



The Association of Cyber-Bullying and Adolescents in Religious and Secular Schools in Israel

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Abstract

Internet usage during leisure time is a growing area of research, especially among adolescents. Our aim was to evaluate the association between Internet usage patterns of religious and secular adolescents, exposure to cyber-bullying, and psychosomatic symptoms in Israel. A cross-sectional study was carried out using questionnaires administered to 7166 students aged 11–17 (4223 secular; 2943 religious). Cyber-bullying was more common among secular students (11.4%) than religious students (8.4%). Multiple logistic regression predicting cyber-bullying showed significant results for boys, primary school age, Internet usage, bad moods, sleeping disorders, and dizziness. A comparison across school levels and between the education sectors did not show major differences in the probability to experience bullying. However, different characteristics played the role in explaining propensity to that experience. These findings can help to plan school-level oriented intervention programs to educate adolescents on prudent use of the Internet to combat the spread of cyber-bullying.

Keywords Religious adolescents · Internet usage · Cyber-bullying · Psychosomatic symptoms

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Introduction

Adolescence and Leisure Time in Virtual Space

Adolescence is the transition period from childhood to adulthood, characterized by many biological, psychological, and social changes (Lebel and Beaulieu 2011; Tesler et al. 2016). Perceived as distinct from childhood, it is a universally acknowledged developmental stage. Even so, the nature and levels of developmental tasks that adolescents are required to meet may change from one society to another (Carleton et al. 2008). Many studies have been conducted in recent years on adolescent leisure time (Badura et al. 2018). Leisure can be defined as time not expended meeting existential needs (e.g., eating, sleeping, working, education, or engaging in domestic chores) (Kleiber et al. 1986; Mahoney and Stattin 2000). It is important to partake in leisure activities (Mahoney and Stattin 2000; Newman et al. 2014); studies have shown that they contribute to child and adolescent development, as they offer opportunities to develop new skills, create social relationships, experience new identities during adolescence, attain self-definition, and promote personal autonomy and decision-making skills (Holder et al. 2009; Mahoney and Stattin 2000).

Research surveys and studies show that individuals born during Generation Y, namely teenagers born after the 1990s, are immersed in new communication technologies (Bolton et al. 2013; Morton 2002). Approximately half of teenagers aged 12–17 use the Internet for about 4 h per day and smart phones for almost 6 h a day (HBSC 2016; Harel-Fisch et al. 2016). A comparison between Israeli and European adolescents found that the former ranked highest for using computers, tablets, and smart phones 4 h per day or more (Harel-Fisch et al. 2016). In fact, media use has become ever-present in teens and young adults alike (Bolton et al. 2013; Boniel-Nissim et al. 2015; Ford 2013).

Exposure to Cyber-Bullying in Virtual Space

The last decade has witnessed even more accessibility to new communication technologies (Livingstone and Smith 2014; Silverstone 2017). American teenagers were found to spend about a third of the day on various electronic devices, and this trend is only rising. It was also shown that greater use of electronic devices contributes to higher levels of cyber-bullying (Bradshaw et al. 2015). For example, adolescent risk of exposure to cyber-bullying has increased significantly, creating a significant challenge for health systems (Kim et al. 2018; Tian et al. 2018; Vaillancourt et al. 2017). Data from the Health Behaviour in School-Aged Children (HBSC) study from 2014 revealed that 13.6% of overall violence initiated by adolescents takes place via different communication technologies. Boys are more likely to engage in bullying than girls, who are more likely to become victims (HBSC 2016). The findings of (Elçi and Seçkin 2019) reveal that female students have significantly less awareness of cyber-bullying than males. Also the study of Arnarsson et al. (2019) found that for boys, cyber-bullying was most frequent in the youngest age group and then decreased steadily in the older age groups. Girls were on average more likely

to be cyber-bullied. Cyber-bullying was more common among 13- and 15-year-olds than 11-year-olds. In another study about cyber-bullying and cybervictimization, the results were analyzed by comparing differences between countries and between genders. Boys committed more cyber-bullying than girls in all countries, but there were no overall gender differences in cybervictimization. (Sorrentino et al. 2019). Another interesting study with comparator groups that were younger than the participants was consistently judged to be most at risk of experiencing cyber-bullying (Betts et al. 2018).

In addition, there is a relationship between cyber-bullying by technological means and general well-being (Vaillancourt et al. 2017). Furthermore, children who use bullying behavior to intimidate or frighten others on the Internet tend to develop risky, as well as antisocial behaviors, such as alcohol drinking or delinquency (Kim et al. 2018; Li 2010; Harel-Fisch et al. 2016). More research has shown that victims of cyber-bullying suffer from symptoms of depression (Nixon 2014).

Moreover, studies have confirmed a relationship between extended periods of time spent in front of screens (screen behavior) and psychosomatic symptoms, such as depression, anger, and irritability (Ford 2013; Lenhart et al. 2017; Marques et al. 2015). Due to an increase in screen behavior, there has been a significant rise in headaches and migraines among adolescents (Holstein et al. 2015; Marques et al. 2015).

Religiosity and Internet Use

The effect of religion has been researched for many decades, and results concerning the relationship between religion and ethical behaviors have been mixed (Armfield and Holbert 2003; McNamara Barry et al. 2010; Dilmaghani 2018; Fariddanesh and Rezaei 2017). However, no definite conclusion about their relationship has yet been reached. In some studies, no relationship between religion and unethical behaviors was found (Lau and Yuen 2013), while in others, a negative association was observed between individual religiousness and justification of ethically suspect behaviors (Parboteeah et al. 2008). Furthermore, in a literature review by Benjamins (2012), it was found that attending religious services was associated with less risky behaviors. Parboteeah et al. (2008) argued that the mixed results were due to the conceptual and methodological flaws of the studies. As far as risky online behaviors are concerned, Gerlich et al. (2010) found that there were no differences between the ethical attitudes of Christian students and those of other religious affiliations, but students' frequency of worship attendance positively predicted moral judgment. However, students still practiced the illegal copying of CDs and downloading of music and movies regardless of their religion.

Swart (2009) also reported that while Christian faith influences moral beliefs, values, and attitudes, it has hardly any effect on unethical and risky behaviors when students were confronted with moral dilemma. Other studies used religiosity and spirituality as proxies for religion to examine their influence on a number of behaviors. Notwithstanding the debate over the distinction between religiosity and spirituality, some scholars are inclined to focus on the commonality of the two constructs

and contend that “spirituality is conceptualized as the engagement with the sacred, whereas believers are united with the sacred and to each other through religiosity” (McNamara Barry et al. 2010). Grimes and Rezek (2005) found that religiosity manifested as regular attendance at religious services was positively correlated with cheating in school, but negatively correlated with assisting others to cheat. These mixed results point to the need for further work to revisit the nuanced relationship between religion and risky online behaviors.

With regard to the effect of religion on risk-taking, Pitel et al. (2012) found that Christians were no different than non-Christians in terms of risky online behavior. This also concurs with the findings of prior research that an inverse relationship between religiosity and health risk behavior was found in several behaviors (especially use of substances) but not in violent behaviors in particular (Pitel et al. 2012). Some research has shown that religiosity can serve as a protective factor against violence in general and cyber-bullying in particular (Li 2010; Malinakova et al. 2018).

Harel-Fisch et al. (2016) found differences between religious and secular adolescents in use of electronic devices (personal computers, smart phones, and tablets) for the purpose of chatting, using the Internet, and emailing. While it has been found that 22% of secular adolescents use electronic devices for 4 h per day or more, only 16% of their religious counterparts engage in similar usage rates. This phenomenon is also reflected in Internet and mobile use during leisure time. Religious and secular adolescents were asked if they had been victims of cyber harassment; 4.5% of religious adolescents answered positively, while 5.8% of secular adolescents answered positively (Harel-Fisch et al. 2016).

While the topic of religion and cyber-bullying has been previously studied, differences in how subgroups (e.g., between genders and grade in school) are affected have not been studied. No intervention to date has taken such differences into account. From the above, several hypotheses may be formulated: The first hypothesis is that there will be a difference between education (state-secular vs. state-religious) and patterns of cyber-bullying and psychosomatic symptoms and that cyber-bullying patterns and psychosomatic symptoms will be lower in the religious sector. The second hypothesis is that a negative relationship will be found between three age groups (primary school [6th grade], junior high school [8th grade], and high school [10th grade]) and cyber-bullying patterns in the religious sector. The third hypothesis is that there will be a difference between boys’ and girls’ exposure to cyber-bullying and that the former will be more exposed to cyber-bullying than the latter.

Methods

Participants

This cross-sectional, quantitative, correlational study is based on a secondary analysis of the 2014 HBSC study that was conducted in Israel (Harel-Fisch et al. 2016). The Israel National Research initiative for 2014 focused on 6th-, 8th-, and 10th-grade students. In Israel, there are about 345,000 total students in the

grades relevant to this study, in schools supervised by the Ministry of Education (MoE). The MoE issued a list of all schools (including specific classrooms), as well as information about type of school (including secular and religious [Jewish] schools), number of classrooms per grade, and number of students per classroom for the research team. This list served the team as the sampling framework of the study. There were 182 schools that were sampled, out of which 225 classrooms (47 6th grade, 41 8th grade, and 49 10th grade) were sampled. In some cases, questionnaires were not administered due to principals declining to administer questionnaires, schools that appeared on the list but were in fact closed, and cancellations due to tests or trips.

Measures

Independent Variables

Socio-demographic variables included grade (6th, 8th, or 10th), type of school (state-secular or state-religious), and gender. Frequency of Internet usage during leisure time was comprised of two questions. The first question was “How many hours per day in your free time on weekdays do you usually use electronic devices such as a computer, tablet, or smart phone to use for chatting, Internet, email, homework, etc.?” The second question was “How many hours per day in your free time on weekends do you usually use electronic devices such as a computer, tablet, or smart phone to use for chatting, Internet, email, homework, etc.?” Each question was rated on a scale of 1, meaning “not at all” to 9, meaning “about seven hours per day.” Validity and reliability of the questions and responses were adapted from a study by Torsheim et al. (2010).

Dependent variables were comprised of exposure to cyber-bullying and psychosomatic symptoms. Frequency of exposure to cyber-bullying was comprised of two questions. The first question was “In the last 2 months, how often were you a victim of the following schoolyard harassments: mean notifications, text messages, emails, offensive posts, or online mockery?” The second question was “In the last 2 months, how often were you the victim of the following harassments in the schoolyard: inappropriately photographed without knowledge or consent to then be posted on the web or sent in a text message?” Each question was rated on a scale of 1 to 5, with 1 being “I was not victimized in this manner in the last 2 months” to 5 being, “Several times a week.” These measures were adopted from a study of Olweus (2013).

In the current study, the psychosomatic symptoms index was comprised of eight items: bad mood, anger, irritability, sleeping disorders, headaches, stomachaches, backaches, and dizziness. These were measured on a 5-point scale (1 being almost on a daily basis to 5 being rarely or never). The internal consistency between the eight items was $\alpha=0.88$. It was then reversed, and a psychosomatic symptoms scale was set by item average. The higher the score, the more frequent were the symptoms. The HBSC psychosomatic symptoms list has been widely used as a proxy for adolescent psychological well-being (Haugland and Wold 2001).

Procedure

In the first stage, steering meetings were held to make decisions about the questionnaire content, target population, and sample layout. Upon completion of the questionnaires, a request for approval was submitted to the Chief Scientist and Administration of Religious Education, which received a confirmation. After receiving the list of schools and classes from the MoE, we ran a pilot of the questionnaires on site, analyzed the pilot findings, and modified the questionnaires accordingly. The fieldwork was evaluated on a national scale, interviewers were hired and trained, school principals were contacted, data were gathered on site, the data file was encrypted, and the scientific file was cleaned and processed.

Data gathering from the population of the religious schools was heterogeneous, containing religious primary schools, regional junior high schools, and high schools. Following the Chief Scientist's approval, the study team addressed the school principals and after obtaining their consent and HBSC questionnaires were distributed among all of the sampled religious schools.

The research protocol received approval from ethics committees of the Israeli Ministry of Education and Bar Ilan University.

Results

The study sample consisted of 7166 students, of whom 4223 (approx. 59%) studied in secular schools and 2943 (approx. 41%) studied in religious schools. About 47% of the sample was boys, while most of the students were in junior high school, from both sectors (approx. 44%—state-secular; approx. 47%—state-religious). The response rate of children enrolled in participating classes was over 95%.

The first hypothesis posited a difference between sectors (state-secular vs. state-religious) in patterns of cyber-bullying, in that cyber-bullying would be more frequent in the state-secular schools than in the state-religious schools. To test this hypothesis, we used a Chi-square test. A significant difference ($p < 0.001$) between sectors was found (Table 1). In the state-secular schools, 11.4% of the students reported exposure to cyber-bullying versus 8.4% in the state-religious schools, confirming the first hypothesis.

The first hypothesis also claimed that there would be a difference between schools (state-secular vs. state-religious) in psychosomatic symptoms, in that they would be

Table 1 Differences between sectors in cyber-bullying

	State-secular schools	State-religious schools	Chi-square statistics	Significance level
Minimal or no exposure to cyber-bullying	88.6%	91.6%	17.07	$p < 0.001$
Exposure to cyber-bullying	11.4%	8.4%		
<i>N</i> (total)	4223	2943		

more frequent in the state-secular than state-religious schools. To test this hypothesis, we used a Chi-square test for each of the psychosomatic symptoms. Significant differences were found in each of the symptoms, except dizziness (Table 2). The frequency of headaches, stomachaches, backaches, bad mood, anger, irritability, and sleeping disorders was found to be lower among state-religious students (by 3–5%, depending on the symptom) than among state-secular students. Thus, the second hypothesis was supported.

Table 2 Differences between sectors in psychosomatic symptoms

Symptoms	State-secular schools	State-religious schools	Chi-square statistics	Significance level
<i>Headache</i>				
Not at all or almost none	56.36%	60.35%	11.33	$p < 0.001$
Once a week or more	43.61%	39.65%		
<i>N</i> (total)	4223	2943		
<i>Stomachache</i>				
Not at all or almost none	65.71%	69.89%	13.82	$p < 0.001$
Once a week or more	34.29%	30.11%		
<i>N</i> (total)	4223	2943		
<i>Backache</i>				
Not at all or almost none	71.73%	76.66%	21.78	$p < 0.001$
Once a week or more	28.27%	23.34%		
<i>N</i> (total)	4223	2943		
<i>Bad mood</i>				
Not at all or almost none	51.60%	56.00%	13.49	$p < 0.001$
Once a week or more	48.40%	44.00%		
<i>N</i> (total)	4223	2943		
<i>Anger</i>				
Not at all or almost none	39.00%	43.36%	13.63	$p < 0.001$
Once a week or more	61.00%	56.64%		
<i>N</i> (total)	4223	2943		
<i>Irritability</i>				
Not at all or almost none	39.96%	42.68%	23.73	$p < 0.001$
Once a week or more	63.04%	57.32%		
<i>N</i> (total)	4223	2943		
<i>Sleeping disorders</i>				
Not at all or almost none	62.16%	66.36%	13.27	$p < 0.001$
Once a week or more	27.84%	33.64%		
<i>N</i> (total)	4223	2943		
<i>Dizziness</i>				
Not at all or almost none	75.30%	75.94%	0.39	$p = 0.534$
Once a week or more	24.70%	24.06%		
<i>N</i> (total)	4223	2943		

The second hypothesis predicted a negative relation between age group (primary school, junior high school, and high school) and cyber-bullying patterns. To test this hypothesis, Pearson correlation coefficients were calculated. A weak significant negative relation ($r = -0.03$) was found between age group and cyber-bullying patterns (Table 3). Thus, the older the student was, the less he or she was exposed to cyber-bullying.

The third hypothesis was that there would be gender differences in exposure to cyber-bullying, such that boys would be more exposed than girls. A significant difference was found ($p < 0.001$), with 12.2% of boys and 8.3% of girls reporting they were exposed to cyber-bullying.

Table 4 displays a summary of the logistic regression model for predicting the exposure to cyber-bullying according to study variables ($N = 7166$). For a finer modeling, we divided the regression models into the school levels, high schools ($N = 3239$), junior high schools ($N = 1944$) and primary schools ($N = 1983$). In Table 4, we present the odds ratio and the 95% confidence interval. An odds of 1 means that the probability to experience bullying is equal to the probability not to experience, that is, no significant effect. These analyses were performed subject to a treatment weight; that is, we assessed a weight for religious schools versus secular schools. Overall, it was found that the probability of the girls' exposure to cyber-bullying was 0.54 times less than for boys ($p < 0.001$). Students who used the Internet were 1.40 times more exposed to cyber-bullying than non-users ($p < 0.001$). In addition, students who suffered sleeping disordered and dizziness were 1.29 times and 1.53 more exposed to cyber-bullying ($p < 0.05$; $p < 0.01$, respectively). Our propensity score-matching analysis resulted in minor and insignificant average treatment effect on the probability to experience bullying (average treatment effect = -0.007 ; 95% CI: $-0.025, 0.010$). We also used the multiple-group comparison framework to compare the two sectors and found no difference between the free and the constraint model. Thus, following the insignificant sector effect, and the invariance comparison, we conclude that regardless of the expected difference across sectors, the model did not provide support for that expectation. This was consistent when we looked at each school level, separately, see Table 4. The gender effect was found significant for high school and junior high school students; that is, girls' propensity to experience bullying was lower in comparison with boys, but this effect was insignificant among primary school children. Primary and junior high school students' complaints on dizziness were associated with higher propensity to experience bullying, but this effect was insignificant among high school students. Junior high school students, who reported bad mood, were also more prone to experience bullying.

Discussion

This research focused on factors associated with exposure to cyber-bullying and emotional and physical distress among adolescent students in secular and religious schools in Israel. Exposure to cyber-bullying was primarily measured by behavioral patterns during leisure time. Our findings support the study hypotheses, indicating differences between student types. Additional variables associated with exposure

Table 3 Correlations between sector, age, gender, somatic symptoms, Internet usage, cyber-bullying

	Gender	Headache	Stomach ache	Backache	Bad mood	Anger	Irritability	Sleeping disorders	Dizziness	Age group	Internet usage	cyber-bullying
Sector (secular/religious)	0.02	-0.04**	-0.04**	-0.06***	-0.04**	-0.04**	-0.06***	-0.04**	-0.01	-0.03**	-0.21***	-0.05***
Gender (boy/girl)		0.20***	0.16***	0.06***	0.13***	0.09***	0.10***	0.04**	0.13***	0.02	0.10***	-0.06***
Headache			0.52***	0.34***	0.35***	0.30***	0.31***	0.31***	0.43***	0.06***	0.12***	0.09***
Stomachache				0.37***	0.32***	0.30***	0.29***	0.30***	0.35***	-0.02*	0.11***	0.09***
Backache					0.32***	0.27***	0.26***	0.29***	0.33***	0.10***	0.09***	0.11***
Bad mood						0.56***	0.54***	0.37***	0.32***	0.07***	0.10***	0.12***
Anger							0.84***	0.32***	0.28***	0.04**	0.11***	0.12***
Irritability								0.33***	0.29***	0.05***	0.11***	0.11***
Sleeping disorders									0.37***	0.07***	0.09***	0.12***
Dizziness												
Age group (primary/junior high school/high school)										0.05***	0.10***	0.13***
Internet usage											0.10***	-0.03*
												0.06***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4 Weighted logistic regression for predicting exposure to cyber-bullying (1 = yes; 0 = no), across all respondents and by school level

Variable	All		Primary		Junior high school		High school	
	OR	CI (95%)	OR	CI (95%)	OR	CI (95%)	OR	CI (95%)
Religious versus secular sector	0.88	[0.70, 1.11]	0.92	[0.67, 1.57]	0.82	[0.54, 1.22]	0.86	[0.59, 1.26]
Girls versus boys	0.54***	[0.44, 0.67]	0.71	[0.47, 1.06]	0.54**	[0.39, 0.77]	0.45***	[0.32, 0.64]
Junior high school versus primary school	1.11	[0.85, 1.43]	-	-	-	-	-	-
High school versus primary school	0.70	[0.54, 0.91]	-	-	-	-	-	-
Medium versus low socioeconomic	1.14	[0.77, 1.69]	1.64	[0.69, 3.90]	1.17	[0.59, 2.34]	0.98	[0.56, 1.74]
High versus low socioeconomic	1.35	[0.90, 2.02]	2.15	[0.87, 5.29]	1.25	[0.61, 2.57]	1.17	[0.64, 2.14]
Internet usage: yes versus no	1.40**	[1.10, 1.79]	1.45	[0.91, 2.32]	1.25	[0.85, 1.84]	1.54	[0.99, 2.39]
Headache: a lot versus little	0.39	[0.87, 1.44]	0.92	[0.53, 1.57]	1.13	[0.75, 1.71]	1.28	[0.84, 1.93]
Stomachache	1.05	[0.82, 1.35]	1.23	[0.73, 2.06]	0.85	[0.57, 1.28]	1.17	[0.79, 1.75]
Backache	1.29	[1.02, 1.63]	1.55	[0.96, 2.52]	1.11	[0.76, 1.64]	1.33	[0.92, 1.93]
Bad mood	1.41	[1.09, 1.83]	1.15	[0.67, 1.96]	1.73*	[1.14, 2.64]	1.32	[0.86, 2.01]
Anger	1.37	[0.89, 2.09]	1.34	[0.58, 3.08]	1.42	[0.69, 2.93]	1.34	[0.68, 2.63]
Irritability	1.15	[0.75, 1.76]	1.11	[0.48, 2.54]	1.17	[0.57, 2.42]	1.18	[0.60, 2.33]
Sleeping disorders	1.29*	[1.03, 1.62]	1.36	[0.85, 2.17]	1.28	[0.89, 1.84]	1.26	[0.87, 1.82]
Dizziness	1.53***	[1.20, 1.95]	1.87*	[1.11, 3.14]	1.59*	[1.07, 2.37]	1.33	[0.90, 1.96]

Weight by inverse probability weighting (IPW)

OR odds ratio; CI confidence interval

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

to cyber-bullying were gender and age group (i.e., 6th grade, 8th grade, and 10th grade) (Table 5).

Exposure to Cyber-Bullying

Epidemiological features of exposure to cyber-bullying among adolescents and evidence of its associated health, economic, and social implications suggest that this is a significant phenomenon (Li 2010; Nixon 2014). It was found that increased use of Internet and mobile technologies is strongly associated with elevated risk of exposure to cyber-bullying. These findings point to a daunting challenge for the health care system (Li 2010; Tian et al. 2018).

As noted, we posited differences in cyber-bullying between religious and secular adolescent students. Our results are compatible with the literature, showing less exposure in the religious sector. Recent HBSC trend analysis summaries from 2006 and 2011 also report that frequency of cyber-bullying among students in Israel is rising but still lower among religious students (Harel-Fisch et al. 2006, 2016; Yadav and Yadav 2018). Our findings show exposure rates of 8.4% of cyber-bullying among students at religious schools and 11.4% among students at secular schools.

In addition, various studies have showed that exposure to cyber-bullying is associated with emotional and physical distress, such as being in a bad mood, anger, irritability, and experiencing sleeping disorders (Kim et al. 2018; Perren et al. 2010; Tian et al. 2018). Our study found that students at religious schools exhibited less psychosomatic symptoms than their secular counterparts. These findings support the literature, indicating that religiosity does serve as a protective factor compared with the secular population (Gerlich et al. 2010).

According to the HBSC report, as well as Nixon (2014) and Tian et al. (2018), there is a gradual age decrease in exposure rates to cyber-bullying among adolescents (HBSC 2014; Nixon 2014; Tian et al. 2018). This effect was also found in our results, where age group was significantly associated with cyber-bullying exposure patterns. The older the students were, there was a lower the percentage who reported cyber-bullying (Boniel-Nissim et al. 2015). Our study also emphasized cyber-bullying differences between girls and boys. A survey by the Israeli Central Bureau of Statistics (2014) was conducted for the Ministry of Internal Security, which found that nearly 9% of girls aged 12–18 and 0.5% of boys aged 12–18 experienced sexual harassment online. In addition, 12% of all respondents experienced threats or humiliation online (13% girls and 10% boys). An average of seven percent (8% girls and 6% boys) reported impersonation or identity theft (Israel Central Bureau of Statistics 2014). Our findings show an inverse relationship in which boys are exposed to more intense cyber-bullying than girls, with 12.2% of boys reporting exposure to cyber-bullying versus 8.3% of girls.

In sum, it is clear that the Internet plays a key role in the lives of Israeli children and adolescents. High percentages of children and adolescents from different population groups use the Internet in various ways. This usage can embody danger for all younger users. In Israel, continued development, design, and operation of intervention programs to improve prudent Internet skills and tools are a social imperative.

Table 5 Weighted logistic regression for predicting exposure to cyber-bullying (1 = yes; 0 = no), across all respondents and by school level

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Junior high school versus primary school	1.11	[0.85, 1.43]	–	–	–	–	–	–
High school versus primary school	0.70	[0.54, 0.91]	–	–	–	–	–	–
Medium versus low socioeconomic	1.14	[0.77, 1.69]	1.64	[0.69, 3.90]	1.17	[0.59, 2.34]	0.98	[0.56, 1.74]
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Stomachache	1.05	[0.82, 1.35]	1.23	[0.73, 2.06]	0.85	[0.57, 1.28]	1.17	[0.79, 1.75]
Backache	1.29	[1.02, 1.63]	1.55	[0.96, 2.52]	1.11	[0.76, 1.64]	1.33	[0.92, 1.93]
Bad mood	1.41	[1.09, 1.83]	1.15	[0.67, 1.96]	1.73*	[1.14, 2.64]	1.32	[0.86, 2.01]
Anger	1.37	[0.89, 2.09]	1.34	[0.58, 3.08]	1.42	[0.69, 2.93]	1.34	[0.68, 2.63]
Irritability	1.15	[0.75, 1.76]	1.11	[0.48, 2.54]	1.17	[0.57, 2.42]	1.18	[0.60, 2.33]
Sleeping disorders	1.29*	[1.03, 1.62]	1.36	[0.85, 2.17]	1.28	[0.89, 1.84]	1.26	[0.87, 1.82]
Dizziness	1.53***	[1.20, 1.95]	1.87*	[1.11, 3.14]	1.59*	[1.07, 2.37]	1.33	[0.90, 1.96]

Weight by inverse probability weighting (IPW)

OR odds ratio; CI confidence interval

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This study had a few limitations. First, we used a cross-sectional study, which is based on latitudinal data at a single point in time. This method does not take into consideration the effect of health promoting policy over a period of time. Furthermore, causal deductions of cross-sectional study findings are limited. This area of education research is well known for its difficulty in locating causality due to common bidirectional effects of variables. Therefore, a longitudinal study to detect operational conclusions with higher validity of cause and effect is desirable. This would thus allow for repeating measurements and negation of confounding variables. Second, our data were based on self-reports of adolescents, which can be influenced by various factors, e.g., social desirability. Third, these study findings on students from the Jewish sector (in both secular and religious schools) reflect the situation among Jewish students only (even in the secular schools). Applying these findings to the Arab or any other sector in Israel should be undertaken with caution due to cultural differences.

Cyber-bullying is less common in religious schools than in secular schools. Adolescents in both sectors require intervention to assist in countering cyber-bullying. These findings can be used as the basis for planning sector-specific intervention programs both to educate on prudent use of the Internet during leisure time and to combat the spread of cyber-bullying. The significance of programs that promote adolescent health is continuously growing as a resource for producing comprehensive health behavior changes. Therefore, the development of intervention programs promoting educated use of the Internet and exposure to cyber-bullying may reduce this phenomenon. Furthermore, providing practical tools to educational teams may contribute to reduction or even elimination of this phenomenon in the education system.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict interest.

Ethical Standards The research protocol received approval from ethics committees of the Israeli Ministry of Education and Bar Ilan University.

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