Development of an Online Risk Scale for High School Students

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Abstract

The behavioral aspects of children's internet usage have been well-researched; however, the psychological aspects of related issues, such as children's awareness of online risks and problems, remain underexplored. To analyze students' perception of the risks associated with internet use, we developed an Online Risk Perception Scale comprising 12 items related to sensitivity to online trouble, online anonymity, and internet dependency. The scale was then distributed to 1264 students from three high schools in Japan. The results of the reliability and multi-group confirmatory factor analyses indicated that the scale demonstrated reasonable reliability. Some variations among the participating schools were also observed, which may be attributed to the schools' risk awareness programs and preventive measures related to problematic online behaviors. This study also examined the relationship between the scale and students' actual experiences of online perpetration, victimization, and excessive internet use. However, no clear results were obtained, indicating the need for further investigation.

Keywords

Scale Development, Online Risk Perception, Online Anonymity, Internet Dependency, High School Students

1. Introduction

Recently, mobile communication devices (e.g., smartphones, tablets) have undergone rapid development and widespread adoption, making the internet more accessible than ever before. In the digital realm, individuals of all ages and social statuses engage in casual information exchanges and enjoy unrestricted commu-

nication. However, children who have not yet developed the necessary skills for the appropriate utilization of information and discernment of content authenticity are inadvertently exposing themselves to various risks on the internet. These risks include cyberbullying, excessive reliance on internet browsing and online gaming, expenses incurred on online platforms, inflammatory posts, defamatory remarks toward others, involvement in sexual crimes (e.g., prostitution or revenge pornography), and participation in violent crimes (Finkelhor et al., 2000; Wolak et al., 2006; Gámez-Guadix et al., 2016; National Police Agency, 2017). A 2017 survey conducted by the Cabinet Office of Japan revealed that 84% of elementary school students, 92% of junior high school students, and 98% of high school students use the internet (Cabinet Office, 2017). This indicates that internet usage has become a part of children's daily routines, both inside and outside of school. There has simultaneously been an increase in participation in cyberbullying, including the defamation and exclusion of peers, with 2075 cases in elementary schools (1.4% of the total), 4644 in junior high schools (7.8%), and 2365 in high schools (18.7%), indicating a grave situation (Ministry of Education, Culture, Sports, Science, and Technology, 2017). Therefore, numerous local governments and schools consider the prevention of internet-related problems among children to be an urgent and critical challenge.

Another concern related to children's internet usage is the so-called "internet addiction" issue, characterized by a state in which individuals find it difficult to discontinue their internet usage and experience irritability when attempting to do so. According to the aforementioned survey by the Cabinet Office, children's average daily internet usage time on weekdays is notably high, with elementary school pupils averaging 93.4 minutes, junior high school students averaging 138.3 minutes, and high school students averaging 207.3 minutes. It has been reported that approximately 20% of high school students use the internet for five hours or more each day (Cabinet Office, 2017).

In such circumstances, it can be argued that children are at risk of becoming victims or perpetrators of cyberbullying or criminal activities, as well as internet addiction. However, there have been no quantitative examinations of whether children are sufficiently aware of these risks. The recognition of risks related to victimization has been widely discussed in the field of criminology. Subjective probabilities of experiencing victimization, known as "crime risk perception", and the emotional and affective disturbances related to victimization, termed "crime anxiety" (Ota, 1997) have been shown to mutually influence and impact crime prevention awareness (Sasatake, 2008). Furthermore, to design and implement measures and policies related to crime prevention, it is important to understand the awareness and attitudes of the individuals involved and their actual behaviors, and to effectively convey risk information (Nagai, 2011). As a substantial amount of domestic and international research on children's online issues has focused on understanding the behavioral aspects of these issues, knowledge about how children behave online is gradually accumulating (e.g. Raskauskas

& Stoltz, 2007; Smith et al., 2008; Gradinger et al., 2009; Ttofi & Farrington, 2011; Tsuruta & Nojima, 2015; Nishimura & Endo, 2015; Foody et al., 2017). However, the psychological aspects, such as awareness, emotions, and attitudes concerning online risks and problems, have not yet been thoroughly examined.

"Belief in anonymity" has been identified as a psychological factor that significantly influences perpetrating behavior on the internet. Kondo (2007) reported that only 1.4% of their respondents stated that they posted online using their real names, with similarly low percentages for blogs and social networking sites (2.5%). This indicates that many internet users prefer to maintain anonymity online. The primary reason for this preference was the desire to avoid the risk of defamation and other negative interactions with unkind users. Orita (2009) claimed that even when internet users believe they are in a highly anonymous state, it is not necessarily challenging for site administrators or service providers to identify specific posts or when and from which devices they were made. Takeuchi et al. (2015) argued that a strong belief in online anonymity, even if it may not be practically achieved, can lead to what they call "moral disengagement" (Bandura et al., 1996), whereby individuals' moral and ethical considerations are temporarily overridden (i.e., ignored through advanced rationalization). This, in turn, can facilitate involvement in harmful behaviors such as defamation and cyberbullying.

The concept of online anonymity has been discussed in the field of Computer-Mediated Communication (CMC) research (e.g. Kiesler et al., 1984; Sproull & Kiesler, 1986; Sproull & Kiesler, 1991). Morio and Buchholz (2009) offered a hierarchical explanation of anonymity, categorizing it into three levels, the most basic and fundamental level being "visual anonymity (non-face-to-face)", where individuals cannot visually confirm the identity of others. The second level is "identity dissociation", where online and real-world identities are separated, and the highest level of anonymity is "lack of identifiability", where it is impossible to identify others in both online and real-world contexts. In 2013, the Technical Study Working Group on Personal Data established within the Cabinet's IT Strategy Headquarters classified internet users' identities into two dimensions: "specificity" and "identifiability". They defined "real name" as the state in which the individual can be specifically identified, "pseudonym" as the state in which the individual cannot be specifically identified but can be distinguished from others, and "anonymity" as the state in which the individual cannot be specifically identified and cannot be distinguished from others (Orita, 2014).

Regarding the relationship between anonymity and aggressive behavior toward others in CMC, Sugitani (2009) pointed out that these theories commonly attribute their characteristics to the "scarcity of nonverbal cues". In other words, the reduced availability of nonverbal information—such as facial expressions and gestures—during communication diminishes the sense of "social presence", which is the mutual awareness that "the other person is there". Consequently,

the usual inhibitions that are present in face-to-face situations may become less effective (Sproull & Kiesler, 1991). Kiesler et al. (1984) referred to this state as "social anonymity" and related it to the "deindividuation effect", wherein the individual's locus of behavioral responsibility becomes ambiguous as they become submerged within a group. From the perspective of social identity theory, Postmes et al. (2002) argued that the deindividuation effect in collective behavior is the result of transitioning from personal identity to group identity, which leads to conformity with group norms. These theories suggest that individuals perceive themselves and others to be highly anonymous when communicating online. Such perception can lead to a temporary weakening or deactivation of the morals and ethics that individuals would typically possess, resulting in moral disengagement (Bandura, 2002). This could also consequently facilitate actions such as easily engaging in defamation and other harmful behaviors.

Considering these factors, this study developed scales to examine the following three factors in the context of internet use: 1) risk perception and anxiety about online victimization; 2) beliefs concerning anonymity in relation to online perpetration and defamation; and 3) the inclination toward excessive immersion and dependency on the internet. This study focuses on high school students, who have particularly high rates of mobile phone and internet usage. This research also explores the relationships between these factors and student's actual experiences of online misbehavior.

2. Materials and Methods

2.1. Scale Development and Pilot Study

To develop an Online Risk Perception Scale, we adapted and modified items from Arai, Fuji, and Yoshida's (2010) Cognitive Response Scale for Crime. Specifically, we replaced the concept of "crime" with "online victimization", and included eight items related to the perception of deteriorating online safety (three items), the perception of the risk of online victimization (two items), and optimistic beliefs related to online victimization (three items). These items were designed to measure how individuals perceive the risk of experiencing online victimization and how optimistic or pessimistic beliefs relate to online safety.

To develop an Online Risk Anxiety scale, we adapted and modified items from Arai, Fuji, and Yoshida's (2010) Emotional Response Scale for Crime. Specifically, we replaced the concept of "crime" with "online victimization", and included five items related to anxiety about online safety in general (three items) and anxiety about personally experiencing online victimization (two items). These items were designed to measure individuals' general anxiety about online safety and personal anxiety regarding the risk of experiencing online victimization.

To develop a Beliefs Regarding Online Anonymity scale, we conducted focus group interviews with ten high school students and five university students on the theme of anonymity on the internet and the perpetration of harmful actions.

We sought their opinions on topics such as why harmful actions—such as defamation—occur online, and the characteristics of individuals who engage in these actions. Based on the responses obtained from these interviews, we created a scale comprising ten items related to beliefs about anonymity. These items assess individuals' beliefs about the role of anonymity when perpetrating harmful actions on the internet.

Finally, to develop an Excessive Internet Usage and Dependency Inclination scale, we conducted focus group interviews with ten high school students on the theme of excessive internet usage. We sought their opinions on topics such as whether they ever felt that they were using the internet excessively, and whether they had experienced feelings of anxiety or irritation when using social networking sites. Based on the responses in these interviews, we developed a scale comprising five items related to excessive internet usage and inclination toward dependency. These items were designed to assess how individuals perceive their own internet usage and whether they exhibit signs of dependency on the internet, particularly on social networking sites.

Using the 28 items mentioned above, we conducted a pilot study with 30 university and 100 high school students. The study employed a 6-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree". An exploratory factor analysis (EFA) was conducted using the maximum likelihood method with a Promax rotation. Six items (e.g., "I often come across potentially harmful websites on the internet", and "It's fun to impersonate others on the internet") with factor loadings below .40 or high loadings on multiple factors were removed. We finally developed a unified Online Risk Perception Scale, comprising 22 items categorized into the following dimensions: 1) online risk perception (five items), 2) Online Risk Anxiety (five items), 3) beliefs about online anonymity (seven items), and 4) inclination toward internet dependency (five items).

The development of this scale was an ongoing process involving consultations with students and educators from participating research schools—primarily focused on high schools—over the past decade. The items were continually reviewed, based on feedback and discussions with stakeholders. For instance, the inclusion of items related to the inclination toward internet dependency was prompted by concerns raised by participating schools about issues such as disruptions in students' basic daily routines and reduced classroom focus, which they believed could be attributed to excessive internet usage. These insights led to the addition of items to assess both students' awareness and actual tendencies related to internet dependency.

2.2. Participants

Among the 44 high schools in one prefecture in Japan, we chose schools for participation to ensure balanced representation of regions and a diverse range of academic levels. Studies were conducted across all grades in each high school, but we selected grades for which data spanning multiple years were available. To

examine the reliability and validity of the scale, data from the following three high schools were used:

High School A: For the 2019 first-year class (WAVE 1 data), out of 134 students, four with incomplete responses were excluded, resulting in 130 valid responses (97.0%). Of the 150 students in the 2020 first-year class (WAVE 2 data), 10 with incomplete responses were excluded, resulting in 140 valid responses (93.3%).

High School B: Of the 256 students in the 2019 first-year class (WAVE 1 data), 13 with incomplete responses were excluded, resulting in 243 valid responses (94.5%). Among the 239 students in the 2020 first-year class (WAVE 2 data), 15 with incomplete responses were excluded, resulting in 224 valid responses (93.7%).

High School C: For the 2021 first-year class (WAVE 1 data), out of 274 students, 10 with incomplete responses were excluded, resulting in 264 valid responses (96.3%). For the 2022 first-year class (WAVE 2 data), 257 students participated and all provided valid responses (100%).

In total, data from 1264 participants were used for the analysis, after excluding 46 participants because of incomplete or excluded responses. The overall valid response rate was 96.4%. The Online Risk Perception Scale described above was used in this study. For each item, participants were instructed to select the response that best represented their daily thoughts and ideas. The responses were rated on a 6-point Likert scale from 1 = "Strongly Disagree" to 6 = "Strongly Agree".

3. Results

3.1. Exploratory Factor Analysis

An EFA was conducted on WAVE 1 data (2019 High School A and B, 2020 High School C) using the maximum likelihood method with a Promax rotation. Three factors were extracted, as shown in Table 1. Eight items, with factor loadings below .40 or showing high loadings on multiple factors, were removed. The first factor, comprising seven items, included a mixture of emotional reactions to potential harm on the internet, such as "feeling scared of potentially becoming a victim online" and "feeling anxious about using smartphones or the internet", as well as cognitive reactions, such as "I feel like I'm going to be victimized online someday too". As these responses were related to online victimization, this factor was termed "trouble sensitivity". As both emotional and cognitive responses to online risks are expected to increase the likelihood of taking preventive actions, higher scores for this factor were considered to indicate a heightened sensitivity to risk situations.

The second factor was composed of four items related to online anonymity, such as "You can say whatever you want online because the sender remains unidentified", and "As individuals are not identified on the internet, we are allowed to speak freely". Therefore, this factor was named "anonymity beliefs". This factor

Table 1. EFA with WAVE 1 data from the three schools.

	Trouble Sensitivity	Anonymity Beliefs	Dependence Inclination	Communality
I feel afraid of being victimized online	**.808**	.049	.080	.679
I feel anxious about using a mobile phone or the internet	**.793**	.047	−.188	.604
I am worried that I might be victimized online	**.735**	.056	.037	.549
I am somewhat concerned about the safety of the internet	**.715**	−.083	.084	.553
I am concerned about various types of damage that occur on the internet	**.646**	−.047	−.076	.415
The internet has become more dangerous than ever before	**.565**	−.122	−.006	.345
I feel like I'm going to be victimized online someday too	**.454**	.074	.147	.256
On the internet, you can say whatever you want because the speaker is not identified	−.001	**.747**	−.007	.555
Because individuals are not identified on the Internet, we are allowed to speak freely	−.036	**.707**	−.036	.493
What you say on the internet will not be identified	.057	**.515**	−.079	.246
It's okay to write about others as long as it's not a lie or a bad word	−.071	**.406**	.114	.211
I get frustrated when I can't use the internet when I want to	.007	.049	**.732**	.559
The internet is an essential part of my daily life	−.022	−.159	**.555**	.280
I become concerned when my messages on social media are not marked as "read"	.052	.107	**.496**	.297

reflects the strength of a person's belief that the internet is an anonymous space. From a risk perception perspective, higher scores on this factor indicate a tendency among individuals to consider the internet as a safe and anonymous platform, suggesting lower sensitivity to potential risk situations.

The third factor, comprising three items, revolved around items indicating an inclination toward internet dependency, such as "I get frustrated when I can't use the internet when I want to" and "The internet is an essential part of my daily life". This factor was defined as "dependence inclination". Higher scores on this factor indicated a greater likelihood of an existing inclination toward internet dependency. Consequently, individuals with high scores were expected to be more sensitive to and aware of their internet dependency risks. However, this may not be the case for individuals with low dependency scores, as they may either have a low inclination toward dependency or be unaware of their dependency risk, even if their actual internet dependency behavior is high. Caution must be exercised in such cases.

In the EFA, the model fit indices indicated a good fit (CFI = .939, RMSEA = .069), despite a slightly elevated RMSEA value. Additionally, in terms of reliability, the first factor exhibited ω = .861, the second factor ω = .690, and the third

factor ω = .640. Although the second and third factors showed lower values, they still demonstrated adequate levels of internal consistency.

3.2. Multi-Group Confirmatory Factor Analysis

A multi-group confirmatory factor analysis (CFA) was conducted using WAVE 2 data (2020 High School A and B, 2022 High School C). The fit indices revealed slight decreases in fit quality (CFI = .915, GFI = .906, AGFI = .866, RMSEA = 0.070), and school-specific standardized root mean square residual (SRMR) values of .063 for High School A, .061 for High School B, and .072 for High School C. These results suggest that there may be some variations in the model fit indices between schools.

3.3. Extraction of Common Items through EFA

As mentioned above, owing to the decrease in model fit in the multi-group CFA, exploratory factor analyses using WAVE 1 data for each school were conducted to identify common items. After removing four items that were not common among the three schools (which showed high loadings in only one school) and subsequently eliminating six items with factor loadings below 0.40 or high loadings on multiple factors, another EFA was conducted. There was no change in the number of factors compared to the initial EFA. However, the number of items changed: The trouble sensitivity factor decreased from seven to four items, while the anonymity belief factor increased from four to five items; the dependence inclination factor remained unchanged. In this model, the model fit indices showed a slight improvement (CFI = .966, RMSEA = .054), compared with the initial EFA. Furthermore, the reliability of the factors remained at a similar level, with the first factor at ω = .813, the second factor at ω = .707, and the third factor at ω = .649 (Table 2).

3.4. Multi-Group CFA of Common Items

Subsequently, a multi-group CFA was conducted using WAVE 2 data from each school, based on the common items extracted from the second EFA. The model fit indices in this analysis showed a slight improvement, compared to the previous multi-group analysis (CFI = .925, GFI = .927, AGFI = .888, RMSEA = .067; School A SRMR = .064, School B SRMR = .056, and School C SRMR = .075). Therefore, a model based on these common items was selected for further analysis.

3.5. Comparisons of School and Year Differences

To examine the trend of responses to each factor of the participants, descriptive statistics for trouble sensitivity, anonymity beliefs, and dependence inclination were calculated for each school and year (Table 3).

To examine the differences between schools for each factor by year, an analysis of variance was conducted. The results indicated that for trouble sensitivity,

Table 2. EFA with common items among the three schools.

	Trouble Sensitivity	Anonymity Beliefs	Dependence Inclination	Communality
I feel afraid of being victimized online	**.907**	.014	−.017	.813
I am worried that I might be victimized online	**.768**	.021	−.044	.575
I am somewhat concerned about the safety of the internet	**.629**	−.124	.085	.448
I feel like I'm going to be victimized online someday too	**.518**	.078	.054	.286
Because individuals are not identified on the internet, we are allowed to speak freely	.010	**.748**	−.074	.532
On the internet, you can say whatever you want because the speaker is not identified	.053	**.728**	−.039	.511
What you say on the internet will not be identified	.061	**.492**	−.072	.224
It's okay to write about others as long as it's not a lie or a bad word	−.034	**.454**	.092	.240
Various online harms don't concern me	−.158	**.412**	.149	.251
I get frustrated when I can't use the internet when I want to	.023	.050	**.774**	.632
The internet is an essential part of my daily life	−.010	−.134	**.526**	.252
I become concerned when my messages on social media are not marked as "read"	.081	.109	**.467**	.281

Table 3. Descriptive statistics of the three factors among the participating schools.

		Trouble Sensitivity	Anonymity Beliefs	Dependence Inclination
School A	WAVE 1 data	3.487	1.878	3.595
	WAVE 2 data	3.610	1.688	3.432
School B	WAVE 1 data	3.545	1.847	3.505
	WAVE 2 data	3.683	1.688	3.228
School C	WAVE 1 data	3.392	1.795	3.306
	WAVE 2 data	3.277	1.763	3.529

there was no significant main effect among the three schools in the WAVE 1 data ($F_{[2, 634]} = 1.325$, n/s). However, in the WAVE 2 data, a significant main effect was observed ($F_{[2, 624]} = 8.762$, $p < .001$, $\eta p2 = .027$). Post-hoc multiple comparisons for the WAVE 2 data revealed significant differences between Schools A and C ($p < .01$) and Schools B and C ($p < .001$).

Regarding anonymity beliefs, there were no significant main effects on either the WAVE 1 data ($F_{[2, 634]} = 0.804$, n/s) or WAVE 2 data ($F_{[2, 624]} = 0.989$, n/s), and neither dataset showed statistically significant differences between the schools.

Finally, in terms of dependence inclination, there were significant main effects on both the WAVE 1 data (F[2,634] = 4.539, $p < .05$, ηp2 = .014) and WAVE 2 data (F[2, 624] = 5.257, $p < .005$, ηp2 = .017). In the WAVE 1 data, post-hoc tests revealed significant differences between Schools A and C ($p < .05$) and Schools B and C ($p < .05$). For the WAVE 2 data, a significant difference was observed between Schools B and C ($p < .005$).

Figure 1 presents a radar chart of the WAVE 2 data for all three schools, showing significant differences in trouble sensitivity, anonymity beliefs, and dependence inclination.

3.6. Relationship between the Three Factors and Experiences of Online Victimization, Perpetration, and Excessive Internet Use

Finally, correlation analyses were conducted to examine the relationships between the three factors used in this model and students' experiences of online victimization, perpetration, and excessive internet use. Regarding students' online victimization experiences, the average scores of eight items, including "having one's name or personal information posted online" and "having embarrassing images or videos of oneself posted online without permission", were used in the analysis. For their online perpetration experiences, the average scores of five items, including "posting negative comments or personal information about someone online" and "posting embarrassing images or videos of someone else online without permission", were used. For their excessive internet usage, the average scores of four items, including "being unable to stop using the internet or online games" and "experiencing sleep deprivation or difficulty waking up due to excessive internet or online game use", were used. No significant differences were observed between schools or WAVES for any of these experience scores; therefore, the integrated data from both WAVES at each school were used in this analysis.
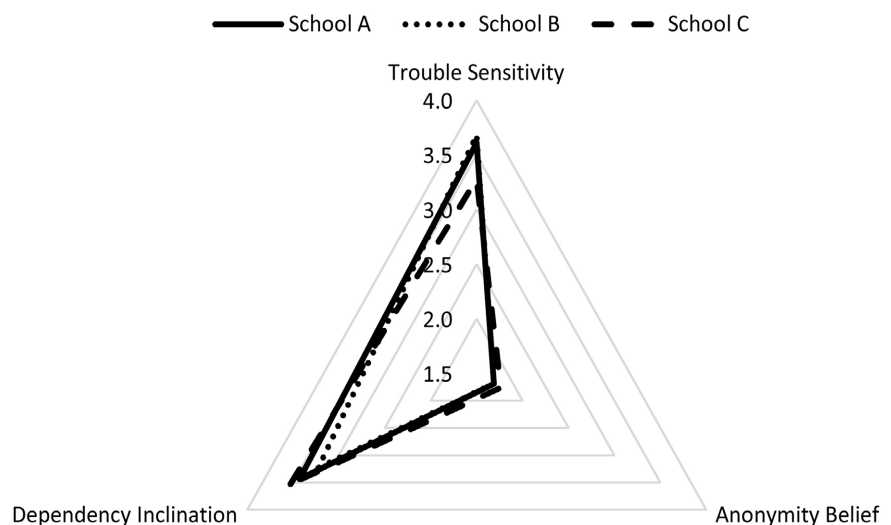

Figure 1. Radar chart of the three factors using WAVE 2 data from each school.

Table 4. Correlations between the three factors and students' experiences of perpetration, victimization, and excessive internet use.

	1	2	3	4	5	6
1) Trouble Sensitivity	1					
2) Experiences of Online Victimization	.134	1				
3) Anonymity Beliefs	−.048	.090	1			
4) Experiences of Online Perpetration	.047	.402**	.110	1		
5) Dependence Inclination	.236**	.167	.225**	.083	1	
6) Experiences of Excessive Internet Use	.091	.283**	.096	.250**	.344**	1

The results of the correlation analysis showed significant positive correlations between trouble sensitivity and dependence inclination ($r = .236$, $p < .01$), online victimization experiences and online perpetration experiences ($r = .402$, $p < .01$), online victimization experiences and excessive internet usage ($r = .283$, $p < .01$), anonymity beliefs and excessive internet usage ($r = .225$, $p < .01$), online perpetration experiences and excessive internet usage ($r = .250$, $p < .01$), and dependence inclination and excessive internet usage ($r = .344$, $p < .01$) (Table 4).

These findings indicate that higher levels of trouble sensitivity are associated with a higher dependence inclination, and that experiences of online victimization, online perpetration, and excessive internet usage tend to be positively correlated with each other. In addition, a greater belief in online anonymity was associated with a higher dependence inclination.

4. Discussion

This study focused on the risk perception of high school students regarding time spent online and developed a scale to examine individuals' sensitivity to online trouble, beliefs about online anonymity, excessive internet use, and inclination toward internet dependency. This study also explored the relationship between these factors and students' actual experiences of online perpetration, victimization, and excessive usage. Several recent studies have addressed online risk perception (e.g. Byrne et al., 2016; Ramos-Soler et al., 2018; Torres-Hernández et al., 2022); however, this study offers a different approach. For example, previous studies largely listed various online behaviors to evaluate the perceived risks as-

sociated with these behaviors; these studies focused mainly on internet addiction, and investigating the actual occurrence (presence and frequency) of risky online behaviors. Different from these prior studies, our research aims to elucidate more general tendencies related to children's perceptions to online problematic behaviors, specifically focusing on online risk perception, beliefs about anonymity, and dependency inclination. Our goal is to contribute to the consideration of preventive and responsive measures in schools by highlighting these general trends.

The scale that we developed comprised 12 items: four on sensitivity to online trouble, five on beliefs about online anonymity, and three on the inclination toward internet dependency. The scale demonstrated reasonable reliability, based on our EFA and multi-group CFA.

However, further investigation on the relationship between the factors and students' experiences is required. First, the findings related to beliefs about anonymity revealed that students generally do not have such strong beliefs about anonymity on the internet. This suggests that they have a low risk of getting involved in cyberbullying due to moral disengagement caused by mistakenly assuming that the internet provides complete anonymity (Takeuchi et al., 2015). However, we found no significant relationship between the degree of belief in anonymity and students' actual experiences of online perpetration. It is important to note that a very small number of students reported engaging in online perpetration in this survey. This may have been a contributing factor to these results.

Trouble sensitivity returned higher scores than were obtained for beliefs about anonymity. This suggests that students use the internet with some degree of awareness of potential online risks. However, similar to online anonymity beliefs, there was no significant relationship with students' actual online victimization experiences. Therefore, further investigations are necessary to better understand the relationships between these factors.

Finally, higher scores were obtained for dependency inclination than for beliefs about anonymity. This suggests that there are students who have a certain degree of risk of internet addiction. Furthermore, a significant positive correlation was observed between dependence inclination and students' actual experiences of excessive internet usage. This indicates that individuals with higher dependence inclination scores are more likely to exhibit actual internet overuse; this result highlights the need to focus on this issue.

The levels of internet use among high school students in Japan may be related to the GIGA School Project, which began in earnest in national compulsory education schools in the 2023 academic year. This project aims to promote individually optimized learning through the establishment of high-speed, large-capacity, in-school communication networks and by providing one device to each student. The push for online classes during the COVID-19 pandemic has contributed to this development. By the end of the 2024 academic year, 99.9% of

municipalities should have developed learning environments in which all elementary and secondary school students can use learning devices. Similarly, in high schools, all prefectures are scheduled to complete the "one device per student" environment for first-year students in 2024, and all grades are scheduled to complete the installation by the middle of the 2026 academic year (Ministry of Education, Culture, Sports, Science and Technology, 2022; 2023).

However, it is important to note that these advancements in digital learning and access to technology have also brought about new issues. For example, a survey on internet dependency among approximately 20,000 primary, middle, and high school students in Osaka Prefecture revealed that 10% of primary school boys were suspected to have internet addiction, while 30% of high school girls exhibited behaviors of "pathological use" (Takeuchi, 2021a). Furthermore, there has been a continuous increase in cases of child prostitution (321 cases) and child pornography (658 cases) originating from online platforms, as well as other instances of online trouble for children over the past five years (National Police Agency, 2023). Some schools have also reported the inappropriate use of distributed devices by students. This shows that challenges regarding students' internet use persist, and that there is a need to further enhance students' awareness of online risks, thereby promoting more autonomous and appropriate internet usage among children.

In summary, this study successfully developed a scale focusing on students' perceptions of online risks. However, our study had several limitations. First, it examines data from two academic years at three schools. However, subtle variations were observed in the levels of trouble sensitivity and dependence inclination among these schools. This could be attributed to preventive measures taken by schools in terms of risk awareness education and other efforts concerning problematic online behavior.

Second, when developing the scale, cognitive and emotional responses to online risks were combined into a single factor referred to as "trouble sensitivity". Research on crime victimization often treats risk perception and victimization anxiety as distinct factors. Therefore, it may be necessary to further explore this scale by subdividing it into lower-level measures.

Finally, it is worth noting that this study exclusively targeted three high schools located in a specific region of Japan. As previously mentioned, slight variations were observed among these schools. It is therefore crucial to recognize that the results of this study may not be generalizable to all high school students in Japan, and further validation using a more extensive and diverse sample is warranted.

In addition to this study, Kanetsuna, Aoyama, and Toda (2018), Toda and Kanetsuna (2021), and Takeuchi (2021b) provide detailed descriptions of cyberbullying and its prevention measures in Japan. Toda and Oh (2021) further enhanced the awareness of this issue by conducting a study comparing cyberbullying in Japan and Korea. We plan to conduct future studies based on these findings.

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Author Contributions

Conceptualization, Kanetsuna, Ieshima and Toda; methodology, Kanetsuna, Ieshima and Toda; validation, Kanetsuna, Ieshima and Toda; formal analysis, Kanetsuna; investigation, Kanetsuna and Ieshima; resources, Kanetsuna and Toda; data curation, Kanetsuna; writing—original draft preparation, Kanetsuna; writing—review and editing, Kanetsuna, Ieshima and Toda; visualization, Kanetsuna; supervision, Toda; project administration, Kanetsuna; funding acquisition, Kanetsuna. All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement

The study was approved by the Institutional Ethics Committee of Osaka Kyoiku University (Reference No. 442).

Informed Consent Statement

Informed consent was obtained from all participants involved in the study.

Data Availability Statement

The data presented in this study are available on request from the corresponding author.

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Conflicts of Interest

The authors declare no conflict of interest.

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Supplementary Materials

The following supporting information can be downloaded at:

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