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ORIGINAL ARTICLE

Risk Factors of Cyberbullying Perpetration Among School-Aged Children Across 41 Countries: a Perspective of Routine Activity Theory

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Abstract

Cyberbullying perpetration among school-aged children could have negative public health implications worldwide. The present study used a routine activity theory framework to conceptualize and investigate potential risk and protective factors for cyberbullying perpetration across countries and World Health Organization (WHO) regions. The study used a 2013–2014 cross-sectional sample of 214,808 school-aged children from 41 countries/WHO regions. The sample came from the Health Behavior in School-aged Children (HBSC) survey. Applying weighted least squares tegression, the study explored whether cyberbullying perpetration was associated with various routine activities across different cultures. Findings supported predictions suggested by the routine activity theory. Regression models found that family activities were a protective factor buffering the risk of cyberbullying perpetration among school-aged children. In addition, greater involvement with certain peer and solitary activities increased the likelihood of cyberbullying behaviors. The routine activity theory seems to be a viable theoretical framework for understanding risk and protective factors associated with cyberbullying perpetration among a large internationally representative sample. Across many countries, cyberbullying perpetration shares potential risk factors among school-aged children.

Keywords Cyberbullying perpetration · School-aged children · Routine activity theory · International research

Introduction

Cyberbullying involvement among school-aged children is a growing public health concern worldwide (Christian Elledge et al. 2013). The prevalence of cyberbullying behaviors is increasing dramatically as a consequence of the growing accessibility and utilization of electronic and mobile devices among school-aged children (Olweus 2012, 2013).

Implications and Contributions Among school-aged children, cyberbullying perpetration shares potential risk and protective factors across diverse countries. Knowledge of consistent risk and protective factors for cyberbullying perpetration can inform the development and implementation of anti-bullying interventions. Efforts to reduce cyberbullying will involve a multi-systemic process of collaborating with parents, schools, and entire communities, and may benefit from global cooperation.

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According to a United Nations Children's Fund (UNICEF) cyberbullying report from 30 countries, 33% of school-aged children reported they have been bullied online, and almost 25% of school-aged children skipped school because of cyberbullying (UNICEF 2019). Cyberbullying behaviors among school-aged children included attempts to hurt, harass, insult, and attack to other children intentionally via social media platforms and technological devices in and outside of school. The present study aimed to (1) investigate risk factors associated with cyberbullying perpetration among school-aged children, and (2) examine whether the relationships between routine activities and cyberbullying perpetration are similar or different across cultures.

Literature Review

Routine Activity Theory

Routine activity theory (RAT) has been widely applied to investigate and explain deviant, delinquent, and criminal behaviors (Osgood et al. 1996; Vazsonyi et al. 2018; Vazsonyi et al. 2002). Emerging from human ecological theory, the RAT suggests that routine activities of daily life can influence delinquent of criminal opportunities and trends (Cohen and Felson 1979, 1980). The fundamental premise of the RAT is that daily routine activities have potential for increasing or decreasing deviant, delinquent, and/or criminal conduct (Choi et al. 2019a). The routine activity theory emphasizes the degree to which criminal behaviors are associated with activities that happen at home and at work, or in everyday experiences outside the home (Cohen and Felson 1979). Cohen and Felson (1979) contended that the changes in patterns of routine activities could affect crime rates because crime is influenced by opportunity. Moreover, these seminal authors clarify that any crime requires the combination of a motivated offender, a suitable target, and the absence of a capable guardian. Accordingly, the absence of any one factor may be sufficient to prevent the commission of a crime. That is, if one factor is removed, delinquent or criminal conduct could be mitigated (Cho et al. 2019). According to Cohen and Felson (1979), the absence of capable guardian is the most important factor among the aforementioned three factors, and it is the only factor associated with crime rates in a given area (Choi et al. 2019b). Although it has mostly been applied to understand crime, the RAT also has clear application to delinquent acts, including cyberbullying.

Correlates with Cyberbullying Perpetration

To date, a number of factors have been found to be associated with the perpetration of cyberbullying. Gender and age differences have been extensively explored as potential cyberbullying risk factors. Several studies have indicated that girls are more likely than boys to engage in cyberbullying (Cassidy et al. 2013; Kowalski and Limber 2013; Modecki et al. 2013; Rice et al. 2015; Surander et al. 2010; Vazsonyi et al. 2012). The association between age and cyberbullying behaviors is less clear. Aboujaoude et al. (2015) found that age was not associated with cyberbullying behaviors (Aboujaoude et al. 2015). Patchin and Hinduja (2011), however, found that older school-aged children had greater involvement in cyberbullying than did younger school-aged children (Patchin and Hinduja 2011). Having been bullied by others has been found to be a risk factor for cyberbullying perpetration among children (Twyman et al. 2010; Vazsonyi et al. 2012). Twyman et al. (2010) investigated the potential role of family and peer activities as protective factors and online activities as risk factors. Among US children age 11–17, they found that those who had been bullied by others were more likely to later perpetrate cyberbullying. Vazsonyi et al. (2012) investigated cyberbullying perpetration and victimization and low self-control among 25,142 children across 25 European countries. This study found a positive association between cyberbullying and offline bullying in both perpetration and victimization (Vazsonyi et al. 2012).

Daily usage of Internet-mediated communication tools (IMCT), social networking, and computers contribute to the occurrence of cyberbullying (Cho et al. 2019; Park et al., 2014; Ybarra and Mitchell 2004). Multiple recent studies have shown that school-aged children who frequently used IMCT were more likely to engage in cyberbullying perpetration than their counterparts (Álvarez-García et al. 2018; Kırcaburun et al. 2019; Lee and Shin 2017). A study of school-aged children in South Korea found that frequent users of the Internet and social networking sites (SNS) were more likely to engage in cyberbullying perpetration (Park et al., 2014). Cho et al. 2019 conducted an investigation of cyberbullying among a large nationally representative sample of African-American children in the USA. The study found a greater risk for peer conflicts among those who spent more time using social media, which could lead to cyberbullying perpetration (Cho et al. 2019). In the last 5 years, a growing body of literature has focused on the relationship between social media usage and cyberbullying perpetration among children (Brody and Vangelisti 2017; Kowalski et al. 2019; Park et al., 2014; Whittaker and Kowalski 2015).

A range of studies have addressed the influence of family members and peers on cyberbullying perpetration. Cho et al. (2019) found that paternal monitoring and peer unstructured activities were negatively associated with cyberbullying perpetration among African-American children (Cho et al. 2019). Zurcher et al. (2018) found that a warm and supportive parenting style reduced cyberbullying behaviors among 12- to 19-year-old adolescents (Zurcher et al. 2018). A review concluded that problematic parent-child relationships, family dynamics, and parenting styles predicted cyberbullying

involvement, and that strong supportive parent-child relationships were a protective factor against cyberbullying perpetration among children (Cross et al. 2015). Peer attachment has been found to be negatively associated with online aggressive behaviors among children (Twyman et al. 2010), but peer approval has been identified as a risk factor (Sasson and Mesch 2014). However, very few studies have investigated how family and peer activities could influence cyberbullying perpetration among children.

Although cyberbullying has received substantial research attention in recent decades, most studies have focused on cyberbullying victimization rather than perpetration (e.g., Choi 2008; Choi and Lee 2017; Merrill and Hanson 2016; Näsi et al. 2017). Furthermore, the current research on cyberbullying perpetration among school-aged children lacks a focus on relevant theoretical frameworks (Xiao et al. 2016).

Routine Activities and Cyberbullying Perpetration Across Cultures

The routine activity theory has been used to investigate a wide range of aggressive, deviant, delinquent, and criminal behaviors on the Internet, such as cyber-dating abuse (Van Ouytsel et al. 2018), online identity theft (Williams 2016), cyber-interpersonal violence (Choi and Lee 2017), cybercrime (Kigerl 2012; Leukfeldt and Yar 2016), online sex crimes (Navarro and Jasinski 2015), and cyberbullying perpetration among college students (Xiao et al. 2016). A few studies have investigated the growing concern of cyberbullying perpetration in different cultures in the context of the routine activity theory. One previous study (Xiao et al. 2016) investigated the association between the routine activity theory and cyberbullying perpetration among 50 college students in Hong Kong. Findings revealed that aggressive disposition, attitudes toward the victim, and online disinhibition were associated with cyberbullying perpetration. Another previous study (Navarro and Jasinski 2015) used the routine activity theory to investigate cyberbullying with a nationally representative sample of US teenagers. The study found that routine activities that were categorized as suitability and availability, such as use of social networking and instant messaging, had the strongest associations with cyberbullying. Given the current state of knowledge, the present study is timely and fills a gap by investigating cyberbullying perpetration among school-aged children across cultures by applying the routine activity theory framework.

The Present Study

The purpose of the present study is to examine cyberbullying perpetration among school-aged children and to identify potential risk factors associated with cyberbullying perpetration across 41 countries/WHO regions in Europe and North America. The present study aims to extend understanding on cyberbullying perpetration by:

(1) Assessing the association between cyberbullying perpetration and routine activities with a large internationally representative sample of children;
(2) Examining potential risk and protective factors associated with cyberbullying perpetration in this sample; and
(3) Exploring how sociodemographic characteristics and a traditional bullying history relate to cyberbullying behaviors in this sample.

Methods

Study Population and Procedures

The study used the public-use dataset Health Behaviors in School-Aged Children (HBSC), 2013–2014. The HBSC is a cross-sectional study conducted in collaboration with the World Health Organization (WHO) every 4 years among member countries and WHO regions (HBSC 2013–2014). The HBSC 2013–2014 survey involved a nationally representative sample of 214,080 school-aged children in 41 countries and WHO regions in Europe and North America, including Finland, Norway, Austria, Belgium (French), Belgium (Flemish), Hungary, Israel, Scotland, Spain, Sweden, Switzerland, Wales, Denmark, Canada, Latvia, Poland, the Czech Republic, Estonia, France, Germany, Greenland, Lithuania, Russian Federation, Slovakia, England, Greece, Portugal, Ireland, the Yugoslav Republic of Macedonia (MKD), Netherlands, Italy, Croatia, Malta, Slovenia, Ukraine, Bulgaria, Iceland, Luxembourg, Romania, Turkey, and Armenia. Each country participated voluntarily, and the survey was approved by the ethics review board or equivalent institution of each country (De Looze et al. 2019).

The study population was school-aged children at the onset of adolescence. The primary sampling unit was school class (Roberts et al. 2009). Classes were selected via random selection of classes within target school years and grades. Some of the participating countries elected to stratify the sample to ensure representation of geographic areas, ethnic groups, or school types. In most countries and WHO regions, questionnaires were delivered to schools and administered by teachers in classrooms. In total, the present study sample includes 214,080 school-aged children across 41 countries.

Measures

Each participating country was asked to answer certain population health-related questions (e.g., sexual health, violence,

and injuries) to enable the quantification of key health information. At the child level, the HBSC study assessed children's health and well-being; social environments; health behaviors, including exercise, eating habits, and physical activities; school characteristics; family and peer supports and risk factors; other risk behaviors; and core demographic variables.

Because the HBSC survey was administered in more than 40 countries, language translations were critical to ensure survey validity. All of the survey items were initially in English and were translated to each nation's language. To promote consistency and accuracy in translation, the HBSC used back-translation as the standard approach for checking the translations and comparing against the original source.

Cyberbullying Perpetration The outcome variable was cyberbullying perpetration, which was treated as a continuous variable and computed from two survey items indicating whether respondents had been cyberbullied by messages and/or pictures (Cronbach's $\alpha = 0.702$). Cyberbullied by messages was operationalized as having been bullied in the following ways: someone sent mean instant messages, wall postings, emails, or text messages, or created a website that made fun of the participants. Cyberbullied by pictures was operationalized as someone took unflattering or inappropriate pictures of the participants without permission and posted the pictures online. Both cyberbullied by messages and cyberbullied by pictures were measured utilizing a 5-point response scale (1 = have not, 2 = once or twice, 3 = 2–3 times per month, 4 = once/week, and 5 = several times/week). The higher scores indicated a higher level of involvement in cyberbullying perpetration.

Routine Activities The survey included 15 questions addressing daily and regular activities. Variables related to routine activities were classified into four categories: family activities, peer activities, solitary activities, and community activities. We followed a classification model used previously (Vazsonyi et al. 2018).

Family Activities A measure of family activities reflected the frequency of time spent with family members in family breakfast and family dinner. Family breakfast and family dinner were rated on a scale ranging from 1 = never, 2 = less than once a week, 3 = 1–2 days a week, 4 = 3–4 days a week, 5 = 5–6 days a week, to 6 = every day.

Peer Activities A measure of peer activities involved five survey items reflecting activities with friends, including hanging out with friends after school after 8 pm, talking to friends via the Internet, using instant messaging, and using other social media with friends. Using instant messaging meant that participants actively contacted friends using instant messaging such as BBM or Facebook. Other social media meant that participants contacted their friends using other social media, such as Facebook (by posting on a wall, not by chat), My Space, Twitter, Apps (e.g., Instagram), games (e.g., Xbox and YouTube). A 4-point scale measured each of these variables (1 = hardly ever or never, 2 = less than weekly, 3 = weekly, 4 = daily).

Solidary Activities A solitary activity variable measured the frequency of three types of entertainment activities, including playing computer games and using computers for non-game purposes. Playing computer games (Cronbach's $\alpha = 0.882$) was the total score from two items measuring the frequency of playing computer games on weekdays and weekends, ranging from 1 = not at all, 2 = half an hour a day, 3 = 1 h a day, 4 = 2 h a day, 5 = 3 h a day, 6 = 4 h a day, 7 = 5 h a day, 8 = 6 h a day, to 9 = 7 h or more a day. The last variable in this category was a total score of using a computer for non-game purposes (Cronbach's $\alpha = 0.906$), ranging from 1 = not at all, 2 = half an hour a day, 3 = 1 h a day, 4 = 2 h a day, 5 = 3 h a day, 6 = 4 h a day, 7 = 5 h a day, 8 = 6 h a day, to 9 = 7 h or more a day.

Community Activities Community activities involved one item measuring the number of days respondents engaged in physical activities in a week, including different kinds of sports and other school activities. It is a ratio variable ranging from 0 to 7.

Demographic Characteristics Demographic characteristics included gender, age, and family economic status. Gender was measured as "male" or "female." Age was measured as age in years (from 10 to 16). Because the study surveyed children, family economic status was measured as the respondents' thoughts about "how well-off their family is" as a proxy, ranging from 1 = very well-off, 2 = quite well-off, 3 = average, 4 = not very well-off, to 5 not at all well-off. The higher score indicated a lower level of perceived economic status.

History of Traditional Bullying A final variable addressed respondents' history of traditional bullying. The variable measured the frequency with which respondents had ever bullied other school-aged children traditionally, ranging from 1 = never, 2 = once or twice, 3 = 2–3 times, to 4 = once per week, and several times per week.

Data Analysis

The outcome variable "cyberbullying perpetration" was a continuous variable, so a weighted least square regression with robust standard errors was applied to estimate associations between the outcome and explanatory variables. The student weight variable included with the HBSC dataset was applied in the regression models. Preliminary analysis of tolerance

statistics (≥ .65) indicated that there were no multi-collinearity problems among explanatory variables.

Findings

Of 241,080 participants, 50.8% were school-aged girls while 49.2% were school-aged boys. The mean age of the sample was 13.5 years (see Table 1). In terms of cyberbullying perpetration (see Table 2), nearly 7% of respondents bullied others online by messages once or twice in their lifetime and 5.4% cyberbullied others using pictures. Notably, 1.2% of the sample had cyberbullied others by messages several times in a week and approximately 9 per one thousand children had bullied others online using pictures. Approximately 50% of respondents thought their family's socioeconomic status (SES) is above average (very well-off and quite well-off). Regarding a history of traditional bullying, nearly 20% of respondents reported that they traditionally bullied others at least once in their lifetime. Moreover, about 3.3% of respondents reported that they traditionally bullied others regularly. Mean levels of cyberbullying perpetration among school-aged children across all 41 countries are shown in Fig. 1. There are significant mean differences across all countries/WHO regions in cyberbullying perpetration (Table 3).

Table 4 shows the results from a Pearson's correlation analysis of the association between cyberbullying perpetration and routine activities across countries. Frequency of family meals were negatively associated with cyberbullying perpetration. Peer activities, and solitary activities, were positively associated with cyberbullying perpetration. Only physical activities were not associated with cyberbullying perpetration. In addition, family activities including both family breakfast and family dinner were negatively associated with hanging out with friends after 8 pm, instant messaging, social networking usage, and daily computer and video game hours. Moreover, family activities were positively associated with community activities. Notably, daily computer usage and video games were negatively associated with community activities.

ANOVA analyses were conducted to assess associations with gender, age, family's SES, and traditional bullying. As illustrated in Fig. 2, most countries had minimal gender differences in cyberbullying behaviors. Figure 3 shows that respondents who more frequently traditionally bullied other children also reported a high level of cyberbullying perpetration in most countries. As illustrated in Fig. 4, respondents were more likely to perceive their family's SES to be lower in the countries with relatively higher levels of cyberbullying perpetration.

Table 5 shows the results of the WLS regression analysis which investigated the association between cyberbullying perpetration with demographic, control, and explanatory variables including family activities, peer activities, solitary activities, and community activities. With regard to demographic characteristics, both gender and age were significantly associated with cyberbullying perpetration. Girls ($b = -0.053$, $p < 0.001$) were more likely to engage in cyberbullying perpetration than were boys. Age ($b = -0.003$, $p < 0.001$) was negatively associated with cyberbullying perpetration among school-aged children. In other words, as children were older, the level of cyberbullying was lower. Family economic status

Table 1 Socio-demographics and traditional bullying history of school-aged children

	Frequency on cyberbullying perpetration				
	N (%)		M (SD)	*F*	*p* value
Gender					
Girls (ref)		105,414(50.8%)	2.307 (0.889)	5.377	0.020*
Boys		108,666(49.2%)	2.294 (0.993)		
Age			13.5	2.150	0.000***
Family well-off	Very well-off	39,777 (16.5%)	2.322 (1.083)	231.083	0.000***
	Quite well-off	79,653 (33.0%)	2.271 (0.856)		
	Average	80,002 (33.2%)	2.287 (0.886)		
	Not very well-off	11,665 (4.8%)	2.402 (1.021)		
	Not at all well-off	2983 (1.2%)	2.747 (1.735)		
Traditional bullying others	Have not	164,079 (68.1%)	2.227 (0.779)	1762.423	0.000***
	Once or twice	35,085 (14.6%)	2.426 (1.071)		
	2–3 times	6762 (2.8%)	2.692 (1.415)		
	Once per week	3729 (1.5%)	2.679 (1.509)		
	Several times per week	4425 (1.8%)	3.129 (2.222)		

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

Table 2 Descriptive analysis on cyberbullying perpetration

	N (%)					Total M (SD)
	Have not (%)	Once or twice (%)	2–3 times per month (%)	Once a week (%)	Several times per week (%)	
Cyberbullied by messages	82.3	6.9	1.2	0.6	1.3	1.17 (0.594)
	N (%)					Total M (SD)
	Have not (%)	Once or twice (%)	2–3 times per month (%)	Once a week (%)	Several times per week (%)	
Cyberbullied by pictures	83.6	5.4	0.9	0.4	0.9	1.13 (0.529)

($b = 0.021$, $p < 0.001$) was positively associated with cyberbullying perpetration among school-aged children. In other words, school-aged children who reported a lower family socioeconomic status were more likely to engage in cyberbullying behaviors. Previous traditional bullying behaviors ($b = 0.202$, $p < 0.001$) was also significantly associated with cyberbullying perpetration among school-aged children. School-aged children who traditionally bullied other students were more likely to bully other children online compared with those who had not traditionally bullied other children (Fig. 5).

Routine Activities In the present study, school-aged children who more frequently had family dinner ($b = -0.021$, $p < 0.001$) with their parents engaged in fewer cyberbullying behaviors. Having dinner with parents emerged as a protective factor against cyberbullying perpetration. School-aged children who were more frequently hanging out with friends outside after 8 pm ($b = 0.031$, $p < 0.001$) engaged in more cyberbullying behaviors. Children who both used instant messaging ($b = 0.007$, $p < 0.001$) and other social media daily ($b = 0.017$, $p < 0.001$) engaged in higher levels of cyberbullying perpetration. In other words, school-aged children who spent more time in using instant messaging and other social media were more likely to exhibit cyberbullying behaviors than were those who spent less time in using social media. Similar to social media usage, school-aged children who spent more time daily using computers ($b = 0.010$, $p < 0.001$) and playing video games ($b = 0.005$, $p < 0.001$) had greater involvement in cyberbullying perpetration.

Discussion

Cyberbullying perpetration has become a widespread concern with technology development and the ongoing development of new forms of social media, particularly in the Western developed countries. Our study is one of the first studies exploring cyberbullying perpetration with an internationally representative sample across different countries and cultures. Informed by the routine activity theory, the study investigated associations between routine risk and protective activities and cyberbullying perpetration among school-aged children across 41 countries. The findings highlighted the significance of different routine activities in understanding cyberbullying perpetration across countries and cultures. The findings underscore the role of certain family activities, peer activities, and solitary activities in cyberbullying, and add to the existing literature on cyberbullying perpetration.

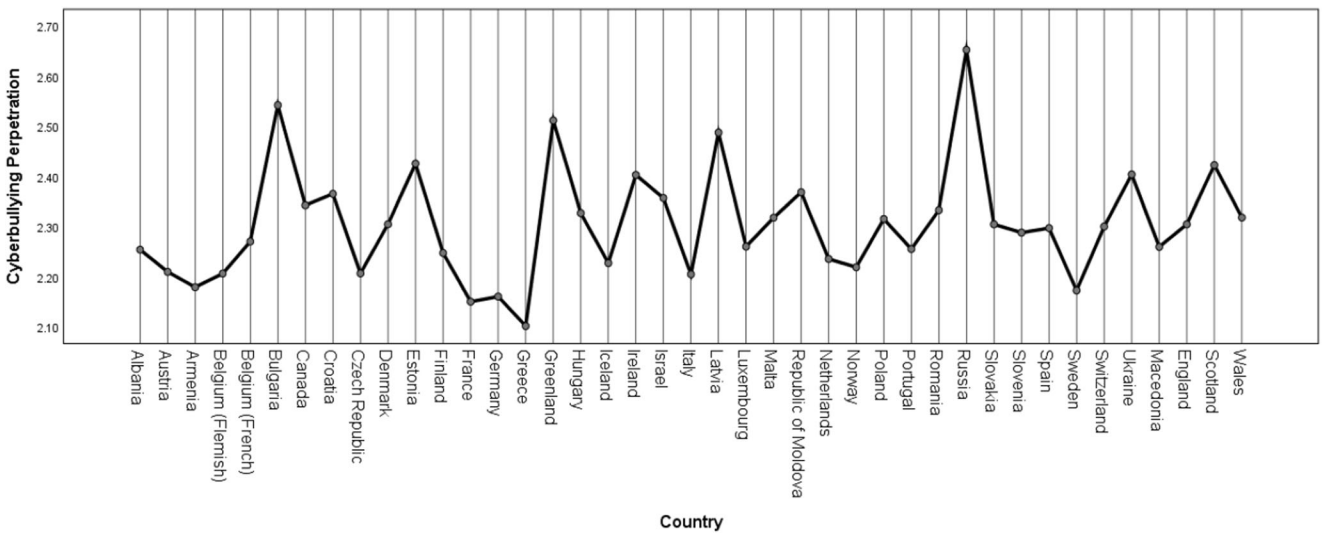

Fig. 1 Mean cyberbullying perpetration levels by country

Table 3 Descriptive analysis across 41 countries on cyberbullying perpetration

Country/WHO region	*N*	Mean	SD
Albania	5024	2.254	0.956
Austria	3458	2.210	0.842
Armenia	3679	2.179	0.668
Belgium (Flemish)	4393	2.206	0.754
Belgium (French)	5892	2.270	0.871
Bulgaria	4796	2.542	1.384
Canada	12,931	2.342	0.980
Croatia	5741	2.365	1.140
Czech Republic	5082	2.206	0.759
Denmark	3891	2.305	0.933
Estonia	4057	2.425	1.252
Finland	5925	2.247	0.789
France	5691	2.140	0.618
Germany	5961	2.160	0.632
Greece	4141	2.101	0.542
Greenland	1020	2.512	1.001
Hungary	3935	2.327	0.804
Iceland	10,602	2.227	0.977
Ireland	4098	2.403	0.944
Israel	6193	2.357	1.115
Italy	4072	2.205	0.670
Latvia	5557	2.487	1.222
Luxembourg	3318	2.260	0.980
Malta	2265	2.318	0.934
Republic of Moldova	4648	2.368	1.052
Netherlands	4301	2.235	0.660
Norway	3422	2.219	0.718
Poland	4545	2.315	0.957
Portugal	4989	2.255	0.925
Romania	3980	2.333	0.867
Russia	4716	2.652	1.587
Slovakia	6099	2.305	0.938
Slovenia	4997	2.288	0.943
Spain	11,136	2.297	0.993
Sweden	7700	2.172	0.658
Switzerland	6634	2.300	0.000
Ukraine	4552	2.404	1.184
Macedonia	4218	2.259	0.917
England	5335	2.305	0.824
Scotland	5932	2.422	1.027
Wales	5154	2.318	0.902

School-aged children among 41 countries shared some similarities in routine activities, which is similar to prior research (Vazsonyi et al. 2002). However, we did not find community activities, such as sports or dancing, to be associated with cyberbullying perpetration. Significant gender differences were found in cyberbullying perpetration in multiple countries, which is consistent with previous studies (Barlett and Coyne 2014; Kowalski et al. 2014; Vazsonyi et al. 2012, 2002). An association with age identified in this study is also consistent with previous research. As children from age 10–16 were older, the level of cyberbullying perpetration was lower (Navarro et al. 2015). School-aged children who perceived their family economic status to be lower were more likely to engage in cyberbullying, which mirrored previous studies (Vazsonyi et al. 2018). Children who traditionally bullied others were also more likely to engage in cyberbullying, which is also consistent with prior research (Vazsonyi et al. 2012). In this study across countries, age, perceived SES, and traditional bullying were revealed as common factors associated with cyberbullying perpetration.

The study's most novel findings pertain to routine activities. Having family dinner with parents revealed as a protective factor against cyberbullying perpetration. Children who frequently had family dinner with their parents were less likely to engage in cyberbullying, which had been found in a prior study (Knopf 2015), but not in research involving many countries. Perhaps more frequent family dinners with parents promote family communication and contact and foster parental monitoring, and support (Knopf 2015), as well as an improved parent-child bond. The routine activity theory suggests that in family dinners, parents would play the role of "capable guardian," thereby preventing cyberbullying for a time.

As for routine peer activities, school-aged children who frequently used social networking sites (SNS) and instant messaging applications, such as Instagram and Facebook, were significantly more likely to perpetrate cyberbullying, which is consistent with previous studies (Park et al., 2014; Ybarra and Mitchell 2004). Notably, we also found that children who were hanging out with friends outside of school after 8 pm were much more likely to engage in cyberbullying. Because this study involved youth age 10–16, with a mean age of 13, hanging out with friends late at night could expose children to more risks for deviant behaviors. Regarding solitary activities, the longer the time spent using a computer for surfing the Internet or playing video games in a week, the greater the likelihood of cyberbullying, which is line with previous research (Li and Pustaka 2017; McInroy and Mishna 2017; Merrill and Hanson 2016; Ybarra and Mitchell 2004). Spending more time using computers or video games would likely increase time communicating with others, which could increase exposure to negative experiences via the Internet (Li and Pustaka 2017). The study findings related to peer and solitary activities are consistent with predictions of the routine activity theory. School-age youth who spend more time on social media surely have more opportunity to engage in cyberbullying.

Table 4 Correlations of cyberbullying perpetration and routine activities

	1	2	3	4	5	6	7	8	9	10
Cyberbullying	1									
Family breakfast	− 0.031**	1								
Family dinner	− 0.051**	0.400**	1							
Hangout with friends after 8 pm	0.056**	− 0.080**	− 0.084**	1						
Instant messaging	0.043**	− 0.112**	− 0.066**	0.260**	1					
Social networking	0.053**	− 0.059**	− 0.023**	0.252**	0.505**	1				
Talk with a friend via the Internet	0.032**	− 0.041**	− 0.041**	0.229**	0.380**	0.357**	1			
Computer use daily	0.078**	− 0.156**	− 0.093**	0.185**	0.273**	0.271**	0.197**	1		
Video games daily	0.057**	− 0.068**	− 0.022**	0.098**	0.092**	0.166**	0.136**	0.419**	1	
Physical activities	− 0.004	0.119**	0.076**	0.085**	0.031**	0.037**	0.027**	− 0.070**	− 0.040**	1

**Correlation is significant at the 0.01 level (2-tailed)

Limitations

The present study provided new empirical evidence on risk and protective factors associated with cyberbullying perpetration globally, but there are two main limitations that should be considered. First, the study used a cross-sectional design that cannot explore causal relationships between risk and protective factors and cyberbullying perpetration. Prospective studies might apply longitudinal data to investigate the causal relationship between risk and protective factors and cyberbullying perpetration among school-aged children. Second, although the present study explored cyberbullying perpetration in 41 countries, most of these countries are developed countries in Europe. Hence, the findings cannot be generalized to school-aged children in developing countries, or other developed countries with different social systems or cultures, nor can the findings be generally applied to any of the individual countries among these 41 countries.

Implications for Practice and Policy

Parents' Role

The identification of common cyberbullying risk factors provides essential insights for efforts intended to mitigate cyberbullying perpetration among school-aged children internationally. Cyberbullying perpetration often involves personnel electronic devices at home. Because it is not limited to

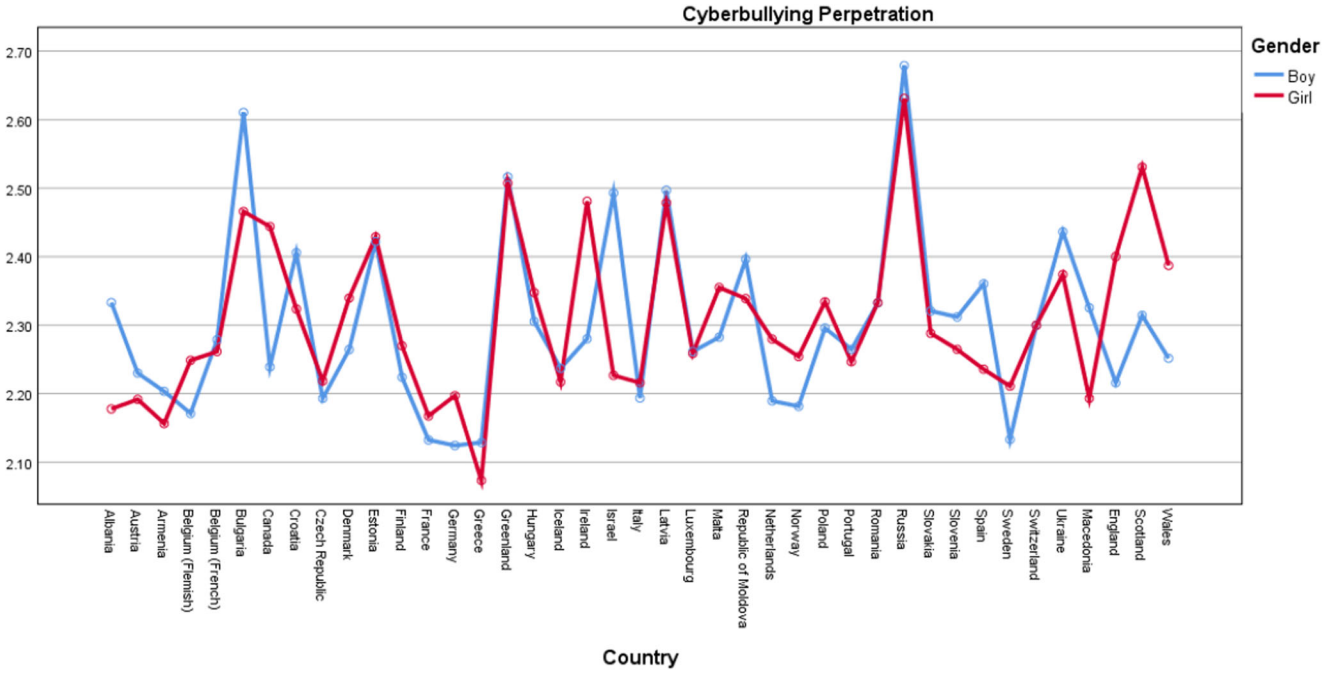

Fig. 2 Gender differences on cyberbullying perpetration level by country

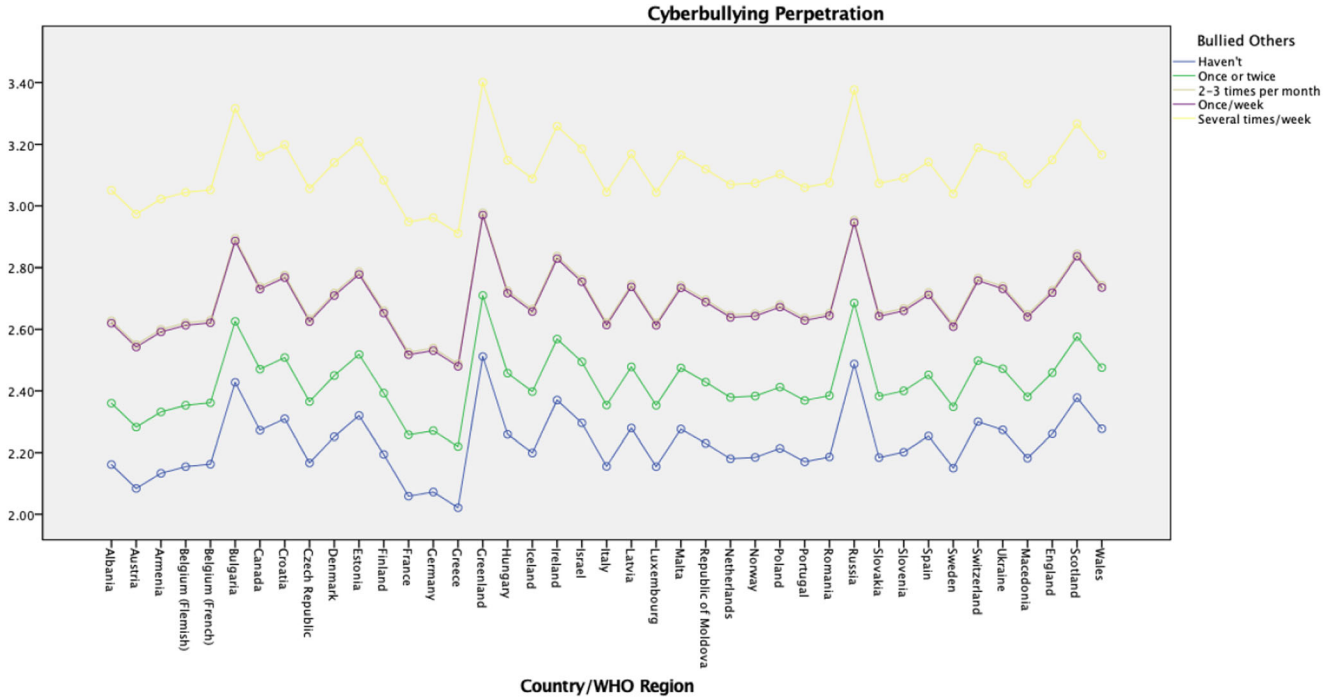

Fig. 3 Differences of traditional bullying history on cyberbullying perpetration level by country

schools, parents may be able to play a key role in reducing cyberbullying behaviors among school-aged children (Cassidy et al. 2013). Parents can work to create an open and warm environment where their children can feel free to talk about their online experiences (Cassidy et al. 2012; Cassidy et al. 2013; Elsaesser et al. 2017). Elsaesser and colleagues (2017) found that school-aged children whose parents had authoritative parenting styles, combined with high levels of warmth and supervision, were less likely to engage in cyberbullying. In addition, parents can establish clear expectations for children's daily routine activities. Parents can promote spending more time in family activities, encourage appropriate websites, and enforce time limits on time with friends. Parents can also limit time on the Internet and playing video games, thereby further reducing opportunity for cyberbullying perpetration or victimization (Elsaesser et al. 2017).

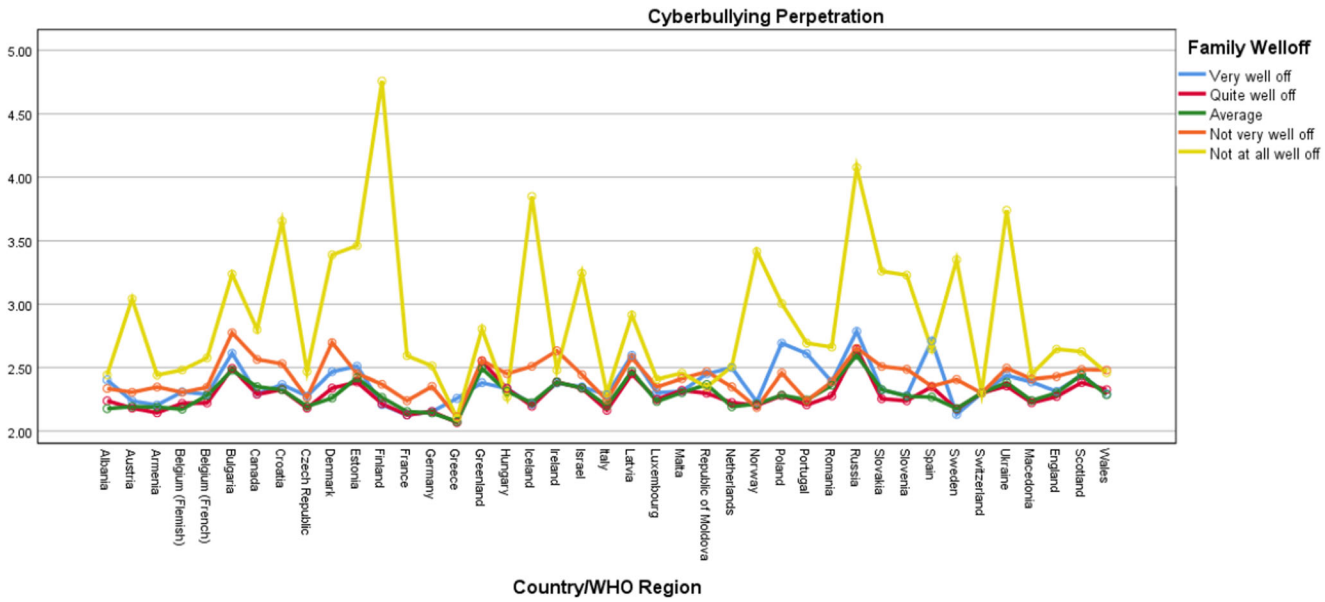

Fig. 4 Family's SES differences on cyberbullying perpetration level by country

Table 5 Regression results of associations between cyberbullying perpetration and main variables

		B	Std. error
Control	Gender (ref = girls)	−0.053***	0.004
	Age	−0.013***	0.001
	Family well-off	0.221***	0.003
	Bullied others	0.203***	0.002
Family activities	Family breakfast	−0.002	0.001
	Family dinner	−0.021***	0.001
Peer activities	Using instant messaging	0.008***	0.001
	Using other social media	0.019***	0.002
	Talking with friends via Internet	−0.002	0.002
	Hangout with friends after school	0.007***	0.002
Solitary activities	Computer use daily	0.010***	0.001
	Play games daily	0.001***	0.001
Constant		2.055	0.022
F-statistics			680.628
R-square			0.199

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

School's Role

Cyberbullying and its negative consequences should be taught in schools. Cassidy et al. (2013) cited multiple studies indicating that schools can empower students with digital literacy, Internet safety, online privacy, technological and online skills, and measures to protect themselves. Helping school-aged children to develop healthy behaviors and social skills should become a primary goal and should be included in school curricula. Even more important, school interventions should collaborate with parents to increase parents' awareness of the technological environment that their children are facing now, and to train parents to monitor and supervise children's online activities (Cassidy et al. 2013; Perren et al. 2012).

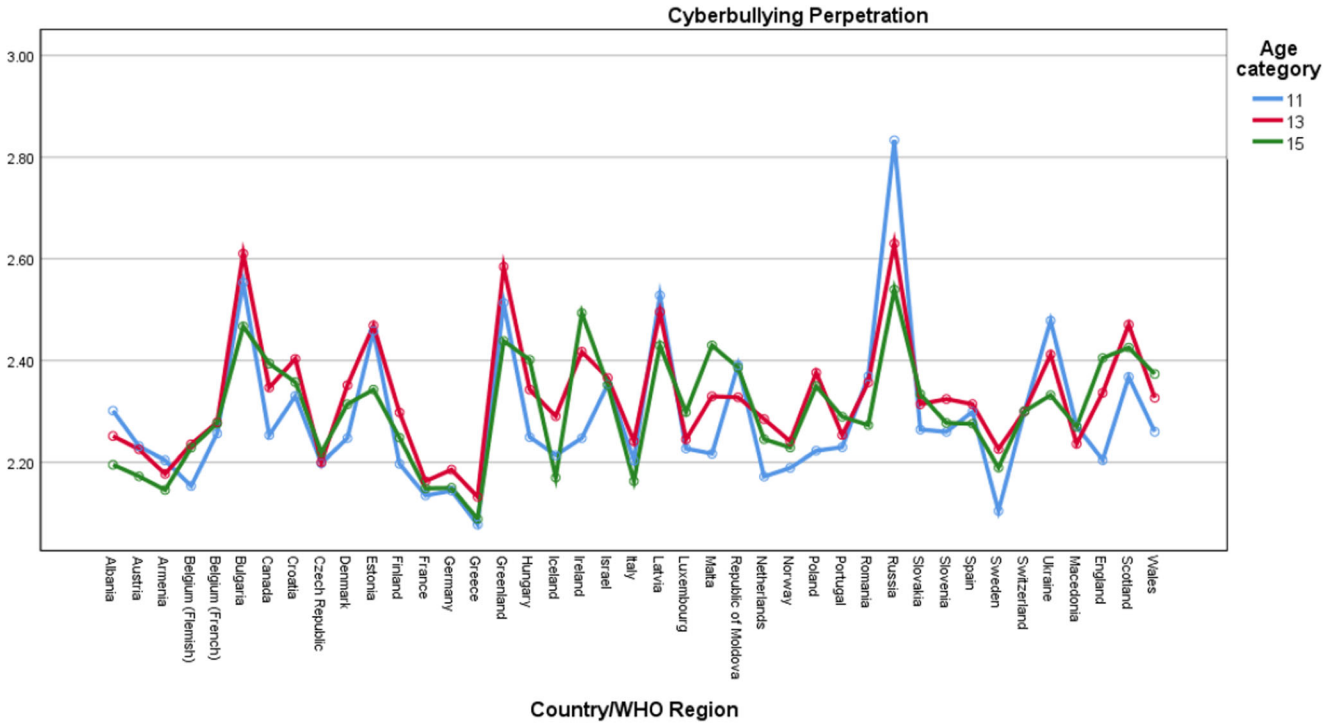

Fig. 5 Age differences on cyberbullying perpetration by county

Policy's Role

Cyberbullying among school-aged children is becoming a significant concern in public health. Cyberbullying perpetration should be considered a broad community issue not only a child, parent, or school problem, since many countries share common risk factors. In addition to limiting use of SNS or the Internet among school-aged children, it is also important for policymakers to improve awareness of adverse consequences of cyberbullying, and to target the root of cyberbullying problems (Näsi et al. 2017; Sengupta and Chaudhuri 2011). The relationships among mobile phone accessibility, the usage of SNS and the Internet, and cyberbullying perpetration highlight the need to improve the implementation of anti-bullying intervention programs, especially for younger children, to reduce the incidence of cyberbullying (Holt et al. 2016). Moreover, risks for cyberbullying underscore the importance of an international legal framework that provides for the protection of children from exposure to violence, and promotes education, socialization, freedom of expression, access to online information, and privacy, such as the United Nations Convention on the Rights of the Child (Cassidy et al. 2013).

The present study provided a rare opportunity to investigate factors associated with cyberbullying perpetration among school-aged children internationally. Policymakers and educators should become aware that cyberbullying is not only merely a social behavior but it is also linked to children's subjective well-being and life satisfaction (Navarro et al. 2015). Researchers have argued that children should be included in drafting cyberbullying and traditional bullying intervention protocols, as well as necessary educational rehabilitative approaches (Cassidy et al. 2013). Anti-bullying interventions should not only aim to reduce cyberbullying behaviors but should also aim to improve children's life satisfaction and subjective well-being.

Conclusion

Cyberbullying perpetration is a common phenomenon and shares characteristics with aggressive behaviors among school-aged children across different countries and cultures. The present study applied a large-scale, internationally representative sample with representation from various cultural backgrounds and countries. The routine activity theory was demonstrated to be a sensible theoretical framework for conceptualizing the risk for cyberbullying perpetration among a large internationally representative sample. The present findings inform future research on cyberbullying perpetration. First, family activities, such as family dinner, had a buffering effect on cyberbullying perpetration. Second, social networking usage, daily computer usage, and video game playing might be harmful activities in the online environment. Third, female school-aged children were more likely to bully others online than their male counterparts. Fourth, school-aged children with a traditional bullying history were more likely to engage cyberbullying perpetration.

The findings also point to potential risk factors associated with cyberbullying perpetration, and thereby inform anti-bullying interventions targeting school-aged children. Reducing cyberbullying perpetration will require a multi-systemic process of collaborating with parents, schools, communities, and the entire society, and needs global cooperation. As the utilization of the Internet is an essential part of everyday life, it is crucial for future studies to understand and further investigate cyberbullying perpetration and its consequences among school-aged children.

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