Research Square

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Development of a Chinese adolescent cyberbullying scale

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Research Article

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Abstract

Background

We developed an adolescent cyberbullying scale based on the online use behavior of Chinese adolescents, using a large sample as a basis, in compliance with psychometric methods.

Methods

We formulated a pre-test questionnaire based on a conceptual operational definition and constructed a model and question bank. We included 476 participants in item analysis and exploratory factor analysis and 226 participants in reliability testing and confirmatory factor analysis to develop the final questionnaire.

Results

The developed questionnaire consists of four factors and 13 questions. The internal consistency of the questionnaire dimensions was 0.531–0.891, and test–retest reliability was 0.224–0.502. The internal consistency of the questionnaire was 0.864 and test–retest reliability was 0.518. Construct validity was good, and the correlation with Olweus Bully/Victim Questionnaire-V and Multidimensional Bullying Victimization Scale cyberbullying questions was 0.219 and 0.289, respectively.

Conclusion

Through exploration and discovery in this study, we established a cyberbullying scale that reflects the Internet usage characteristics of Chinese adolescents. The validity and reliability of the questionnaire was good. This scale can be used as an effective measurement tool for adolescent cyberbullying behavior in China.

Introduction

1.1. Methods

1.1.1. Participants

Sampling (sample 1) was performed in four elementary and secondary schools, covering elementary grade 4 to junior high school grade 3. A total of 2409 valid questionnaires were collected. The participants' ages ranged from 11 to 18 years, and the mean age was 13.8±1.63 years. The male:female ratio was 1:1.

1.1.2. Drafting the pre-test questionnaire

(1) Theoretical model construction

The following points were highlighted in theory construction for the present cyberbullying measurement tool, based on psychometric requirements and the general status of Chinese adolescent cyberbullying behavior.

First, adolescent Internet use habits under the current development status of China's Internet were highlighted. On the one hand, the main purpose of using the Internet among Chinese adolescents is online socializing, gaming and entertainment, and online learning; the main method of accessing the Internet by this population is smart phones. However, at the basic education stage, schools have strict requirements on mobile phone use and use time, with durations strictly controlled. Therefore, Internet usage in Chinese adolescents is mainly for a small number of applications and concentrated at night and on weekends.

Second, types of cyberbullying are similar to those in the real world. Through case analysis, we found that there are diverse types of cyberbullying behavior, which can be described from multiple perspectives such as use of real name/anonymous, individual/group,

and spread (point to point)/dissemination (point to surface). In terms of classification, cyberbullying can be classified based on real world “verbal bullying,” “relationship bullying,” and “sexual bullying.”

Third, the unique characteristics of cyberbullying were highlighted. These include anonymity, overcoming spatiotemporal boundaries, the power-upending principle, and technological barriers that are unique to cyberbullying.

Lastly, we concretized the question measurement indicators. During the study, we adopted an analytical thought process of “motive→behavior→question” and summarized the characteristics of different forms of cyberbullying, from motive to behavioral presentation, to provide a reference for question.

(2) Construction of a question bank

Following the theoretical model construction, question formulation was based on two aspects of cyberbullying, namely, anonymity (real name/anonymous) and behavioral content (verbal attack/group ostracization/rumors and defamation/sexual harassment). We also considered the correlation between Internet application and behavior in the instructions and questions. For example, “kicking me out of message groups in QQ or WeChat” is a group ostracization behavior in an instant messaging application using someone’s real name and is a typical behavior of cyber relationship bullying.

Cyberbullying-related questions in existing measurement tools and representative behaviors in cyberbullying interview cases were used as reference in question drafting. First, typical bullying behaviors were extracted from the aforementioned tools and classified based on their dimension in the original scale. Second, information was extracted from interview cases and cyberbullying behavior was summarized to supplement typical behaviors. Finally, experts were invited to draft and review the questions based on these typical behaviors.

In the question drafting process, a group comprising elementary and secondary school teachers; administrative staff and principals; psychology graduate students; and university psychology, pedagogy, sociology, and legal theory instructors drew up the preliminary draft. After that, elementary and secondary students read the questions, and their feedback was used to revise the content and combine any questions with repeated content. After multiple rounds of small-scale testing, a pre-test scale (16 questions) was obtained, which was named the Adolescent Cyber Victimization Scale (ACVS).

(3) Pre-test scale

The pre-test scale included five demographic questions, and 16 questions addressing school bullying behavior. Other than for demographic variables, a 5-point Likert scale was used for cyberbullying behavior-related questions. In the instructions, the measurement period was stated as “in the past month.” A score of 1 indicated never, 2 indicated 1–2 times, 3 indicated 2–3 times, 4 indicated once a week, and 5 indicated multiple times a week.

1.1.3. Testing and data processing

Testing was carried out using a written, hardcopy questionnaire, and study participants were asked to complete the scale independently. Sufficient time was provided. Collected questionnaires were screened and those with incomplete or unstandardized answers were removed. Data analysis was carried out using IBM SPSS 26 software.

To increase participant representativeness, victim of bullying was used in the data analysis stage, which comprised participants who chose “1–2 times” (corresponding to 2 points on the Likert scale) and above in any question. Based on this criterion, 476 participants were included in the statistical analysis, accounting for 19.76% of the total sample.

1.2. Results and analysis

1.2.1. Question analysis

An independent samples *t*-test was performed on high- and low-score groups (top 27% and bottom 27%) to test the discriminatory power of the questions. The results showed significant differences in the means between high- and low-scoring groups ($p<0.01$).

The overall correlation and internal consistency tests were used to assess the homogeneity of the revised questions. The results indicated that the internal consistency coefficient of 16 questions was 0.798. After revision of question 5 (Ignoring my messages sent in WeChat groups and QQ groups), the total correlation was 0.258 and the correlation coefficient was low. After removing this question, the internal consistency coefficient was 0.803, which was higher than the internal consistency coefficient of the pre-test scale. Based on relevant study recommendations, the question should be deleted. The correlation coefficients of other questions were in the range of [0.308, 0.557]. Internal consistency statistical results showed that the internal consistency coefficient after deleting each question was lower than that of the pre-test scale, which was 0.798. The remaining 15 questions were used for exploratory factor analysis.

1.2.2. Exploratory factor analysis

Exploratory factor analysis was performed for 15 questions; the results of the Kaiser–Meyer–Olkin test were 0.77, that of Bartlett's test of sphericity chi-square value was 2723.799, (p<0.01). Principal component analysis and varimax rotation were used to obtain four principal components with eigenvalues greater than 1. The first component explained 29.78% of the variance and the cumulative explained variance was 61.47%. Eigenvalues, scree plot, factor loading (>0.5), communality (>0.2), and MSA (>0.5) were used to remove 2 questions with low factor loading. These were question 4 (spreading indecent photos or videos of me online) and question 11 (posting malicious comments about me online). After another factor analysis, the measure of sampling adequacy (MSA) was [0.679, 0.844], communality was [0.493, 0.834], and load was [0.66, 0.9]. Finally, four factors and 13 questions were obtained. Table 1 shows the factor names and question content.

Factor 1 contains three questions, with factor loading of [0.723,0.866] and mainly involving using online information for intimidation, threats, spreading of rumors, and incitement; this factor was named cyber verbal bullying. Factor 2 includes three questions, with factor loading of [0.66,0.691] and mainly involves excluding the victim from an online group as a goal, such as using group chat and privacy disclosure to incite others to ostracize the victim. This factor was named cyber relationship bullying. Factor 3 comprises three questions, with factor loading of [0.698,0.756] and involves behaviors performed under anonymity, such as impersonation or hijacking another's account to make inappropriate remarks. This factor was denoted cyber anonymous defamation. Factor 4 includes 4 questions, with factor loading of [0.719,0.9] and involves behaviors associated with pornography, such as verbal teasing, distribution of obscene photos of others, and spreading obscene photos of others on chat groups. This factor was named cyber sexual bullying.

1. Formulation of a Chinese adolescent cyberbullying scale

1.1. Methods

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2. Formal questionnaire test and validity and reliability tests

2.1. Methods

2.1.1. Participants

At 4–6 weeks after the previous test, sampling (sample 2) was carried out in the same schools as those selected in sample 1. A total of 2409 participants in sample 1 participated in the post-test. Based on the screening criteria of sample 1, we obtained 226 victim of bullying, who all participated in the pre-test. These were used as re-test samples and accounted for 9.38% of the entire sample.

2.1.2. Tools

The formal scale includes 13 questions in the pre-test scale and five demographic variables. The criterion validity questionnaire 1 was the victim part of the Chinese version of the Olweus Bully/Victim Questionnaire (OBVQ) [18], which comprised nine questions in total and measures verbal and physical bullying. A 5-point scale was used, in which 1 represents never and 5 represents several times a week. The internal consistency coefficient in this study was 0.89. The criterion validity questionnaire 2 included four

questions related to cyberbullying in the Chinese version of the Multidimensional Bullying Victimization Scale (MBVS) [19]. A 4-point Likert scale was used, in which 1 represents never and 4 represents frequently. The internal consistency coefficient in this study was 0.905.

The Centre for Epidemiological Studies Depression Scale (CES-D) was used as a tool to assess predictive validity [20].The CES-D is a brief self-report instrument developed to assess current depressive symptom severity among the general population. Comprising 20 items focused on symptoms experienced in the week prior to assessment, it uses a 0-to-3 response scale corresponding to the frequency of symptom occurrence. Scores range from 0 optimalstatus to 60 mostseverestatus, and the commonly recommended cutoff for identifying probable depression cases is 16 [21].The internal consistency coefficient in this study was 0.85.

2.1.3. Testing and data processing

A written, hardcopy questionnaire combined with optical mark recognition (pen) were used for testing. The criteria for removing invalid questionnaires were the same as those in the pre-test. Amos 22 was used for confirmatory factor analysis.

2.2. Results and analysis

2.2.1. Reliability

The reliability results showed in Table 2 that the internal consistency coefficient of the factors was within [0.531, 0.879] and the overall internal consistency was 0.864. A pre-test and post-test were used to evaluate the test–retest reliability. The test–retest reliability of factors was within [0.224, 0.502] and the overall test–retest reliability was 0.518.

2.2.2. Validity

(1) Construct validity

Table 3 shows the correlation coefficients between factors and the total score. The correlation coefficients between factors were within [0.295, 0.64], or low–medium positive correlation. This shows that the factors are different and cannot be replaced by each other while ensuring consistent measurement content. The correlation between factors and the total score was within [0.725, 0.813], which was greater than the correlation between different factors. The correlation coefficients met the criterion recommended by related studies [22], showing that the content consistency of factors and overall questionnaire was high.

Structural equation modeling was used to carry out confirmatory factor analysis of the formal questionnaire to evaluate its construct validity and examine the rationality of the model. To validate whether the hypothetical model was the optimal model, the fit between the hypothetical model and non-discriminatory factor model (competitive model M1) was used for comparison. Table 4 shows the fit index of the two models. M1 did not fulfill the related theoretical hypothesis and the fit of the hypothetical model was superior.

The convergent validity of the higher-order model was further tested; Table 5 displays the fit indicators. The factor loadings(standardized regression weights) of the questions were within [0.482, 0.952], which was close to or equal to 0.5, as recommended in related studies. The composite reliability of the factors was within [0.531, 0.897]. With the exception of online community ostracism, the correlation coefficients of the other factors were 0.7 and above, as recommended in related studies. The average variance extracted was within [0.275, 0.745]. With the exception of online community ostracism, the correlation coefficients of the other factors were 0.5 and above, as recommended in related studies [23].

(2) Criterion-based validity

The results for criterion-based validity analysis of the formal questionnaire showed that the correlation between the total score of the formal questionnaire and OBVQ-V was 0.219 ($p<0.01$), and its correlation with four cyberbullying-related questions in the MBVS was 0.289 ($p<0.01$). Hence, the correlation was significant.

Among the group of respondents who experienced cyberbullying in this survey, 104 individuals had a CES-D score of 16 or higher, accounting for 46% of the total sample. A significant correlation was found between cyberbullying and depression, consistent with previous research findings [24], with data analysis revealing a correlation coefficient of 0.261 ($p < 0.01$).

3. Discussion

In this study, the Internet use habits of Chinese adolescents served as a foundation to formulate a cyberbullying scale that is suitable for adolescents, with a focus on bullying behavior using social media and instant messaging software. The final scale contained 13 questions and four dimensions, and its validity and reliability were high.

3.1. Operational definition reflects the characteristics of Chinese adolescent cyberbullying

The development of mobile Internet technology and popularization of smart phones in China has resulted in a unique online ecosystem. This has drastically changed the Internet use habits of adolescents. In this ecosystem, adolescent cyberbullying shows characteristics such as anonymity, a lack of spatiotemporal boundaries, unlimited audience, and persistence. Cyberbullying also upends the power principle in traditional face-to-face bullying in the real world. This has increased the difficulty of monitoring and preventing cyberbullying. The present adolescent cyberbullying scale developed in this study includes commonly seen cyber verbal bullying and online anonymous defamation, as well as online community ostracism that is unique to socializing software, and online sexual harassment that is predominant under conditions of anonymity and technological abuse. The scale covers the main online usage scenarios of adolescents and includes typical cyberbullying behavior. Typical behaviors ultimately included in the scale developed in this study included 10 behaviors, such as intimidation and threats, anonymous defamation, impersonation, and Internet water army insults. These typical behaviors were consistent with those described by Chen et al. Using our scale as a measurement tool to investigate the current status of cyberbullying can better facilitate subsequent behavioral pattern and incidence analyses [25].

3.2. Multidimensional structure provides improved conditions for in-depth analysis of cyberbullying

The present adolescent cyberbullying scale contains four dimensions in total. Compared with the RCBI, CAV, and CVBS, our adolescent cyberbullying scale includes more content. The RCBI [26] and CAV [27] both have unidimensional structures, with 6 and 14 questions, respectively that measure cyberbullying harm. The three dimensions of the CVBS are cyber verbal bullying, identity concealment, and fraud [28]. Zhang et al. introduced and revised the latter instrument into China, which can be used to confirm cyber verbal bullying, cyber relationship bullying, and cyber rights bullying [14]. The cyber verbal bullying and cyber relationship bullying dimension of the Chinese CAV were consistent with those of the present study; identity concealment and fraud in the original CAV scale showed high concordance with online anonymous defamation in our study. Cyber verbal bullying, cyber sexual bullying, and cyber relationship bullying in this study showed high concordance with the verbal/text, visual/sexual, and social ostracization dimensions in the CBV formulated by Lee et al. [15]. The development and popularization of information technology has inevitably led to diversification of Internet usage behavior and more complex cyberbullying behavior. A multidimensional structure is better suited for this development trend, and multidimensional measurement tools create conditions for the in-depth analysis of cyberbullying behavior.

3.3. Scales developed based on the victim population are more representative

The sample size of the pre-test and post-test in this study exceeded 2400 participants. However, when the scale was developed, our team selected victims of bullying based on definitions in related studies. The victim population was only used in the question analysis and factor analysis stages. This analysis thought process increased the question screening requirements and ensured that the retained questions were representative and typical. Examples of deleted questions included “spreading indecent photos or videos of me online” and “posting malicious comments about me online.” Chinese people are more reserved than other populations and posting indecent photos to defame somebody as well as making malicious comments are considered extremely serious cases of bullying; for this reason, both the perpetrator and victim are unwilling to proactively report such cases. Therefore, although these

behaviors are typical cyberbullying behaviors, the number of people who actively report these behaviors is low, resulting in poor measurement parameters regarding these questions and their deletion. In this study, victims were screened to further focus on typical behaviors, which improved the measurement parameters as much as possible. For example, in cyber sexual bullying, the behaviors addressed in many questions were carried out in an anonymous manner using certain techniques to conceal or impersonate others. For example, for "spreading obscene photos or videos of me online," the perpetrator is usually anonymous. Such behavior is difficult to track and even difficult for victims to detect. Therefore, the incidence of typical behaviors in some questions was not high in our data. By selecting for victims, the measurement parameters of related questions were superior in the question analysis step, and these questions were retained.

3.4. The reduced test-retest reliability of the scale may stem from the following two factors

Response bias among participants.

On one hand, the cultural stigma effect. In the Chinese cultural context, victims of school bullying often perceive a stigma associated with their situation, leading to concerns about revealing their identity. When the retest is conducted on a named basis, participants may deliberately downplay their actual experiences out of fear of negative social judgment resulting from being labeled as "victims of bullying." On the other hand, the fear of retaliation mechanism. Some participants worry that truthful reporting will provoke retaliation from the bullies, leading them to adopt defensive response strategies during the post-test phase. This systematic response bias directly reduces the consistency of measurement results across time.

The effect of school interventions.

Intervention measures implemented by educational institutions in response to bullying incidents constitute an important external confounding variable. Following the pre-test, some schools implemented school-wide anti-bullying interventions (such as school-wide announcements, psychological counseling, and behavioral correction) based on preliminary screening results. Such systematic interventions led to a significant reduction in bullying incidence at the post-test, resulting in differences in baseline levels between the two measurements. This phenomenon is essentially a response to the measurement tool's sensitivity to changes in the real-world context, but it objectively reduces the stability of the retest data.

3.5. Study limitations and prospects

Cyber relationship bullying covers many online community ostracism behaviors. This has research value, as a typical bullying behavior using social media and instant messaging software, and is an important constituent of the cyberbullying scale. However, this dimension had the lowest test–retest reliability and convergent validity. There are two main reasons for this. First, there are some technical barriers to such behavior. For example, there are many steps required to block someone on WeChat moments. The second reason is blocking is difficult to be detected, and people who are blocked cannot promptly discover who blocked them. Only when they actively open the perpetrator's moments do they have a chance to determine whether they were blocked through the appearance of the webpages. However, based on related studies and expert recommendations, we retained this important dimension and related questions in this study to ensure measurement integrity. In the future, cases and interviews will be used for further validation.

The pre-test and post-test in this study were conducted using the same population. The pre-test showed an incidence of cyberbullying of 19% but the post-test incidence was 9.38%. This large difference between the pre-test and post-test results may be owing to effective bullying control measures in the school. Additionally, perpetrators may curb their bullying behavior because attention was aroused regarding bullying owing to the pre-test. In the future, our team will continue to validate the reliability and validity of this scale in other populations. Some researchers have conducted comparative studies in Hong Kong, mainland China, and Taiwan and found that the cyberbullying victimization rate was 33.0%, 23.8%, and 31.7%, respectively. A study among Spanish students found a cyberbullying victimization rate of 15.3% [29]. A meta-analysis showed an incidence of cyberbullying victimization between 14.0% and 57.5% [30], with large differences in the current status of cyberbullying among different countries. In 2021, the Ministry of Education of China required schools to strengthen mobile phone control for elementary and secondary students and to guide students to use mobile phones rationally with the aim to decrease their interference with learning. This objectively decreased the incidence of cyberbullying and may be a reason why the cyberbullying incidence in our study was lower than that in related studies.

Our team considered the challenges of social desirability responses in the surveys on bullying behavior. Perpetrators are usually unwilling to disclose their bullying behaviors. There were large differences in responses among the victims and perpetrators of online bullying victims. For example, a victim views the “Internet trolling behavior” as targeting them individually, but this behavior is considered non-discriminatory and random from the perpetrator’s perspective [31]. Therefore, our team first conducted a study among cyberbullying victims. With a more comprehensive understanding of cyberbullying, we proceeded to investigate bullying behavior so as to develop the present cyberbullying scale.

Conclusions

The Chinese adolescent cyberbullying scale developed in this study demonstrates generally satisfactory psychometric properties and performs well in the Chinese Mainland context. It provides a concise self-reported measure of cyberbullying victimization among adolescents, covering cyber verbal bullying, cyber relationship bullying, online anonymous defamation, and cyber sexual bullying. Grounded in the online communication patterns and Internet use characteristics of Chinese adolescents, the scale is suitable for school-based monitoring, large-scale population surveys, and research on adolescent cyberbullying and related mental health outcomes. Its multidimensional structure may also support more targeted identification, prevention, and intervention for different forms of cyberbullying.

Abbreviations

China Internet Network Information Center (CNNIC)

Revised Cyber Bullying Inventory (RCBI)

Cyber-aggression and Cyber-victimization scale (CAV)

Cyber Victim and Bullying Scale (CVBS)

CyberBullying Victimization Scale (CBV)

Adolescent Cyber Victimization Scale (ACVS)

measure of sampling adequacy (MSA)

Olweus Bully/Victim Questionnaire (OBVQ)

Multidimensional Bullying Victimization Scale (MBVS)

Declarations

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Author Contributions

Z.H. and P.Q. wrote the main manuscript text. Z.H. and S.Y. prepared methodology and provided funding acquisition. All authors read and approved the final manuscript.

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Data availability

The datasets are available from the corresponding authors on a reasonable request.

Ethics approval and consent to participate

This study was approved by the Ethics Committee of the Academic Affairs Office, Guiyang University (Approval No.23GZYB130). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Written informed consent was obtained from all adolescent participants and their parents. All methods were carried out in accordance with relevant guidelines and regulations.

Consent for publication

Not Applicable.

Competing interests

The authors declare no competing interests.

GLOSSARY

Items on the scale

F1 Cyber verbal bullying

Sending me harmful or threatening messages using the telephone, SMS, QQ, or Qzone

Sending rumors about me to others using the telephone, SMS, QQ, or Qzone

Spreading rumors about me in WeChat groups, QQ groups, and moments

F2 Cyber relationship bullying

Blocking me on WeChat or QQ or not allowing me access to WeChat moments and Qzone

Publicly revealing information, messages, and conversations logs that I sent to the perpetrator to without my permission

Kicking me out of chat groups such as WeChat or QQ

F3 Online anonymous defamation

Impersonating me to spread my private information or false information via telephone, SMS, WeChat groups, QQ groups, or Baidu Tieba

Impersonating me to spread other people's private information or falsely accuse others via telephone, SMS, WeChat groups, QQ groups, or Baidu Tieba

Hijacking or hacking into my WeChat or QQ account to spread information unfavorable to me using my identity

F4 Cyber sexual bullying

Sending me pornographic messages using the telephone, SMS, QQ, or Qzone, causing me distress

Sending pornographic rumors about me to others using the telephone, SMS, QQ, or Qzone

Spreading rumors about me and pornography in WeChat groups, QQ groups, and moments

Spreading indecent photos or videos of me online

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Tables

Table 1. Naming the pre-test scale

Factor name and number	Item	Facot Loading(Standardized Regression Weights)	Composite reliability	AVE
Cyber verbal bullying (F1)	CV1	0.92	0.834	0.64
	CV2	0.905		
	CV3	0.505		
Cyber relationship bullying (F2)	CR1	0.482	0.531	0.275
	CR2	0.557		
	CR3	0.531		
Cyber anonymous defamation (F3)	CA1	0.915	0.897	0.745
	CA2	0.916		
	CA3	0.748		
Cyber sexual bullying (F4)	CS1	0.71	0.888	0.672
	CS2	0.945		
	CS3	0.952		
	CS4	0.619		

Table 2. Reliability of the formal questionnaire

Factor number	F1	F2	F3	F4	Total
A (n=226)	0.809	0.531	0.891	0.879	0.864
Test-retest reliability (n=226)	0.502**	0.224**	0.464**	0.395**	0.518**

Note: *p<0.05; **p<0.01; the same applies for the following tables.

Table 3. Correlation coefficient matrix of factor and total score (N=226)

Factor and number	Scale	F1	F2	F3
Cyber verbal bullying (F1)	0.783**			
Cyber relationship bullying (F2)	0.725**	0.482**		
Online anonymous defamation (F3)	0.813**	0.501**	0.460**	
Cyber sexual bullying (F4)	0.749**	0.351**	0.295**	0.640**

Table 4. Fit index of different models (N=226)

Model	χ^2/df	IFI	TLI	CFI	RMSEA (90% CI)
Hypothetical model	2.389	0.954	0.939	0.954	0.079 (0.062/0.095)
M1	10.304	0.660	0.588	0.657	0.203 (0.190/0.217)

Table 5. Convergent validity of higher-order model (N=226)

Factor name and number	Composite reliability	AVE
Cyber verbal bullying (F1)	0.834	0.64
Cyber relationship bullying (F2)	0.531	0.275
Cyber anonymous defamation (F3)	0.897	0.745
Cyber sexual bullying (F4)	0.888	0.672