

- Future research should focus on the timing of the potential effect of prenatal folate on the development of autistic traits, which may lead to new guidelines about continuation of folic acid supplement use in pregnancy.

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Cybervictimization and somatic and psychological symptoms among Italian middle school students

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Background: Existing literature clearly documents the association between cybervictimization and psychological symptoms; less clear is the association between cybervictimization and somatic symptoms. This study aims to verify the association between cybervictimization and both psychological and somatic symptoms on a representative sample of Italian early adolescents. **Methods:** This study used data from 24 099 students aged 13 years participating in the 2009/2010 Health Behaviour in School-aged Children Survey. Self-completed questionnaires, devised by the HBSC international group, were administered in classrooms. Multilevel models of logistic regression (controlling for traditional bullying victimization, computer use and demographics) were used to investigate the association between cybervictimization and psychological and somatic symptoms. **Results:** Overall, 3.1% of the students reported having been bullied frequently electronically and 8.7% occasionally (compared, respectively, to 4.0 and 9.2% victims of traditional forms of bullying). Overall, prevalence of students reporting psychological and somatic symptoms was 32.5 and 12.0%, respectively. Being victims of cyberbullying was positively associated to students' psychological and somatic symptoms, after controlling for traditional bullying victimization and computer use. **Conclusion:** Cybervictimization has similar psychological and somatic consequences for boys and girls, thus suggesting that intervention and prevention efforts should focus on both gender groups.

Introduction

Bullying at school is a relatively common experience among students in many countries throughout the world,¹ and Italy alike.² Recently, the proliferation of electronic communications technologies has afforded youth a new means of peer aggression, called 'cyberbullying'.^{3,4} Cyberbullying includes aggressive behaviour through e-mail, instant messaging, in a chat room, on a website or through digital messages or images sent to a cell phone.

Recent meta-analyses have documented adverse consequences of being bullied at school on youth's lives, including physical health symptoms,^{5–7} psychological problems (e.g., depression, anxiety, low self-esteem),^{8,9} and suicidal ideation.¹⁰ Comparatively much less is known about the risks of cybervictimization for youth's adjustment and well-being. To date, research has shown that, similarly to what

has been documented for traditional bullying, victims of cyberbullying report more depression, anxiety and loneliness compared to non-victimized peers, whereas somatic problems related to the experience of cybervictimization have been investigated to a limited extent.^{3,11} Therefore, there is clear need for large scale, nationally representative studies that further investigate the relationship between cybervictimization and both somatic and psychological symptoms. Moreover, it is necessary to estimate these associations after controlling for the concurrent occurrence of traditional victimization, to test whether cybervictimization uniquely contributes to the negative health outcomes. Another possible confounding variable that needs to be controlled for is Internet use, which is positively associated with both cybervictimization¹² and psychological problems;^{13,14} time spent on sedentary screen-based activities (such as computer use) is also a risk factor for adolescents' physical

complaints.¹⁵ Finally, because gender differences in cybervictimization and its consequences have sometimes been reported,^{4,11,16} we controlled for the role of gender and we tested whether gender moderated the associations between cybervictimization and the two outcome variables.

The main objective of this study is to evaluate the association between cybervictimization and psychological and somatic symptoms in a representative sample of Italian middle school students. We expect cyberbullying to be positively associated with psychological and somatic symptoms, above and beyond links between psychosomatic complaints and traditional bullying victimization and computer use.

Methods

Setting and sampling

The article uses data of a sample of Italian middle school students collected in the 2009/2010 World Health Organization collaborative cross-national study, 'Health Behaviour in School-aged Children' (HBSC; for details see <http://www.hbsc.org>).¹⁷ The research protocol included three age-groups: 11, 13 and 15-year-olds corresponding to the 6th, 8th and 10th grade (1st and 3rd grade of Italian middle school, and 2nd grade of Italian secondary school). Because measures of bullying behaviour were included only in the 13-year-olds' questionnaires, 11- and 15-year-old students were excluded from this study.

Class teachers administered the questionnaires during a regular school day and its completion took approximately 50 min. Participants gave their assent and were assured of the confidentiality of their answers. Parental permission to participate was obtained before the administration.

Participants

According to the international research protocol of the HBSC survey, participants were selected through a 'sample clustering' approach.¹⁸ First, the schools were randomly selected from the National School Office's data base of all public schools, then in each school one class for each age-group was selected randomly. Within each region of the country, samples were stratified to represent the distribution of students in grades 8 (modal age 13) and to be representative of the school student population. Of the schools selected for the study, 95.9% agreed to participate. The sample included all students in the selected classes. This particular design ensures a sample population that accurately reflects the referent population. The study was preliminarily approved by the school boards that informed the parents about its aims and procedures.

The questionnaire was completed by a total of 24 099 middle school students. The average age was 13.6 years (SD = 0.5). The final sample includes 12 229 boys (50.7%) and 11 870 girls (49.3%).

Measures

Data were collected through a self-report questionnaire, devised by the HBSC international group, focusing on health behaviours of early adolescents. The present study uses data related to students' reports of cybervictimization, and psychological and somatic symptoms.

Cybervictimization

The two items assessing cybervictimization were based on the revised Olweus Bully/Victim Questionnaire.¹⁹ After reading a standard definition of bullying, students were asked how often they had been cyberbullied (by a computer or e-mail message or picture and by phone) in the last 2 months. Responses were rated on a five-point scale (1 = never; 2 = once or twice; 3 = two or three times a month; 4 = about once a week; 5 = several times a week). Consistent with Olweus' studies²⁰ and more recent studies²¹ involvement in

bullying (by computer or by phone) was classified as 'occasional victim of cyberbullying' (once or twice) and 'frequent victim of cyberbullying' (more than two/three times in the last 2 months).

Traditional victimization

Students were given the Olweus' definition of bullying,²² and then asked questions about their involvement in bullying victimization: 'How often have you been bullied at school in the past couple of months?'. Responses were rated on a five-point scale (1 = never; 2 = once or twice; 3 = two or three times a month; 4 = about once a week; 5 = several times a week). Again, involvement in traditional bullying was classified as 'occasional victim' (once or twice) and 'frequent victim' (more than two/three times in the last 2 months).

Psychological symptoms

Are a non-clinical measure of mental health composed by four items [part of the HBSC Symptom Checklist (The HBSC symptoms scale has been used in various ways in different studies as either a one-factor scale (with an overall psychosomatic symptom score) or a two-factor scale (by distinguishing between somatic and psychological symptoms). In our sample, we verified the possibility to use the scale as both one- or two-factor scale (the fit index for both Confirmatory Factor Analyses are satisfactory), with the exception of the item about 'feeling dizziness' that did not clearly saturate any of the two factors. For this reason we excluded the item from the two subscales).²³ The scale items include: 'In the last 6 months, how often have you had the following? (i) feeling low; (ii) irritability or bad temper; (iii) feeling nervous; (iv) difficulties in getting to sleep'. Students were considered to experience multiple psychological symptoms when they reported two or more symptoms more than once a week.²⁴

Somatic symptoms

Are a non-clinical measure of mental health composed of a three-item scale (part of the HBSC Symptom Checklist).²³ The scale items include: 'In the last 6 months, how often have you had the following? (i) headache; (ii) stomachache; (iii) backache. Students were considered to experience multiple somatic symptoms when they reported two or more symptoms more than once a week.²⁴

Control variables

Daily computer use and demographics [sex, age and Family Affluence Scale (FAS)] were introduced as control variables. (The variable has been treated as a continuous variable since the age ranges from 12.5 to 17.1.) The FAS is a four-item measure developed and validated in the HBSC protocol,²⁵ which includes four indicators of family affluence: family car ownership, unshared rooms, number of computers at home and time spent on holiday in the 12 months preceding the survey. Responses were summed and the total scores (ranging from 0 to 9) were divided into three groups: students scoring between zero and two were placed into the 'low affluence' category, those scoring between three and five into the 'moderate affluence' group, and those between six and nine in the 'high affluence' category.

Statistical analysis

Prevalence of cyber victims, as well as psychological and somatic symptoms was compared by gender using χ^2 test. To test for the possible contribution of cybervictimization to early adolescent psychological and somatic symptoms, multilevel logistic regression analyses (random intercept) were computed to take into account the hierarchical structure of the data (individuals clustered within schools). CIs were computed at the 95% level, and explained variance was evaluated using Nagelkerke R^2 , a pseudo- R^2 . All

regression analyses were conducted controlling for the effect of the confounding factors.

In order to test for the two-way interactions between cybervictimization and each variable (gender, traditional victimization), the steps involved included: transforming predictor and moderator variables by standardizing (variables were centred to a zero mean), creating interaction terms and structuring the equation.

Results

Descriptive statistics

Table 1 reports the characteristics of the sample by gender. Overall, prevalence of students reporting psychological and somatic symptoms was 32 and 12.0%, respectively. For both psychological and somatic symptoms the prevalence is higher among girls. Moreover, 11.8% of the students declared that they have been victims (8.7% occasionally and 3.1% frequently) of cyberbullying (compared, respectively, to 9.2 and 4.0% who reported to be victim of traditional forms of bullying). Contrary to what happens for traditional victims, girls were more likely to be occasionally involved in cybervictimization compared to boys.

Concerning the overlap between cyber and traditional victimization, in our sample the 26.3% of cybervictims report to be also victimized by peers at school (both occasional and frequent victims). Moreover, 7.2% of the sample reports to suffer at the same time of psychological and somatic symptoms. This overlapping may partially derive from the psychological causes of some somatic complaints.

Findings of the multilevel logistic regression analyses

Consistent with our hypothesis, being victims of cyberbullying was positively associated to students' psychological and somatic symptoms, after controlling for traditional bullying victimization and computer use (Table 2). Furthermore, for both psychological and somatic symptoms, the effect of being victims of cyberbullying seems to increase with the exposure: more frequently a student was exposed to victimization and more suffered by psychosomatic symptoms. Overall, our findings indicate that victims of cyberbullying were more likely to report multiple health

complaints. Moreover, there was a positive interaction between gender and cybervictimization, with a slightly stronger association between being a victim of cyberbullying and somatic symptoms for boys. (We verified the improvement of the model (with and without interactions) with the χ^2 test based on the deviance of the model calculated with the Laplace approximation and Δ BIC. The two interaction terms significantly improved the model for both psychological ($\chi^2(2) = 1574.25, P < 0.001; \Delta$ BIC = -1855.39) and somatic ($\chi^2(2) = 1872.59, P < 0.001; \Delta$ BIC = -1557.20) symptoms.) After introducing the interactions, main effect of cybervictimization remained significant.

No statistically significant interaction of cybervictimization and traditional victimization was found, indicating no difference in the association between cybervictimization and multiple health complaints between students also experiencing traditional victimization.

Discussion

This study aimed to analyze the association between cybervictimization and both psychological and somatic symptoms in a representative sample of Italian early adolescents. In line with previous studies, reporting prevalence rates of cyberbullying ranging between 10 and 35%,¹² our findings show that about 1 in 10 students has been a victim of cyberbullying in the two months before the survey. It is also worth noting that the prevalence of cyberbullying is comparable to the prevalence of traditional victimization for both categories: occasional, 8.7 compared to 9.2%, and frequent, 3.1 compared to 4.0%. This result underlines the need to evaluate the potential negative consequences associated with this form of bullying. In line with recent studies conducted in Finland, Sweden and UK,^{4,11,16,24} girls tend more often to be victims of cyberbullying respect to boys.

In accordance to the main aim of the study, our findings show that being a victim of cyberbullying is positively associated with psychological and somatic symptoms, even when traditional victimization is taken into account. These results echo and expand previous studies that have analyzed the negative consequences of

Table 1 Percentage of students' characteristics by gender

	Total (24 099)	Boys (12 229)	Girls (11 870)	χ^2
Psychological symptoms				
Yes	32.5	25.4	39.7	
No	67.5	74.6	60.3	548.39***
Somatic symptoms				
Yes	12.0	7.8	16.2	
No	88.0	92.2	83.8	392.174***
FAS				
Low	11.7	10.4	13.1	
Medium	41.5	40.5	42.5	
High	46.8	49.1	44.4	69.84**
Computer use				
Less than 2 hours	72.6	68.6	76.7	
2 hours or more per day	27.4	31.4	23.3	199.61***
Traditional victimization				
Non-victimized	86.8	85.2	88.5	
Occasional	9.2	10.3	8.1	
Frequent	4.0	4.6	3.4	57.03***
Cybervictimization				
Non-victimized	88.2	90.2	86.2	
Occasional	8.7	6.8	10.7	
Frequent	3.1	3.0	3.1	112.82***

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

Table 2 Adjusted OR (95% CI) for reporting somatic and psychological symptoms for cybervictims

	Psychological symptoms ($N = 24\ 099$)	Somatic symptoms ($N = 24\ 099$)
Gender		
Female	1	1
Male	0.53 (0.50–0.56)***	0.44 (0.41–0.49)***
Age#	1.20 (1.14–1.27)***	1.08 (1.01–1.17)*
FAS		
Low	1	1
Moderate	0.74 (0.68–0.82)***	0.82 (0.72–0.93)***
High	0.68 (0.62–0.75)***	0.73 (0.65–0.83)***
Computer use		
Less than 2 hours	1	1
Two hours or more per day	1.18 (1.16–1.20)***	1.11 (1.09–1.13)***
Traditional victimization		
Non-victimized	1	1
Occasional	1.73 (1.60–1.91)***	1.53 (1.34–2.74)***
Frequent	2.03 (1.71–2.42)***	1.59 (1.31–1.94)***
Cybervictimization		
Non-victimized	1	1
Occasional	1.68 (1.52–1.85)***	1.79 (1.58–2.04)***
Frequent	2.07 (1.79–2.40)***	2.32 (1.89–2.84)***
Cyber*Gender ^a	1.01 (0.97–1.03)	1.05 (1.01–1.09)**
Cyber*Traditional ^a	1.01 (0.99–1.02)	1.01 (0.99–1.02)
Negelkerke R^2	0.094	0.065
$\chi^2(8)$	1582.93***	773.21***

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

a: Variables treated as continuous.

cybervictimization in other populations.^{3,26–28} In this study, the association between cyberbullying and psychological and physical well-being is striking: students reporting to have been victims of cyberbullying are almost twice as likely to experience psychological and somatic symptoms compared to non-victimized peers and the effect increased substantially by passing from an occasional involvement to frequent involvement. A first explanation for this positive association after controlling for traditional victimization may be that it is not the same individuals who are involved in the two forms of bullying. Moreover, the negative consequences of cyberbullying on well-being may be particularly strong because of the peculiarities of cyberbullying. Indeed, cyberbullying shares the main characteristics of traditional bullying (i.e., intentionality and imbalance of power), but at the same time has some characteristics that may cause additional negative consequences for the victims: cyberbullying can occur even where one expects to feel safe (e.g., home), thus the victim cannot escape the bully by simply avoiding his/her physical presence; cyberbullying reaches a larger ‘audience’ than traditional school bullying.^{26,29} For example, the anonymity may increase the distress of bullied students and serve as a barrier to telling parents or teachers about online victimization, because cybervictims may believe it is impossible to verify the incident or the identity of the perpetrator.¹²

In our sample, small gender differences in the consequences of cybervictimization emerged. While being a victim of this particular form of bullying seems to equally increase the likelihood of psychological symptoms among boys and girls, the association between cybervictimization and somatic complaints is slightly stronger for boys. This might be due to the fact that electronic victimization is different from the forms of victimization most common among boys: many forms of cyberbullying indeed resemble relational aggression rather than physical aggression (e.g., online exclusion and spreading of rumors).^{4,30} When boys are victimized in a form that they are not used to, they may suffer more severe consequences. However, the effect of the interaction was rather modest in magnitude and has to be interpreted with caution. Future studies are needed to move beyond examining mean level gender differences in cyberbullying and to consider the means through which male and female adolescents are victimized online, as well as to understand how being a victim of cyberbullying may differentially affect boys and girls.

Limitations and strengths

This study has some limitations. First, on the basis of preliminary analyses, we used the HBSC symptoms scale as a two-factor scale (by distinguishing between somatic and psychological symptoms) also if much of the studies used the scale as one-factor scale. It will be interesting to introduce in future studies a scale with more items in order to cover a more wide set of somatic and psychological symptoms. Second, its cross-sectional design did not allow us to clearly determine the direction of the relations among the study variables. Studies have longitudinally confirmed this relationship for traditional victimization;⁶ future research should use longitudinal designs to determine whether this is also true for cybervictimization. Moreover, because of how the HBSC protocol is designed, our participants were only 13-year-old students. It would be interesting to know whether students involved in cybervictimization are more likely to start having psychosomatic problems earlier in life than their uninvolved peers. To this end, future studies on this topic should include students from previous school grades. Finally, even if the two items used to measure cybervictimization are validated and widely used² future studies should replicate the current findings by using a more comprehensive measure of cybervictimization.

The strengths of the study include the use of a large sample representative of the Italian middle school population. Moreover, this is the first study conducted that clearly distinguished among

different forms of somatic and psychological symptoms. Finally, because the current data are part of the HBSC multinational study, they will also permit future cross-cultural research on the topic.

Implications

Cyberbullying represents a relatively recent form of bullying that needs to be better understood, especially in relation with its consequences for adolescents’ health. Scholars, but also youth, parents and schools need to gain a better understanding of cyberbullying, in order to develop and implement effective prevention programs.³¹ Besides the gender differences in the association between cybervictimization and somatic symptoms, our findings show that this form of victimization has similar psychological consequences for boys and girls, thus suggesting to focus intervention and prevention efforts on both gender groups. Similarly to traditional bullying prevention, cyberbullying intervention programs must include programming for both girls and boys and must address both overt and covert/social forms of cyberaggression. School policies and educators should stress the fact that cyberbullying, in addition to traditional aggression in the playground, is potentially dangerous for schoolmates’ well-being and is not tolerated.

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Key points

- Peer cybervictimization is a common problem among early adolescents.
- Victimized students are at risk for several health-related problems.

- Similar to what happens with traditional victimization, cybervictims are more at risk for reporting psychological and somatic symptoms.
- We should put more attention to this new form of peer victimization in particular in order to increase awareness about its dangerousness among health and school professionals.

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