552
		Opposing	120	616	79	
		Neutral	38	702	1,551	
		Total	180	1,371	2,001	
			5.07%	38.60%	56.33%	
Case 4	Finance	Supporting	42	192	679	5,346
		Opposing	378	1,443	180	
		Neutral	117	583	1,732	
		Total	537	2,218	2,591	
			10.04%	41.49%	48.47%	
Case 5	Sports	Supporting	0	0	86	5,225
		Opposing	609	1,691	130	
		Neutral	18	1,296	1,395	
		Total	627	2,987	1,611	
			12%	57.17%	30.83%	
Grand total			2,579	10,901	10,500	23,980
			10.75%	45.46%	43.79%	

TABLE 4 | Linguistic features of language categories with significant differences in all cases.

Categories	Cyberbullying		Non-bullying		*p*	Explicit		Implicit		*p*
	M	SD	M	SD		M	SD	M	SD	
Linguistic processes										
WordCount	13.85	15.689	13.228	16.617	**	13.157	14.935	16.778	18.255	**
Word PerSentence	9.061	8.767	8.641	9.239	**	8.844	8.574	9.980	9.486	**
Rate DicCover	0.789	0.208	0.768	0.263		0.791	0.213	0.781	0.188	**
Rate numeral	0.006	0.048	0.008	0.070	**	0.006	0.050	0.006	0.038	**
Words > 6 letters	0.003	0.040	0.008	0.069	**	0.004	0.044	0.001	0.021	
Words > 6 letters	0.027	0.111	0.051	0.182		0.030	0.118	0.015	0.071	**
Rate LatinWord	0.013	0.066	0.02	0.103		0.013	0.070	0.011	0.046	**
Num HashTag	0.007	0.123	0.004	0.089		0.006	0.127	0.009	0.100	*
Funct	0.375	0.212	0.381	0.245	*	0.370	0.216	0.393	0.195	**
Pronoun	0.074	0.094	0.068	0.104	**	0.072	0.094	0.085	0.092	**
PPron	0.045	0.078	0.038	0.073	**	0.044	0.079	0.048	0.073	**
We	0.001	0.011	0.002	0.015	**	0.001	0.011	0.001	0.007	
YouS	0.013	0.042	0.01	0.039	**	0.012	0.042	0.016	0.044	**
SheHe	0.012	0.04	0.008	0.033	**	0.011	0.038	0.018	0.05	**
iPron	0.030	0.06	0.031	0.077	**	0.029	0.059	0.038	0.063	**
Verb	0.110	0.119	0.125	0.143	**	0.108	0.12	0.122	0.116	**
AuxVerb	0.025	0.058	0.023	0.058	**	0.025	0.058	0.026	0.055	**
Adverb	0.089	0.108	0.104	0.133	**	0.088	0.109	0.091	0.101	**
Preps	0.032	0.065	0.031	0.067	*	0.032	0.066	0.033	0.057	**
Conj	0.028	0.056	0.030	0.057		0.028	0.057	0.029	0.053	**
Negate	0.002	0.015	0.002	0.020		0.002	0.016	0.002	0.014	*
Quant	0.015	0.046	0.013	0.045	**	0.014	0.045	0.019	0.048	**
Number	0.008	0.031	0.007	0.035	**	0.008	0.031	0.008	0.032	*
Swear	0.005	0.043	0.002	0.027	**	0.003	0.033	0.012	0.070	**
YouPL	0.001	0.008	0.001	0.008	**	0.001	0.008	0.001	0.009	**
PrepEnd	0.009	0.032	0.011	0.042		0.009	0.033	0.009	0.029	**
SpecArt	0.005	0.026	0.006	0.027		0.005	0.027	0.005	0.022	**
QuanUnit	0.02	0.051	0.019	0.058	**	0.019	0.051	0.024	0.052	**
Interjunction	0.102	0.109	0.108	0.133		0.104	0.111	0.093	0.096	**
MultiFun	0.071	0.092	0.074	0.100		0.068	0.091	0.083	0.099	**
TenseM	0.05	0.086	0.042	0.086	**	0.053	0.089	0.037	0.066	**
PastM	0.002	0.013	0.003	0.022	**	0.002	0.013	0.002	0.010	
PresentM	0.005	0.022	0.005	0.024	*	0.005	0.022	0.005	0.020	**
FutureM	0.005	0.023	0.006	0.032	*	0.004	0.023	0.005	0.026	*
ProgM	0.038	0.079	0.028	0.071	**	0.041	0.083	0.025	0.056	**
tPast	0.001	0.013	0.002	0.016	**	0.001	0.013	0.001	0.011	
tNow	0.002	0.012	0.002	0.014		0.002	0.012	0.002	0.012	*
tFuture	0	0.006	0.001	0.013	**	0	0.005	0.001	0.007	
Psychological processes										
Social	0.071	0.100	0.084	0.126	**	0.068	0.100	0.081	0.098	**
Family	0.007	0.032	0.005	0.033	**	0.007	0.033	0.007	0.031	**
Humans	0.018	0.052	0.019	0.051		0.017	0.048	0.025	0.066	**
Affect	0.109	0.182	0.088	0.164	**	0.118	0.192	0.075	0.128	**
PosEmo	0.072	0.165	0.058	0.148	**	0.084	0.179	0.024	0.068	**
NegEmo	0.028	0.087	0.019	0.07	**	0.025	0.084	0.039	0.099	**
Anx	0.003	0.029	0.002	0.023	*	0.004	0.031	0.003	0.019	
Anger	0.008	0.046	0.004	0.033	**	0.007	0.041	0.015	0.064	**
Sad	0.002	0.019	0.001	0.016	**	0.002	0.02	0.002	0.014	
CogMech	0.169	0.146	0.196	0.182	**	0.173	0.15	0.154	0.129	**
Insight	0.016	0.044	0.029	0.077	**	0.017	0.046	0.015	0.039	
Cause	0.010	0.033	0.011	0.040		0.01	0.034	0.01	0.030	**
Discrep	0.023	0.054	0.026	0.064	*	0.023	0.056	0.021	0.045	
Tentat	0.020	0.051	0.025	0.065	**	0.02	0.053	0.018	0.043	*
Certain	0.020	0.067	0.03	0.093	**	0.02	0.068	0.019	0.061	*
Inclusive	0.025	0.052	0.027	0.062		0.024	0.053	0.025	0.049	**
Exclusive	0.029	0.056	0.031	0.064		0.028	0.056	0.031	0.054	**
Percept	0.019	0.056	0.021	0.061		0.019	0.056	0.02	0.057	**
See	0.007	0.036	0.006	0.035	**	0.007	0.035	0.008	0.041	**
Hear	0.005	0.025	0.008	0.033	**	0.005	0.025	0.005	0.026	**

(Continued)

TABLE 4 | Continued

Categories	Cyberbullying		Non-bullying		*p*	Explicit		Implicit		*p*
	M	SD	M	SD		M	SD	M	SD	
Feel	0.003	0.022	0.004	0.027		0.003	0.022	0.003	0.020	**
Bio	0.026	0.073	0.018	0.064	**	0.022	0.065	0.044	0.098	**
Body	0.014	0.051	0.006	0.033	**	0.012	0.046	0.025	0.068	**
Health	0.005	0.039	0.002	0.020	**	0.004	0.031	0.012	0.062	**
Sexual	0.004	0.028	0.003	0.034	**	0.003	0.025	0.007	0.039	**
Ingest	0.005	0.029	0.007	0.042		0.005	0.029	0.005	0.027	**
Relative	0.066	0.096	0.068	0.112	*	0.062	0.093	0.081	0.107	**
Motion	0.017	0.048	0.018	0.060		0.017	0.049	0.018	0.048	**
Space	0.034	0.069	0.031	0.073	**	0.03	0.063	0.049	0.087	**
Time	0.018	0.049	0.023	0.062	**	0.019	0.05	0.018	0.042	**
Psychology	0.017	0.064	0.024	0.085	**	0.017	0.067	0.017	0.052	**
Personal concern										
Work	0.025	0.064	0.033	0.083	**	0.026	0.065	0.023	0.061	
Achieve	0.01	0.038	0.012	0.045	**	0.011	0.04	0.006	0.027	**
Leisure	0.019	0.054	0.020	0.063		0.02	0.056	0.014	0.044	*
Home	0.002	0.019	0.001	0.013		0.002	0.019	0.002	0.019	**
Money	0.01	0.039	0.007	0.037	**	0.011	0.041	0.007	0.028	**
Religion	0.002	0.017	0.004	0.026	**	0.002	0.017	0.002	0.014	**
Death	0.008	0.039	0.002	0.014	**	0.006	0.035	0.013	0.053	**
Spoken category										
Assent	0.135	0.22	0.087	0.145	**	0.15	0.237	0.069	0.101	**
Nonfl	0.011	0.043	0.014	0.062	*	0.011	0.044	0.011	0.037	**
Filler	0.010	0.032	0.009	0.034	**	0.01	0.031	0.012	0.034	**
Punctuation										
Period	0.007	0.029	0.010	0.051	**	0.007	0.030	0.008	0.028	**
Comma	0.037	0.058	0.038	0.062		0.036	0.057	0.043	0.059	**
QMark	0.025	0.086	0.022	0.089	**	0.024	0.086	0.029	0.087	**
Exclam	0.011	0.056	0.009	0.048	**	0.011	0.057	0.011	0.049	**
Parenth	0.001	0.01	0.001	0.015	**	0.001	0.011	0	0.005	
OtherP	0.003	0.027	0.007	0.053	**	0.003	0.028	0.002	0.025	

*$p < 0.05$; **$p < 0.01$.

relativity. In the personal attention dimension, cyberbullying included more references to money and death, whereas non-bullying comments referred more to work, achievement, and religion. The spoken category and punctuation category included frequent use of assent words and fillers in cyberbullying with more question marks and exclamation marks. Nonfluencies, periods, parentheses, and other punctuation were more prevalent in non-bullying comments.

Comparison of Explicit and Implicit Bullying

Table 4 presents a comparison of comments displaying explicit and implicit bullying. In terms of linguistic processes, comments categorized as explicit bullying contained more words and tags, frequent function words, pronouns (e.g., second- and third-person singular pronouns and impersonal pronouns), common verbs, swear words, temporal words (e.g., present and future markers), and modifiers (e.g., auxiliary verbs, negations, conjunctions, numbers, quantifiers, specific articles, and unit words of quantity). Implicit bullying showed higher rates of dictionary words and complex words along with more second-person plural pronouns, interjections, and tense markers (e.g., past and progressive markers).

In the psychological processes dimension, explicit bullying typically involved the following: more words about social processes (e.g., family and humans), affective processes (with mainly negative words), perceptual processes, and biological processes (e.g., regarding one's health, body, or sexuality); inclusive and exclusive words; and words about motion and space in relativity. Implicit bullying contained more positive emotion-related words and words about feeling, psychology, and cognitive processes (e.g., involving causation, tentativeness, and certainty).

The current concerns dimension included more words related to home, religion, and death in explicit bullying but more words about work, family, and leisure in implicit bullying. In the spoken category and punctuation category, the rates of assent words, nonfluencies, and exclamation points were higher in explicit bullying whereas fillers and punctuation (e.g., periods, commas, and question marks) were more common in implicit bullying.

Linguistic Features in Different Cyberbullying Incidents

As mentioned earlier, the proportions of cyberbullying categories varied by incident. In the case of education, the victim was cursed with a plethora of death-related words, such as "社会性死亡" ("social death") and "死" ("die"). The victim was also body shamed, such as when commentors called her "腚" ("butt"). The feminist community was directly abused using swear words including "母狗" ("bitch") and "犬" ("dog"). In implicit bullying, comments mainly expressed instructional and judgmental language

by questioning the victim's behavior; some comments included strong punctuation [e.g., "凭什么要相互道歉?" ("Why apologize to each other?!"). Others used imperative sentences and exclamation points to make declarations, as in "自作自受!" ("You did it to yourself!") and "必须起诉她!" ("You must be sued!")].

In the entertainment case, explicit bullying mainly featured negative words, words related to appearance and nationality, and punctuation that denied and strongly questioned the victim, such as "好难听??" ("So hard to hear??") and "什么公主?中国不欢迎美国公主" ("What princess? American princesses are not welcome in China"). Most implicit bullying was expressed through sarcasm and judgmental language; for instance, "爸爸有钱真好" ("It's lucky that your father is rich") sarcastically described the victim's family background and implied that she had relied on her family's help to become a star. Comments, such as "方脸不适合出道" ("Square face is really not suitable to be a star") and "天赋还是很重要的, 你还是算了吧" ("Talent is still very important, you should just give up"), emphasized celebrity-related stereotypes, thus dismissing the victim.

Similarities emerged between the cyberbullying cases centered on sports and society. In both cases, explicit bullying involved many swear words. People attacked the victim's looks in the sport case with phrases, such as "表情死贱的" ("What a bitchy expression") and "太丑了" ("That's so ugly"). Others reinforced rumors in the society case, as indicated by "肯定是他妈真的啊" ("It must be fucking true!") and "女的不也睡好几个??" ("Didn't that girl sleep with several people too?"). As for implicit bullying, emotional terms and exaggeration, such as "哈哈哈" (an onomatopoeia for laughing) and "笑死我了" ("You're really killing me"), were used in both cases to express happiness while making light of the victim's pain. Comments like "真是人才" ("What a talent") conveyed support for microblogs vilifying the victims, indirectly amplifying the negative impact of cyberbullying.

Regarding the finance case, explicit bullying mostly took the form of using animals to refer to the victim and cursing him: "仓鼠" ("hamster") and "杂种狗" ("mutt"). Individuals engaging in implicit bullying demanded that the government punish the victim severely as indicated by strong phrasing, such as "必须/支持封杀" ("He must be shut out by all media").

Sentiment Polarity Analysis

Sentiment analysis was carried out to examine comments' sentiment polarity as shown in **Table 5**. The results for different language forms demonstrated significant variation. Generally, cyberbullying was more negative than non-bullying whereas explicit bullying language was more negative than implicit language. **Figure 2** illustrates the distribution of sentiment polarity across cyberbullying categories and the overall emotional analysis of samples of implicit bullying and explicit bullying.

The sentiment of cyberbullying comments was largely negative: comments classified as explicit bullying (sentiment = 0.30, 84.30% negative) were more negative than those categorized as implicit bullying (sentiment = 0.67, 64.56% negative). Interestingly, nearly 30% of cyberbullying comments were considered positive, presumably due to the adopted implicit bullying tactics.

To verify whether sentiment varied significantly between the five cases, we compared cyberbullying comments about different cases (**Figure 3**). No significant difference manifested in the positive probability, whereas a comparison of Case 1 with other cases in the negative probability revealed significant variation. Essentially, statistical differences were observed in the sentiment of comments for each case compared to others ($p < 0.001$).

Table 6 indicates that Case 1, which was dominated by explicit bullying, had the highest percentage of negative sentiment (84.37%). Nearly half of all comments were positive in Case 5 (46.96%) and Case 3 (42.36%); remarks mainly took the form of implicit bullying, such as ridicule and sarcasm.

Semantic Network Analysis

Figure 4 displays the results of text-semantic networks. Multiple keywords related to the topic of education involved a series of verbs, gender-based words, and location-related nouns. Perpetrators mainly attacked the victim's behavior during the incident as well as the victim's body, education, and profession. In the case focusing on gender antagonism, many commenters insulted feminism and made gender-specific attacks.

Most keywords in the society case covered the following: interpersonal nouns, such as "复杂" (complex), "女友" ("girlfriend"), and "唐某" ("the victim"); words related to rumors, such as "造谣" ("disinformation") and "报警" ("call the police"); and words involving love and public affairs, such as "疫情" ("epidemic"), "全国" ("nationwide"), and "对象" ("lover"). Bullies in this case speculated maliciously about the victims' relationship by mocking the content of rumors. Other bullies engaged in verbal abuse to fight against rumor-mongers on the victims' behalf.

The other three cases shared similar results. Taken together, these findings suggest an association between the use of cyberbullying words and the controversial focus of each incident, with cyberbullies first attacking the victim's behavior before progressing to attacks on personal privacy, external conditions (e.g., one's appearance

TABLE 5 | Comparison of sentiment analysis results.

	Cyberbullying		Non-bullying		*p*	Explicit		Implicit		*p*
	M	SD	M	SD		M	SD	SD	M	
Sentiment	0.61	0.907	0.97	0.987	**	0.607	0.907	0.683	0.935	**
Positive_prob	0.6	1.311	0.59	0.862	**	0.603	1.311	0.584	1.207	**
Negative_prob	0.78	0.785	0.65	0.958	**	0.777	0.785	0.758	0.852	**

$^{**}p < 0.01$.

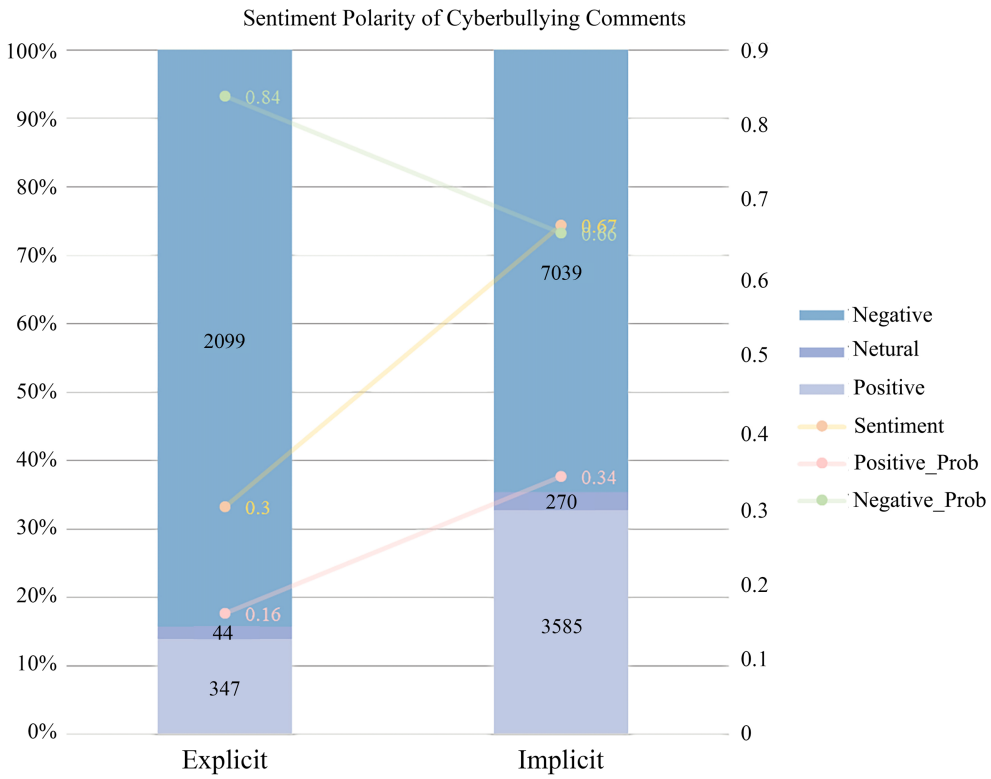

FIGURE 2 | Sentiment polarity of cyberbullying comments (in percentage).

or family), and even a group to which the victim belonged. For example, in the finance case, cyberbullies moved from attacking the victim's behavior to targeting the livestreaming platform and the victim's production team. Cyberbullies in the sport case attacked the athlete herself along with her home country.

DISCUSSION

This study aimed to examine the linguistic features associated with potential cyberbullying (or the likelihood of poor digital etiquette) based on Sina Weibo comments exhibiting instances of explicit bullying, implicit bullying, or non-bullying. Results are addressed based on the three RQs underpinning this work.

General Linguistic Features of Cyberbullying

According to Zhang and Ghorbani (2020), linguistic characteristics refer to the fundamental components, structure, and semantics of natural language. These aspects cover word-, sentence-, and content-level attributes. This study focused on word- and content-level characteristics to examine their effects on cyberbullying. At the word level, compared to non-bullying comments, cyberbullying often featured a higher word count, a greater number of swear words and adjunct words, more frequent use of second-person pronouns and third-person singular pronouns, more mentions of affective and biological processes, greater references to money and death, and more use of question marks and exclamation points. When compared with explicit bullying, cyberbullying comments involving implicit bullying tended to contain the following: fewer words and tags; greater use of dictionary words and complex words; a higher number of tense markers; fewer swear words and negative emotions; more words related to cognitive processes (e.g., causation and certainty); fewer words related to home, religion, and death; and a greater number of fillers and question marks. These patterns are broadly consistent with those of prior studies (Ying et al., 2012; Nobata et al., 2016; Ptaszynski et al., 2016; Li, 2020; Saengprang and Gadavanij, 2021; Xu, 2021).

Stop words, which are words that carry the least amount of semantic information compared with other words (e.g., "a," "as"), are usually removed from cyberbullying detection. Cyberbullying comments in our sample contained more function words, prepositions, tense markers, and numbers that could easily be filtered as stop words, implying that stop-word selection can be explored further in the future. This finding is consistent with that of Dewani et al. (2021), who noted that stop words, such as "here" and "today" in some time-sensitive and location-sensitive key messages, could affect NLP results. More subtle cyberbullying may be achieved linguistically through the use of these kinds of words as modifications or similes (Tan, 2019).

Research has shown that personal pronouns can distinguish cyberbullying: personal pronouns and proper nouns are used to identify particular objects (Searle, 1970). Yin et al. (2009)

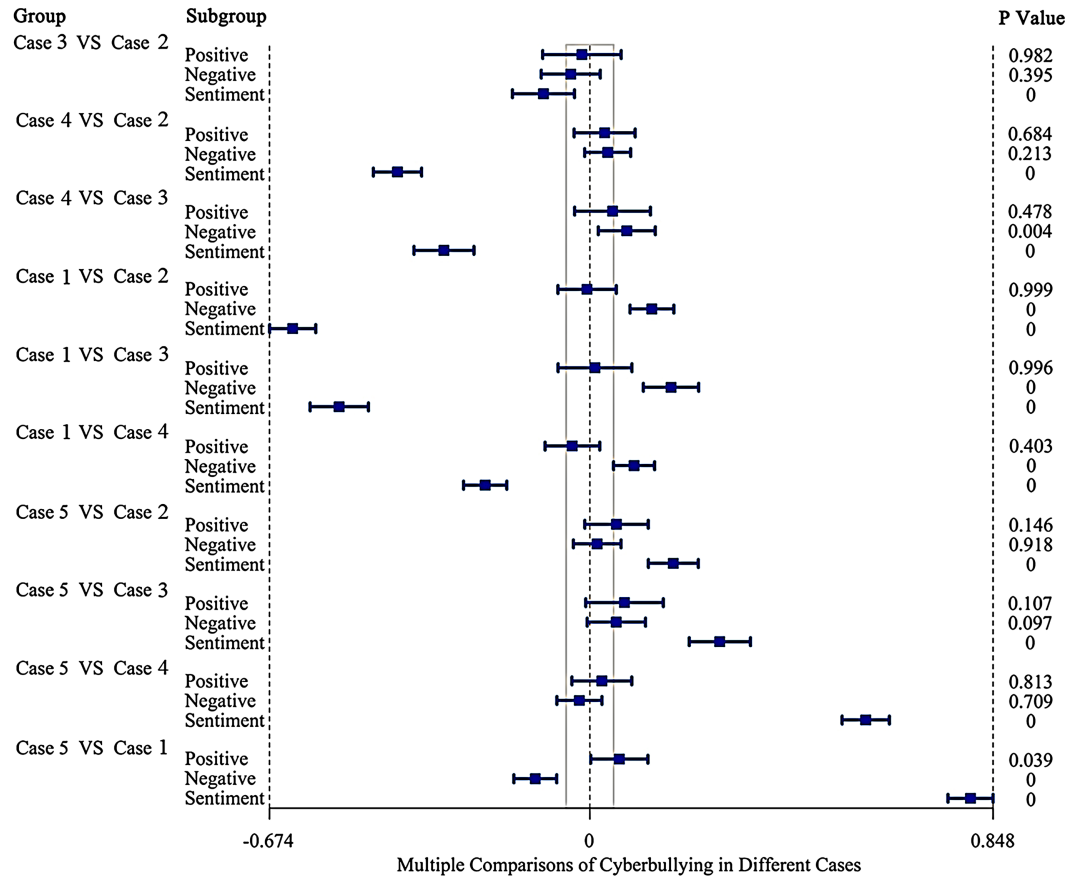

FIGURE 3 | Forest plot of sentiment polarity in cyberbullying cases.

TABLE 6 | Descriptive statistics of sentiment analysis in different cases.

Cyberbullying comments in different cases		Positive		Neutral		Negative	
		n	Percentage (%)	*n*	Percentage (%)	*n*	Percentage (%)
Case 1: Education	Explicit	99	22.20	10	19.61	743	28.87
(*N* = 3,051)	Implicit	347	77.80	41	80.39	1,831	71.13
	Total	446	14.62	51	1.67	2,574	84.37
Case 2:	Explicit	55	9.14	7	8.43	231	13.47
Entertainment	Implicit	547	90.86	76	91.57	1,484	86.53
(*N* = 2,489)	Total	602	24.19	83	3.33	1,715	68.90
Case 3: Society	Explicit	33	5.02	3	6.38	144	17.00
(*N* = 1,551)	Implicit	624	94.98	44	93.62	703	83.00
	Total	657	42.36	47	3.03	847	54.61
Case 4: Finance	Explicit	55	10.38	10	23.26	473	21.66
(*N* = 2,755)	Implicit	475	89.62	33	76.74	1,711	78.34
	Total	530	19.24	43	1.56	2,184	79.27
Case 5: Sport	Explicit	105	6.19	14	14.14	508	27.94
(*N* = 3,614)	Implicit	1,592	93.81	85	85.86	1,310	72.06
	Total	1,697	46.96	99	2.74	1,818	50.30

noted that second-person pronouns (e.g., "you" and "yourself") are more useful than other personal pronouns for harassment detection. Compared with "he" or "she," "you" evokes a sense of direct interaction—as if the audience were standing in front of the speaker—which limits the force of accusation to the victim (Xu, 2021). Non-bullying comments in this study were accompanied by greater use of first-person plural pronouns, such as "we." This trend may have arisen because "we" can also function as a politeness strategy in transient interaction and serves to reduce the distance between a speaker and listener

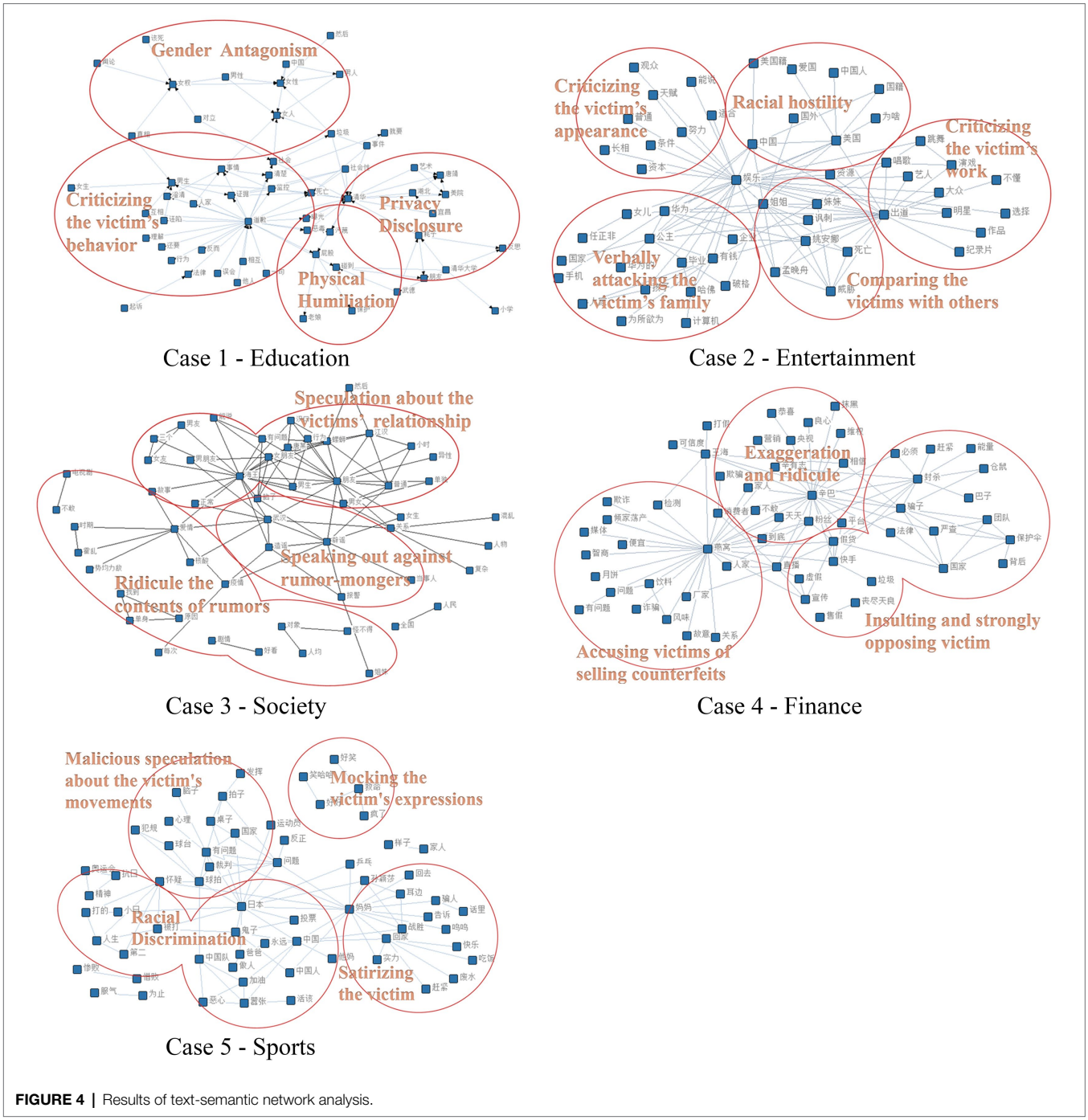

FIGURE 4 | Results of text-semantic network analysis.

(Brown and Levinson, 1987). In cyberbullying incidents, mediators may use "we" to bring others closer to them and to cause readers to be more receptive to mediators' opinions.

In the social media context, uncertainty leads to inefficient communication and potential cognitive dissonance among the public (Dwivedi et al., 2018). Our results accord with those of Zhou et al. (2021), who identified uncertainty as a salient feature of rumor propagation. Cyberbullies convey uncertainty by using nouns with modifiers (e.g., fillers, expressions of certainty, and tentative and adjunct words). Xu (2021) discovered that derogative nouns (with or without modifiers) enable more negative evaluations of victims, such as by using negations. Cyberbullies also tend to hide their malice behind complex words or nouns with modifiers or by using neutral words to avoid being screened by Internet supervisory authorities.

Our results further showed that, in addition to swear words, emotional words are distinctive features of cyberbullying. Recent studies have indicated that sentiment plays a key role on social media: posters can draw wide public attention by using a large number of emotional words (Guo et al., 2019; Ghanem et al.,

2020), which can in turn evoke emotional audience responses (Zhou et al., 2021). Surprisingly, the mean value of positive emotion-related words in our set of cyberbullying comments exceeded that of negative emotion-related words. This outcome was likely due to the prevalence of implicit bullying. In our sample, cyberbullies often used negative words to express their subjective views of an incident; doing so exacerbated responses and amplified associated negative effects. Meanwhile, these posters typically employed positive emotion-related words to satirize and ridicule victims. Group infection theory (Hatfield et al., 1993) maintains that personalized emotions can influence others' behavior, thoughts, and emotions. This influence can interact and grow among multiple people, driving group members to display uniform emotional states and social perceptions (Bowen and Blackmon, 2003; Smith and Conrey, 2007). Along with using emotive expressions, improper punctuation use is common in emotional expression (Ying et al., 2012; Salminen et al., 2020). Cyberbullies may use certain discourse markers (e.g., punctuation and mathematical symbols) to accentuate their messages (Rafi, 2019). Punctuation abuse was found to be particularly frequent in instances of Chinese cyberbullying, especially overusing exclamation points and question marks. Interrogative sentences are one of the most popular types of indirect speech used to express inquiries or requests (Yule, 1996). Yet the heavy use of question marks in cyberbullying content reflects strong skepticism and is loaded with anger. A creative use of language in cyberbullying appeared in questions containing "为什么" ("why") that ended with an exclamation point (Xu, 2021). Saengprang and Gadavanij (2021) suggested that the interrogative mood is often used to express the sender's opinion rather than to ask a question.

Comparisons of Linguistic Features Across Cyberbullying Incidents

Our findings revealed that cyberbullying varied by incident in terms of three aspects: the linguistic features of cyberbullying, word use, and comment sentiment. Descriptive statistics showed that cyberbullying comments displaying implicit bullying were more prevalent than non-bullying content. As mentioned, netizens tended to express their opposition to the victim through context-sensitive words and indirect language, such as interrogative sentences. Some netizens did not initially intend to attack the victim and may have simply meant to mock seemingly humorous parts of the incident. Doing so could inadvertently feed ridicule and rumors, especially in selected cases involving sport and society. These consequences might have occurred because recreational aggression, which is unprovoked and conducted in order to obtain instant gratification (e.g., a quick thrill), usually motivates cyberbullying. Perpetrators may not focus on the impacts of their behavior and thus may not fully understand these effects (Graf et al., 2022).

To gain a richer understanding of cyberbullying at the content level, we scrutinized the semantic network of words and noticed that the controversial focus of the incident—not the domain—influenced posters' word choices. Cyberbullying generally begins with controversial behavior, ranging from criticism of the victim's appearance, experience, and family to indiscriminate attacks on a specific group of victims. Forms of cyberbullying differed significantly across all domains. This result is somewhat challenging to interpret given the lack of a common denominator between areas, but the variation could be attributed to social identities and group categorization. Social identity theory suggests that individuals identify with their own group *via* social categorization, which spurs in-group favoritism and out-group hostility (Tajfel and Turner, 1979). Cyberbullying represents a form of inter-group conflict, such as masculinity vs. femininity (Case 1—education), rich vs. poor (Case 2—entertainment), and home country vs. other country (Case 5—sport). These oppositions feature some degree of power imbalance (Olweus, 1995). People unconsciously classify themselves as either cyberbullies or mediators with respect to cyberbullying; one's label depends on their identification and understanding of group identity. Case 3 (society) had less cyberbullying content and concerned personal privacy and public safety. Amid the COVID-19 pandemic, a large volume of information about personal trips has come to be stored in the cloud, heightening the risk of privacy breaches. The victim's experience in this case could have happened to anyone. Posters could therefore naturally assign themselves to the same group as the victim and empathize with him more readily.

Our findings further demonstrated that the sentiment of cyberbullying comments varied by incident. Sentiment entails a comprehensive analysis of the positive, negative, and neutral sentiment in a particular sentence. The proportions of cyberbullying types and the public's understanding of a controversy each influenced sentiment. When comparing the positive and negative probability in different cyberbullying cases, the positive probability did not differ significantly across cases. This result is interesting but not surprising: implicit bullying was the main type of cyberbullying in each case. Positive and neutral words were widely used to satirize others in all cases, such as "太好笑了" ("That's funny") in Cases 3 and 5 or "有钱真好" ("It's good to be rich") in Case 2. By contrast, the significant difference in negative probability between Case 1 and others may have emerged because this case included the highest rate of explicit bullying; cyberbullies expressed their anger by swearing extensively and by using negative words and death-related terms. Case 1's negative probability was accordingly high. The above findings indicate that cyberbullying detection involves more than simply pinpointing negative sentiment (Ptaszynski et al., 2016). Arreerard and Senivongse (2018) found that some text did not express negative opinions although the content was defamatory. In incidents where ridicule was the predominant form of implicit bullying, the proportion of positive emotions was striking. Current approaches to sentiment analysis for cyberbullying detection hence appear insufficient; additional work is needed to ascertain whether a text is extremely emotional.

Implications for Curbing Cyberbullying and Shaping Digital Citizens

Our results offer several meaningful implications for the detection and governance of cyberbullying. Automatic cyberbullying detection is a task of growing interest and a timely concern given the ubiquity of social networks in everyday life and the

potentially dire consequences of cyberbullying (Rosa et al., 2019). This detection tool is correspondingly valuable. However, Rosa et al. (2019) found that cyberbullying is often misrepresented in the literature, leading to inaccurate systems with limited real-world applicability. As discussed, filtering stop words may not increase the accuracy of cyberbullying detection as predicted; more investigation is needed. Existing methods fail to paint a clear picture of cyberbullying; most concentrate on a limited set of textual features to the neglect of other linguistic characteristics (including implicit ones). It is therefore necessary to generate tools capable of more comprehensive textual analysis of cyberbullying. For example, detailed analysis can address comments related to time and relativity, affective and biological processes, pronouns pointing to victims (e.g., "you"), and terms with a negative meaning but positive connotation (i.e., not all bullying content contains explicit insults). It would be similarly useful to detect uncertainty in sentences, as our results frame this lack of certainty as a key component of rumor propagation. Additionally, semantic network analysis reveals words that are most likely to trigger cyberbullying related to a given incident. These terms can then be taken as "seed words" for cyberbullying and introduced into deep learning to improve model accuracy. Second, cyberbullying detection has been expanded to languages other than English. We combined TextMind, with Baidu's open API of natural language processing, SPSS, and ROSTCM to carry out a preliminary analysis of the linguistic features of Chinese cyberbullying. Our results shed light on the design and development of automatic cyberbullying detection tools for Chinese social networking platforms, such as Sina Weibo, Tencent Weibo, and others.

Regarding the governance of cyberbullying, we recommend that social media platform managers or administrators pay closer attention to comments containing reactions other than explicit aggression: adjunct words (e.g., auxiliary verbs, prepositions, quantifiers, and numbers), frequent assent words, or fillers. In addition, cyberbullies' preferred forms of cyberbullying and the sentiments expressed varied by case. Platform managers or administrators should therefore tailor their approaches to combating cyberbullying in different areas. For example, in the case involving gender antagonism, platform personnel could screen comments containing stigmatizing epithets that represent men or women. Practitioners can also filter negative comments targeting specific groups. Last, rather than outlining general etiquette for social media users to follow, government officials should establish detailed rules and regulations for separate occasions. They should also aim to clean the cyberspace as thoroughly as possible using advanced technology and monitor sensitive incidents with the potential to garner widespread attention. These interventions can minimize the likelihood of cyberbullying. Further, with these rules, social media platforms should advise their users based on the site's characteristics. Bilibili, a leading Chinese video streaming website, is one such example. The platform is famous for its bullet comments service that allows real-time comments from viewers to fly across the screen like bullets. Bilibili provides detailed instructions for bullet-comment etiquette; only users who pass the test can send bullet comments.

For individual social media users, the findings of this paper can offer examples of how not to behave elegantly and responsibly on social networks. Users can thus "learn from failure" and reflect on what digital citizenship embodies—what is effective and what is harmful when socializing online. People can hurt others inadvertently, such as by speaking inappropriately. Online interaction leaves clearer footprints than face-to-face communication. These traces are easily tracked and can subject victims to greater pain. Our results confirm this risk: content analysis revealed that people used bullying language despite not intending to speak out against the victims. Ideally, to be an ethical and responsible digital citizen, one should know how to use ICT to build a harmonious and innovative digital society. It is important to bear in mind what is allowed and what is prohibited, when certain behavior is and is not appropriate, and how to respond decently online. Linguistic features can offer users a concrete sense of how to use words properly in various situations on social media. Our research should thus raise users' awareness of which types of words are preferable to avoid misunderstanding and to discourage cyberbullying. Though anti-cyberbullying is only one of the tasks individuals face while enhancing digital citizenship, it is essential to shaping qualified digital citizens given the prevalence of social networking in daily life. Our research thus makes a meaningful step toward cultivating ethical and responsible digital citizens.

CONCLUSION

Cyberbullying has become one of the most challenging problems plaguing social media, as it harms the physical and mental health of individuals as well as online communities. Most relevant research revolves around preventing cyberbullying and has presented data-based approaches to identify such behavior. However, few studies have differentiated between explicit and implicit cyberbullying, leading to unsatisfactory identification results. Moreover, relatively little is known about cyberbullying in non-English language contexts. The present work sought to examine the linguistic features of cyberbullying on Chinese social media. We first reviewed research related to cyberbullying, especially its language and the relationship between cyberbullying and digital citizenship. Then, a systematic linguistic analysis of 23,980 comments from Sina Weibo was conducted, including content analysis, lexical feature analysis, sentiment polarity analysis, and semantic network analysis. We next distinguished the linguistic characteristics of explicit bullying and implicit bullying and examined the prevalence of implicit bullying as well. Results revealed that cyberbullying language follows several patterns. First, comments categorized as implicit bullying (e.g., ridicule and satire) are more prevalent than non-bullying comments. Second, cyberbullying comments generally contain a higher word count, greater number of swear words and adjunct words, heavy use of pronouns (e.g., "you" and "she"), more affective and biological processes, frequent references to money and death, and frequent use of question marks and exclamation points. Third, comments' sentiment varies by case; the proportion of positive emotions can be underestimated depending on the type of cyberbullying. For instance, cases with

more intense conflict in our sample had a higher proportion of explicit cyberbullying language and more negative expressions than others. Finally, the nature of an incident informs word choice: cyberbullying often stems from controversial behavior, leading to attacks on the victim's appearance, experience, and family as well as potential indiscriminate attacks on a particular group of victims. These findings also underscore the need for cyberbullying research based on pragmatics.

Overall, extracting the linguistic features of cyberbullying contributes to cyberbullying detection and enriches digital citizenship education. The apparent limitations of cyberbullying detection, as indicated by sentiment polarity analysis, reinforce the need for studies identifying the characteristics of implicit bullying and its manifestations. Also, stop words should be used judiciously: words such as prepositions and tense markers, may not be filtered. Regarding digital citizenship education, clear guidelines should be developed for online communication. Qualified digital citizens generally exhibit safe, ethical, and responsible online behavior. The linguistic characteristics of cyberbullying revealed in this study can provide netizens examples of how to communicate properly on social media. Language reflects and influences individuals' perceptions and behavior (Tausczik and Pennebaker, 2010; Kihlstrom and Park, 2018). A better understanding of online language use can facilitate people's online interactions, which can in turn change the digital world.

Despite its revelations, this research has limitations that leave room for future work. Emojis were not considered in our analysis of cyberbullying comments; however, the coding process showed that commenters often expressed attack intentions *via* emojis (Miller et al., 2016; Rafi, 2019). We therefore recommend that follow-up research delve further into individuals' comments, particularly decoding images and emojis (e.g., Hettiarachchi and Ranasinghe, 2019; Kumari and Singh, 2021). Moreover, the linguistic analysis tools adopted in this study were based on LIWC2007 and C-LIWC supplemented with an additional Chinese dictionary. More powerful and updated tools should be applied in subsequent work to accommodate rapidly evolving Chinese Internet vocabulary.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material; further inquiries can be directed to the corresponding authors.

AUTHOR CONTRIBUTIONS

JZho: literature search, methodology, data analysis, and writing—original draft preparation and editing. JQ: literature search, data curation, and data analysis. MS: literature search, content analysis, and writing—review and editing. XJ and JZha: content analysis and writing—review and editing. YG: literature search and content analysis. XQ: literature search and content analysis. YX: writing—review and editing. JH: methodology and writing—revision and editing. YZ: supervision, conceptualization, validation, and writing—review and editing. All authors contributed to the article and approved the submitted version.

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Childhood emotional abuse and cyberbullying perpetration among Chinese university students: The chain mediating effects of self-esteem and problematic social media use

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Childhood abuse has been shown to have a range of adverse physical and psychological consequences, including aggression and bullying. While researchers have explored the relationship between childhood abuse and cyberbullying, little is known about the impact of emotional abuse on cyberbullying. This study examined the link between childhood emotional abuse (CEA) and cyberbullying perpetration among university students in the Chinese cultural context, as well as the chain mediating effect of self-esteem and Problematic Social Media Use (PSMU). A total of 835 university students (18–25 years old; 293 males, 542 females; M_{age}=19.44 years, SD=1.28) completed the Childhood Trauma Questionnaire Short-Form (CTQ-SF), Rosenberg Self-Esteem Scale (RSES), the Social Media Use Questionnaire (SMUQ), and Cyberbullying Inventory (CBI). The results showed that CEA and PSMU were positively correlated with cyberbullying; self-esteem was negatively correlated with cyberbullying. Besides, self-esteem and PSMU sequentially mediated the relationship between CEA and cyberbullying perpetration. The findings indicate that childhood emotional abuse may lower self-esteem and cause problematic social media use, which increases cyberbullying perpetration.

KEYWORDS

childhood emotional abuse, cyberbullying perpetration, self-esteem, problematic social media use, university students

Introduction

By the end of 2021, the number of Chinese Internet users was 1.032 billion, of which the Internet penetration rate reached 73%, and the proportion of online surfing with mobile phones was up to 99.7% [China Internet Network Information Center (CNNIC), 2022]. With the popularity of the Internet, cyberbullying has become a global phenomenon and an increasingly severe social issue. Cyberbullying perpetration is usually defined as "using electronic forms of contact to repeatedly and intentionally

harm a victim who cannot defend him or herself." (Smith et al., 2008), including various behaviors, such as harassment, denigration, masquerade, flaming, and cyberstalking (Smith, 2015). Cyberbullying differs from traditional school bullying in its anonymity, fast spreading, and uncontrollability, which may cause more critical consequences and adverse psychophysiological effects on victims.

The prevalence of cyberbullying varies in different studies due to different definitions and measurement methods (Brochado et al., 2017; Kowalski et al., 2019; Chen and Chen, 2020; Barlett et al., 2021; Eyuboglu et al., 2021; Zhu et al., 2021; Fulantelli et al., 2022). A systematic review showed that the prevalence of cyberbullying victimization among East Asian adolescents ranged from 5.8 to 56.8%, and the rate of bullying was lower than victimization (Park, M. S. et al., 2021). A study in EU member countries showed that the rate of victimization ranged from 2.8 to 31.5%, from 3.0 to 30.6% of cyber perpetration (Henares-Montiel et al., 2022). Several studies have revealed that cyberbullying may lead to anxiety, depression, loneliness, social withdrawal, substance abuse, self-harm, and suicidality (Kwan et al., 2020; Giumetti et al., 2021; Chu et al., 2022; Coelho et al., 2022; Pichel et al., 2022). However, much previous research focused on teenagers, and relatively few studies were conducted on university students. Therefore, this study will explore the influencing factors and internal mechanisms of university students' cyberbullying perpetration to provide empirical support for scientific intervention.

Childhood emotional abuse (CEA) occurs independently of other types of childhood maltreatment (Glaser, 2002) and refers to non-physical, long-term, and harmful interactions between caregivers and children, including verbal aggression, humiliation, blaming, demeaning, or other behaviors (Glaser, 2011; Li et al., 2022). It is noticeable that childhood emotional abuse, which is more devastating than physical and sexual abuse and has potentially lifelong adverse effects, is often overlooked because there is no physical evidence of it (Rees, 2010; Dye, 2020). Studies in different countries and regions have shown high rates of CEA (Chandraratne et al., 2018; Prino et al., 2018). In a recent survey from Hong Kong, 43.3% of participants reported they had suffered emotional abuse during childhood (Fung et al., 2020).

Childhood emotional abuse is a risk factor for aggressive behavior (Wang et al., 2019a). According to the cycle of violence hypothesis, chronically abused victims in childhood are at greater risk of violence in adolescence and early adulthood (Wright et al., 2019) and are more likely to bully peers (Wang et al., 2017; Xiao et al., 2021; Park, J. et al., 2021). Recent evidence suggests that childhood abuse can significantly positively predict cyberbullying (Wang et al., 2019b; Jin et al., 2020; Fang et al., 2022; Li et al., 2022). Two recent studies in Western society have revealed a strong link between CEA and high cyberbullying perpetration among adolescents (Kircaburun et al., 2019; Emirtekin et al., 2020).

Based on previous studies, we consider that CEA is closely related to cyberbullying among university students. However, not all individuals who have suffered from domestic violence will exhibit violent behaviors. Further research is needed to elucidate the mediating or moderating mechanisms in the above relationships.

According to the self-system model (Connell and Wellborn, 1991; Skinner and Wellborn, 1994; Sandler, 2001), self-model is self-representation, which refers to the positive and negative evaluation of individuals. Typical self-evaluations include self-esteem and self-efficacy. Self-esteem refers to an individual's positive or negative evaluations of the global perception of self. Childhood adversity, including family maltreatment, can lead to severe disruption of self-system processes (e.g., self-esteem). From the perspective of attachment theory (Riggs and Kaminski, 2010), self-esteem generates from integrating the attitudes and evaluations of others (e.g., parents and other caregivers) toward the self. Children who grow up in an abusive environment do not get the necessary support and affirmation to develop a sense of self-worth.

Previous studies have also confirmed the negative correlation between childhood abuse and self-esteem (Arslan, 2016; Lim and Lee, 2017; Luo et al., 2020; Chen et al., 2022). CEA, a part of childhood abuse, can also cause low self-esteem (Chen and Qin, 2020), which may lead to a range of emotional and behavioral problems, resulting in psychological and social maladjustment (Arslan, 2016; Lim and Lee, 2017). Several studies have reported that low self-esteem is associated with high cyberbullying (Brewer and Kerslake, 2015; Fan et al., 2019; Yang et al., 2021).

Recent evidence has demonstrated the mediating effect of self-esteem on the relationship between adversity and problem behavior in children and adolescents. We believe that inappropriate parenting (e.g., CEA) will lead to low self-esteem, and low self-esteem may exhibit aggressive behaviors to avoid inferiority and shame caused by failure (Tracy and Robins, 2003).

Social media are fertile ground for cyberbullying perpetration (Chan et al., 2021). Some researchers have mentioned that Twitter and Facebook are two main social media platforms with the highest occurrence of online bullying (Whittaker and Kowalski, 2015). Problematic Social Media Use (PSMU) refers to an over concern and powerful motivation to engage in social media (Andreassen et al., 2016), relevant signs include overuse on social media platforms, log in or check social software frequently, irritability, or anxiety when not being able to access social media (Chen et al., 2020). Numerous research has indicated that PSMU is an important predictor of online aggression and cyberbullying (Görzig and Frumkin, 2013; Barlett et al., 2018; Craig et al., 2020; Marengo et al., 2021; Borraccino et al., 2022; Giumetti and Kowalski, 2022).

Problematic Social Media Use is influenced by many factors. The Interaction of Person-Affect-Cognition-Execution (I-PACE) model explains that problematic Internet use (e.g., social media addiction) is the result of the interaction of a person, affect, cognition, and execution (Brand et al., 2016, 2019). Specifically, a person's core characteristics are the susceptibility variables to behavior addiction, including bio-psychological factors (such as

genes and early adverse experiences), psychopathological correlates (depression, anxiety, and attention deficit hyperactivity disorder), and personality traits (e.g., high impulsivity, low self-esteem, and high neuroticism). Existing studies have confirmed the link between high abuse and PSMU (Worsley et al., 2018; Kircaburun et al., 2020), as well as low self-esteem and PSMU (Saiphoo et al., 2020; Schivinski et al., 2020).

Early traumatic experiences can be internalized in the evaluation of oneself and others, which could cause damage to self-esteem. Moreover, people with lower self-esteem are sensitive to interpersonal relationships and depend on social network to establish social relationships, leading to the intemperate use of social media and ultimately increasing the risk of cyberbullying. Therefore, high emotional abuse may lead to low self-esteem and PSMU in undergraduates, which in turn causes cyberbullying perpetration.

Given all the above, the current study aims to construct a chain mediation model to test the effects of self-esteem and PSMU. Based on the existing theories and empirical research, we put forward four specific hypotheses:

> *H1*: CEA would positively predict cyberbullying perpetration among university students.
>
> *H2*: Self-esteem plays a mediating role in the relationship between CEA and cyberbullying perpetration.
>
> *H3*: PSMU might be a mediator in the relationship between CEA and cyberbullying perpetration.
>
> *H4*: Self-esteem and PSMU together play a chain mediating role in the relationship between CEA and cyberbullying perpetration.

Materials and methods

Participants

Using the cluster random sampling method, 865 students from a university in Shandong province were selected as the research objects. 30 invalid questionnaires were removed, and the remaining 835 questionnaires were valid. Among the participants, there were 293 (35.1%) male students and 542 (64.9%) female students. 416 (49.8%) were freshmen, 246 (29.5%) were sophomores, and 173 (20.7%) were juniors. 308(36.9%) came from an urban area and 527(63.1%) came from a rural area. The age ranged from 18 to 25 years ($M = 19.44$, SD = 1.28).

Measures

Childhood emotional abuse

The Childhood Trauma Questionnaire Short-Form (CTQ-SF) developed by Bernstein et al. (1997, 2003) and revised by Zhao et al. (2005), measures abuse and neglect before the age of 16 years old. It includes five subscales: physical abuse (PA), emotional abuse (EA), sexual abuse (SA), emotional neglect (EN), and physical neglect (PN). Each subscale consists of five items, plus three validity items for a total of 28 items. We used the EA subscale (Chen et al., 2016; Li et al., 2020). The CTQ-SF is scored on a five-point scale (1 = never; 5 = always), with higher scores indicating higher levels of EA. The Cronbach's α of EA in the current study was 0.70.

Self-esteem

The Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965; Wang et al., 1999) was used to measure the level of self-esteem. It consists of 10 items, each item is rated from 1 (strongly disagree) to 4 (strongly agree). Higher scores indicate higher levels of self-esteem. In this research, the Cronbach's α was 0.90.

Problematic social media use

The Social Media Use Questionnaire (SMUQ), developed by Xanidis and Brignell (2016), assesses the problematic use of social media. The SMUQ has nine items and consists of two dimensions: withdrawal and compulsion. Participants rated each item on a five-point scale (0 = never; 4 = always). Cronbach's α was 0.80 in the current study.

Cyberbullying perpetration

Cyberbullying Inventory (CBI; Erdur-Baker and Kavsut, 2007) was used to test the level of cyberbullying perpetration. The CBI has 18 items. Participants rated each item on a four-point scale (1 = never happened; 2 = happened once or twice; 3 = happened 3–5 times; and 4 = happened more than five times). Higher scores indicate serious state of cyberbullying perpetration. In this study, Cronbach's α was 0.80.

Procedure and statistical analysis

We choose students' self-study time to conduct a collective test of the class. To ensure data quality, the first author, familiar with the study, served as the experimenter for each class. The study was approved by the Ethics Committee of Binzhou Medical University. To control the common method bias (CMB), we used procedural remedies and statistical remedies. The questionnaire included some reverse scoring items. Besides, the participants were told that the survey would be conducted anonymously, only for scientific research, and voluntarily.

In addition, we used a statistical test—the Harman single factor test to analyze the common method bias. The results showed that there were 10 factors with eigenvalues >1, and the first factor accounted for 16.12% variance, which is less than the 40% threshold. SPSS 26.0 and SPSS macro PROCESS model 6 (Hayes, 2013) were used for correlation analysis and chain intermediary effect test.

Results

Correlation analysis among variables

The mean, standard deviation, and correlation matrix of each variable are shown in Table 1. The results showed that CEA ($r = 0.23$, $p < 0.01$), PSMU ($r = 0.20$, $p < 0.01$), and cyberbullying were significantly positively correlated, while self-esteem and cyberbullying were negatively correlated ($r = -0.13$, $p < 0.01$). Additionally, there was a significant positive correlation between CEA and PSMU ($r = 0.23$, $p < 0.01$), and a significant negative correlation between CEA and self-esteem ($r = -0.28$, $p < 0.01$) and PSMU and self-esteem ($r = -0.21$, $p < 0.01$).

Mediation of self-esteem and problematic social media Use

Using PROCESS Model 6 to test the chain mediation effect. CEA was used as a predictor variable, cyberbullying as a dependent variable, self-esteem and PSMU as mediating variables, and gender as a control variable. As shown in Figure 1, CEA negatively predicted self-esteem ($\beta = -0.28$, $p < 0.01$) and positively predicted PSMU ($\beta = 0.16$, $p < 0.01$) and cyberbullying ($\beta = 0.19$, $p < 0.01$). Self-esteem negatively predicted PSMU ($\beta = -0.17$, $p < 0.01$), but it had no significant predictive effect on cyberbullying ($\beta = -0.04$, $p > 0.05$). PSMU positively predicted cyberbullying ($\beta = 0.19$, $p < 0.01$). The results of Bootstrap mediation test are shown in Table 2. The mediating effect of self-esteem is not significant, and the 95% CI [−0.01, 0.04] includes 0. The mediating effect of PSMU was significant, with 95% CI [0.02, 0.06], and the mediating effect accounted for 12.2% of the total effect. The chain mediating effect of self-esteem and PSMU was also significant, with 95% CI [0.00, 0.02], and the mediating effect accounted for 3.72% of the total effect.

Discussion

Although the effect of childhood maltreatment on cyberbullying has acquired considerable empirical support (Wang et al., 2019b; Jin et al., 2020; Fang et al., 2022; Li et al., 2022), less is known about the potential mediating mechanisms. Based on a sample of 835 Chinese university students, we constructed a chain mediated model, and the results proved the chain mediating effect of self-esteem and social media use in the above relationship.

As expected (H1), CEA was positively associated with cyberbullying perpetration, which is consistent with the results of previous studies (Kircaburun et al., 2019; Emirtekin et al., 2020; Li et al., 2022). Undergraduates with emotional maltreated experiences are more susceptible to bullying others online. The results support the cycle of violence hypothesis that violence in adulthood can be explained by early abuse. Children who live with violent parents for a long time will inherit violent ways to solve problems, creating a terrible cycle of violence. Based on the results of this study and previous studies, we believe that CEA is a critical risk factor for cyberbullying perpetration.

TABLE 1 Descriptive statistics and correlations among variables.

	M	*SD*	1	2	3	4
1. Childhood emotional abuse	6.92	2.57	—			
2. Self-esteem	31.94	5.28	−0.28**	—		
3. Problematic social media use	15.78	5.67	0.23**	−0.21**	—	
4. Cyberbullying	19.52	3.14	0.23**	−0.13**	0.20**	—

**$p < 0.01$.

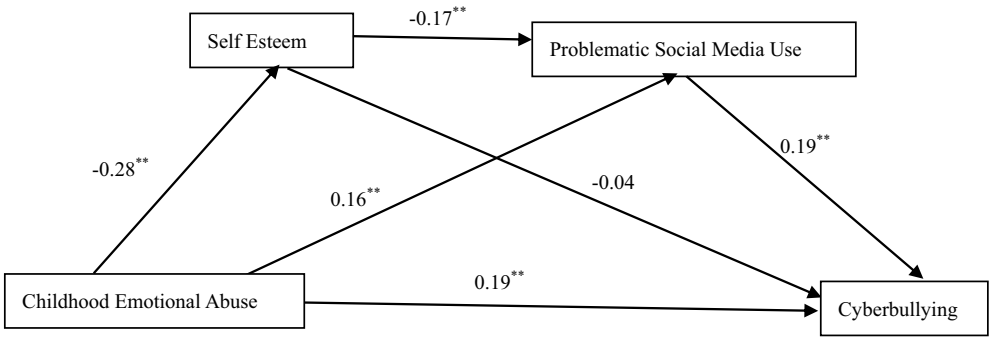

FIGURE 1
Model of the chained mediating effect of self-esteem and problematic social media use. **p<0.01.

TABLE 2 Indirect effect of self-esteem and problematic social media use.

	Effect	SE	LLCI	ULCI
Total	0.06	0.02	0.03	0.10
CEA → SES → CB	0.01	0.01	−0.01	0.04
CEA → PSMU → CB	0.04	0.01	0.02	0.06
CEA → SES → PSMU → CB	0.01	0.00	0.00	0.02

Attachment theory demonstrates that children constantly insulted, terrorized, disparaged, and despised by parents will believe they are worthless, unloved, and unlovable, which seriously affects their formation of correct self-cognition and results in lower self-evaluation. The results showed a negative effect of CEA on self-esteem, which also accords with the earlier observations (Arslan, 2016; Chen et al., 2022). However, when PSMU was added, the predictive effect of self-esteem on cyberbullying was no longer significant, and the path of CEA → self-esteem → cyberbullying was not significant, which is inconsistent with hypothesis 2. This result is similar to previous studies (Xin et al., 2007; Cao and Zhang, 2018). When other variables are added, the direct predictive effect of self-esteem on aggressive behavior becomes no longer significant. Low self-esteem caused by CEA does not necessarily trigger online bullying, though, in the most simple binary relation, our result showed the negative relationship between self-esteem and cyberbullying, but in the background of multivariate context and within the group of university students, the relationship between the above two is likely to be influenced by the third variable, this study also proved it.

In line with Hypothesis 3, PSMU mediated the relationship between CEA and cyberbullying perpetration. Emotional abuse can significantly and positively predict problematic Internet use and social media use, consistent with existing research findings (Dalbudak et al., 2014; Schimmenti et al., 2014; Worsley et al., 2018; Kircaburun et al., 2020). Dalbudak et al. (2014) have found that the types of childhood abuse associated with increasing risk of Internet addiction were emotional abuse, emotional neglect, and physical neglect, among which the emotional abuse was the most important predictor. In addition, Schimmenti et al. (2014) revealed that childhood sexual abuse was associated with a sevenfold increasing risk of problematic Internet use in adolescence. This may be a strategy for individuals who suffered adversity in childhood to cope with early adverse experiences through virtual worlds (Worsley et al., 2018). Frequent and problematic use of social media increases the likelihood of witnessing and imitating online attacks, causing negative consequences of cyberbullying perpetration and victimization. However, PSMU is more strongly linked with cyberbullying perpetration (Craig et al., 2020). Thus, the mediating effect of PSMU was significant.

The current results also indicated that self-esteem and PSMU had a chain mediating effect on the relationship between emotional abuse and cyberbullying. CEA sequentially influences self-esteem and PSMU and eventually leads to cyberbullying among university students. Individuals exposed to parental maltreatment in childhood suffer from emotional trauma and unsatisfied psychological needs. They constantly receive and accumulate negative emotions and feedback from caregivers and gradually internalize negative evaluations of themselves with low self-worth and self-esteem. Moreover, to overcome the trauma caused by early adverse experiences, children and adolescents seek their positive values in social networks to obtain emotional satisfaction, which leads to the excessive use of social media and increases the chances of hurting others and being hurt by others. How does CEA influence cyberbullying among university students? Some researchers suggest that it is through dark personality traits (Kircaburun et al., 2019), while others consider it is through the chain mediating effect of hostile attribution bias and anger rumination (Li et al., 2022). Our results explain why CEA is associated with cyberbullying in terms of self-esteem and PSMU, supporting the I-PACE model and enriching our understanding of the relationship between early adverse experiences and cyberbullying perpetration.

This study confirms that CEA sequentially influences cyberbullying through self-esteem and PSMU in a Chinese cultural context. In the Chinese sample, low self-esteem caused by CEA does not necessarily lead to cyberbullying. It is the overuse of social media that results in the risk of cyberbullying. Whether this conclusion is applicable to other cultures remains to be further tested.

Limitations and future directions

Several limitations of the current study should be noted. Firstly, the cross-sectional design cannot provide evidence for causal relationships among variables, and longitudinal studies should be carried out in the future, which would be more conducive to understanding the impact of emotional abuse on cyberbullying. Secondly, self-report measures were used to collect data, while retrospective self-report is prone to biases. In addition, the sensitivity of abuse or cyberbullying is easily affected by social desirability bias. Thirdly, the samples were taken from undergraduates in China, and cyberbullying has cultural differences (Craig et al., 2020), so future research should conduct cross-cultural tests.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics Committee of Binzhou Medical University. The patients/participants provided their written informed consent to participate in this study.

Author contributions

WX conducted the survey, analyzed the data, and wrote the manuscript. SZ designed the study and revised the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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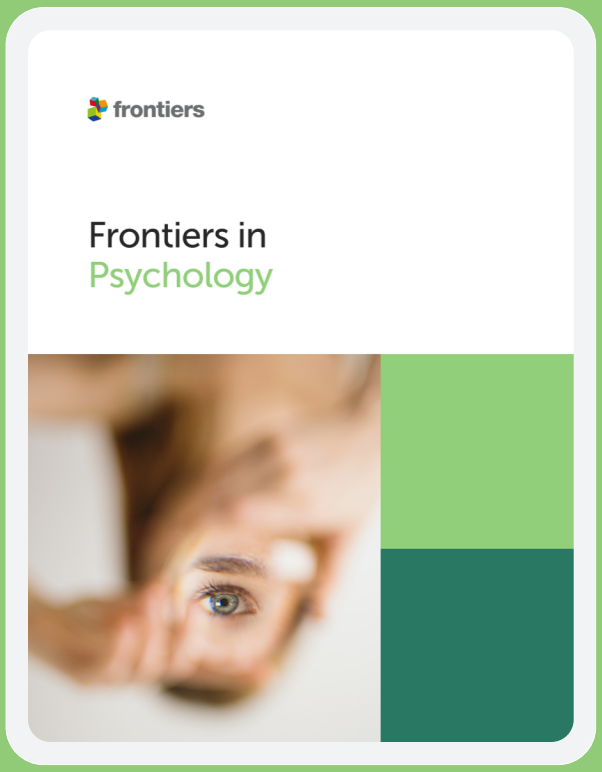

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