The Association Between Cyberbullying, School Bullying, and Suicidality Among Adolescents

Findings From the Cross-National Study HBSC in Israel, Lithuania, and Luxembourg

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Abstract. Background: Bullying and suicidality are serious worldwide problems with negative effects on the young population and therefore international comparisons in this field are of paramount importance. Aims: To analyze the prevalence of bullying and cyberbullying and their association with suicidal behavior among school-aged children in Israel, Lithuania, and Luxembourg. Method: In total, 3,814 15-year-olds from schools in Israel, Lithuania, and Luxembourg were surveyed in the Health Behavior in School-Aged Children (HBSC) cross-national survey in 2013/2014 using standardized anonymous questionnaires. Data analysis employed logistic regression and structural equation modeling (SEM). Results: In all, 6.5% of the adolescents reported being cyberbullied, 15.6% reported being bullied at school. In the previous 12 months, 38.6% reported experiencing emotions that stopped them from doing their usual activities, 17.8% considered attempting suicide, 12.0% made a suicide plan, and 9.5% attempted suicide. Victims of cyberbullying and school bullying had a significantly higher risk of suicidal ideations, plans, and attempts. The SEM analysis confirmed a significant overall effect of bullying on adolescent suicidality. The strongest effect was seen among Israeli students. Limitations: The prevalence estimates were obtained by self-report. Conclusion: The prevalence of adolescent cyberbullying, school bullying, and suicidal behavior is relatively high in Israel, Lithuania, and Luxembourg. Cyberbullying is a strong predictor of adolescent suicidality.

Keywords: adolescents, bullying, cyberbullying, suicidality, associations

Bullying during adolescence is a worldwide public health problem (Barzilay et al., 2017; Ford, King, Priest, & Kavannah, 2017; Kann et al., 2016, Sánchez-Queija, García-Moya, & Moreno, 2017) and, although there are many countries with declining bullying rates (Finkelhor, 2013; Molcho et al., 2009), some countries still report its increase (Cosma, Whitehead, Neville, Currie, & Inchley, 2017). Today, owing to the ever-growing and expanding developments in communication technologies, a new form of bullying, called cyberbullying, has emerged. Cyberbullying is a relatively new tool for bullies that lets them carry out their aggression using technology, and its growth is mainly due to the fast development of technology (Bauman, Toomey, & Walker, 2013; Kowalski, Giumetti, Schroeder, & Lattanner, 2014; Selkie, Fales, & Moreno, 2016).

Cyberbullying has features that differentiate it from traditional bullying. One of these is the bully’s ability to remain anonymous, and another is that even a single incident may recur because the bullying can be repeated online several times (e.g., by forwarding e-mails, Waasdorp & Bradshaw, 2015). Furthermore, since cyberbullying takes place in a digital environment, it has the potential to rapidly reach a much larger audience online (Wang, Nansel, & Iannotti, 2011). Traditional bullying tends to manifest itself in a certain environment and time (for instance, in a school setting), while cyberbullying can take place anywhere at any time (Sampasa-Kanyinga, Roumeliotis, & Xu, 2014).

Being both a victim and a bully of cyberbullying is less prevalent than in traditional bullying, but there is evidence of a strong interaction between these two types with findings showing that teens who have been involved in traditional bullying are more likely to be involved in the cyber form of bullying as well (Modecki, Minchin, Harbaugh, Guerra, & Reunions, 2014). One reason for this is that cyberbullying has been shown to be a means by which victims...
of traditional bullying can retaliate against those who bully them (Sampasa-Kanyinga et al., 2014). While traditional bullying may involve both physical and verbal aspects; cyberbullying does not involve any physical contact and thus it can only cause nonphysical harm to its victims (Barlett & Coyne, 2014).

One also needs to consider the link between bullying and suicide, which is another public health concern that continues to be a leading cause of death among young people worldwide (Wasserman, Cheng, & Jiang, 2005) and adolescence is the period with the highest risk of developing ideas and subsequent behaviors involving suicide. While the rate of suicide is particularly conspicuous among Lithuanian youth (2.14/100,000, among 15-19-year-olds, in 2013), among Israeli and Luxembourg youth suicide it is less prevalent (1.8/100,000 and 3.1/100,000, respectively; World Health Organization [WHO] Regional Office for Europe, 2014; Cash & Bridge, 2009; Harely-Fisch, Abdeen, Walsh, Radwan, & Fogel-Grinvald, 2012; Mark et al., 2013; WHO, 2012; Zemaitiene & Zaborskis, 2005). Much research has been conducted to ascertain the relationship between bullying and suicidal ideation and behavior during adolescence (Barzilay et al., 2017; Daine et al., 2013; Hinduja & Patchin, 2010; Holt et al., 2015).

While traditional bullying has been studied at length in recent years, less is known about cyberbullying, but several studies (Schneider, O’Donnell, Stueve, & Coulter, 2012) have shown that cyberbullying victims are at a higher risk of depression and suicidal ideation than victims of traditional bullying. By increasing the risk of depression and suicidality, cyberbullying has a significant impact on the mental health of adolescents (Nixon, 2014). Comparisons made between individuals who are not exposed to any type of bullying with those who are show that victims of bullying, and even the bullies themselves, are at a higher risk of suicidal ideation and attempts (Hinduja & Patchin, 2010; Shireen, Janapana, Rehmattullah, Temuri, & Azim, 2014).

After considering the extant research on bullying and suicidality, it can be concluded that bullying, cyberbullying, and suicidality are serious worldwide problems with a variety of negative effects on the adolescent and youth population. Consequently, more attention must be given to the aforementioned phenomena in further research, in order to achieve a deeper understanding of these problems, and cross-national studies seem to be the most promising approach for this (Mark et al., 2013).

The current study aims to analyze the prevalence of bullying and cyberbullying and their association with suicidal behavior among 15-year-old adolescents in Israel, Lithuania, and Luxembourg. The data were obtained from the Health Behavior in School-Aged Children (HBSC) survey, carried out in 2013/2014 (Inchley et al., 2016). Israel, Lithuania, and Luxembourg were included in the study because in the recent HBSC survey only these countries were asked questions about suicidality and these countries have a different ranking on the world adolescent suicide scale, and their cultures differ substantially (Wasserman et al., 2005; WHO Regional Office for Europe, 2014). By comparing data from three selected countries, we tested the following hypotheses: (1) bullying increases the risk of adolescent suicidality, (2) the impact of cyberbullying is as severe as the impact of traditional bullying.

Method

Data

The data were obtained from the HBSC study, which is a cross-national survey carried out in 2013/2014 in collaboration with the WHO in 42 European countries. More detailed background information about the study is provided in the International Report (Inchley et al., 2016) and on the website: http://www.hbsc.org. Data on suicide-related behavior were available only from Israel, Lithuania, and Luxembourg. Although the population selected for sampling comprised 11-, 13-, and 15-year-old adolescents, questions about suicidal ideation and behavior were only presented to the 15-year-olds owing to ethical concerns, limiting the current study to the oldest age group only.

Participants were selected by sampling whole school classes at random using school registers. The data collection methods used ensured that the student samples were country representative. The verified data that were obtained from the HBSC Data Management Centre (Bergen University, Norway) originally included 4,641 individual records of 15-year-olds and the specific analyses presented here are based on a total of 3,814 individual records (82.2% of the sample), with no missing values for any of the variables analyzed. Table 1 indicates the samples by country.

The surveys were administered in school classrooms, ensuring students’ confidentiality, and the data were collected by means of standardized self-report questionnaires. Response rates at the school, class, and student level exceeded 80% in the majority of countries (HBSC, 2013).

Ethics

The study conforms to the principles outlined in the Declaration of Helsinki, and ethical approval was obtained for each national survey according to the national regulations at the time of data collection. Researchers strictly followed...
the standardized international research protocol to ensure consistency in survey instruments, data collection, and processing procedures (HBSC, 2013).

Variables

The outcome variables were related to suicidal ideation and behavior and the explanatory variables were bullying-related behaviors. Analyses were controlled for gender, family affluence (FAS), family structure, and parent-child communication. A detailed description of the variables is given in the HBSC Protocol for the 2013/2014 survey (HBSC, 2013).

Bullying

The subject was introduced as follows:

Here are some questions about bullying. We say a student is being bullied when another student, or a group of students, say or do nasty and unpleasant things to him or her. It is also bullying when a student is teased repeatedly in a way he or she does not like or when he or she is deliberately left out of things. But it is not bullying when two students of about the same strength or power argue or fight. It is also not bullying when a student is teased in a friendly and playful way.

The students were then asked:

1. How often have you taken part in bullying another student(s) at school in the past couple of months?
2. How often have you been bullied at school in the past couple of months?
3. How often have you been bullied in the past couple of months in the following ways: (a) Someone sent mean instant messages, wall postings, e-mails and text messages, or created a website that made fun of me; (b) Someone took unflattering or inappropriate pictures of me without permission and posted them online?

Response options to all these questions were: 0 = not at all in the past couple of months, 1 = only once or twice, 2 = two or three times a month, 3 = about once a week, 4 = several times a week. Answers to Question 1 indicate “bullying others at school”; answers to Question 2 indicate “bullying victimization at school”. Both answers (a) and (b) to Question 3 indicate “cyberbullying victimization,” but for the final assessment, only one answer that showed a maximal rate of victimization was used. This solution consisted of the variable been cyberbullied. In analyses that needed binary variables, bullying-related variables were dichotomized: 0 = no or infrequent bullying (0–1 response codes), and 1 = frequent bullying/victimization at least two or three times a month (2–4 response codes). Although bullying victims may also be bullies (Solberg, Olweus, & Endresen, 2007), this rather rare combination was not considered in the analyses.

Suicidal Ideation and Behavior

Suicide-related mental health included five items from the optional package “Suicide and Self-Harm” (HBSC, 2013), which originates from the Youth Risk Behavior Survey conducted in the United States (Kann et al., 2016). The topic of suicide was introduced using a short preamble that defines suicide and infers that this is a recognized health problem. Next, the students were asked to think about the previous 12 months and then questions were asked in a logical sequence that outlined a causal chain: (1) presence or absence of emotions that stopped one from doing activities; (2) serious consideration of attempting suicide; (3) making a suicide plan; (4) actual acts of attempted suicide; and (5) need of treatment by doctor or nurse.

Each question, aside from Question 4, was structured with dichotomous (0 = no/1 = yes) response options. The response to Question 4 indicated the number of suicide attempts during the previous 12 months, but in all analyses it was also recoded as 0 = never and 1 = at least once. In the present study, the first variable was considered depression, the second variable was considered suicidal ideation, the next two (plans and attempts) were considered suicidal behavior, and the fifth variable was considered an indicator of the severity of the suicide attempt.

Family Affluence

Family affluence was measured by the Family Affluence Scale (FAS), which was especially developed to suit the international nature of the HBSC study (Currie et al., 2008). The scale is simple and easy to answer even for young adolescents. The FAS includes six questions:

1. Does your family own a car, van or truck? 0 = no, 1 = yes.
2. Do you have your own bedroom? 0 = no, 1 = yes.
3. In the past 12 months, how many times did you go on a holiday (vacation) with your family? 0 = not at all, 1 = once, 2 = twice, 3 = more than twice.
4. How many computers does your family own? 0 = none, 1 = one, 2 = two, 3 = more than two.
5. How many bathrooms (room with a bath/shower or both) does your home have? 0 = none, 1 = one, 2 = two, 3 = three or more.
6. Does your family have a dishwasher at home? 0 = no, 1 = yes.

The FAS score was calculated by summing up the scores for these six questions, and the respondents from each country were then classified into three relative groups of family affluence. The first group included young people in
the lowest 20% (low affluence), the second included those in the medium 60% (medium affluence), and the third group included those in the highest 20% (high affluence) of the RIDIT-based FAS score in the respective country (Inchley et al., 2016).

**Family Structure**

To identify family structure, respondents were given a checklist of adults (father, stepfather, mother, stepmother, etc.) to designate the people living in their household. Respondents who ticked both father and mother were included in the group of adolescents living in intact families (living with both biological parents), while all remaining respondents were considered adolescents living in nonintact families, which included single-parent families, stepfamilies, or reconstituted families, and looked-after children, that is, in a foster or children’s home.

**Child–Parent Communication**

Respondents were asked separate questions about how easy it is for them to talk to their father, stepfather, mother, or stepmother about things that really bother them. Five response options were provided: 1 = very easy, 2 = easy, 3 = difficult, 4 = very difficult, and 0 = don’t have/see this person. The most positive response to the questions about ease of communication with fathers and stepfathers was talk to father. If a respondent did not respond or responded with 0 to both items, the resulting talk to father variable was coded as missing. A similar process was used to compute the variable of talk to mother. The resulting child–parent communication variables were dichotomized and recoded as 0 = very easy/easy and 1 = difficult/very difficult.

**Data Analysis**

The data of 3,814 individuals who had no missing values for any of the bullying and suicide-related variables studied were analyzed (82.2% of the original sample) and stratified according to country. In addition, analyses were conducted on the data of all three countries and the data were analyzed in two stages.

The first stage of analysis was performed using SPSS (version 21.0; SPSS Inc., Chicago, IL, 2012). To summarize the characteristics of our research sample we produced descriptive statistics (frequencies, percentages, means, and standard errors) that included all the demographic, independent, and dependent variables of interest. To evaluate potential differences between the groups of respondents in all categorical variables, we applied a z test (for binary variables) or a chi-square test (for the remaining variables).

To test the association between bullying and suicide-related behavior, we conducted a series of univariate and multivariate binary logistic regression analyses, with suicide ideation, plans, and attempts as dependent (outcome) variables, and cyberbullying, having been bullied, and bullying others as binary predictors (independent variables). Associations were estimated using odds ratios (OR) with 95% confidence intervals (95% CI), which indicated the likelihood of the suicidality outcome studied for persons with certain characteristics (e.g., been cyberbullied) relative to the reference group (e.g., not been cyberbullied).

In the multivariate logistic regressions, associations were adjusted (controlled) for the effect of possible confounders (gender, family affluence and structure, child–parent communication). We used the enter method with all independent variables, irrespective of their significance as found in the univariate analysis. Interactions between predictors were tested but were found to be insignificant, while \( p < .05 \) was considered statistically significant.

In the second stage of analysis, structural equation modeling (SEM) methods were employed for a deeper exploration of the association between bullying and suicide-related variables. This analysis was conducted using AMOS (IBM SPSS, AMOS 21, Chicago, IL; Arbuckle, 2012). Here, two explicit models were tested against the plausibility of the data. The first model was the structural model, in which suicide ideation, plans, and attempts were hypothesized to reflect one’s latent suicidality factor, which allowed the model to estimate and compare the direct effect of the three bullying components on adolescent suicidality. The second model tested was the bullying measurement model, in which the three bullying measures were hypothesized to reflect one’s latent bullying construct (factor) that affects the suicide latent factor. The model examined whether, in the overall bullying process, cyberbullying victimization has as much impact as being a victim or being an aggressor in school bullying.

The results of the SEM analysis were depicted by path diagrams, where circles/ovals represent latent constructs (factors), rectangles are indicator measures, and small circles are residuals; single-headed arrows indicate regression weights (factor loadings) and double-headed arrows (arcs) are covariances/correlations between elements of the model. These graphs are presented with the standardized estimations, the significance levels of which are determined by critical ratios, on nonstandardized estimations.

Several measures are provided by AMOS to evaluate the fit between a structural equation model and the data (Kline, 2005; Arbuckle, 2012). In the present study the following indices were used: comparative fit index (CFI), Tucker–Lewis index (TLI), and root mean square error of approximation (RMSEA), which was considered the main criterion. CFI and TLI values of close to 1 (≥ .90), and RMSEA values of close to 0 (≤ .08) indicate a good fit. The likelihood ratio chi-square measure of fit should be insig-
significant for a well-fitting model, indicating no significant discrepancy between the observed and predicted associations. With large samples, however, very small discrepancies can result in insignificant chi-square values even when all the other indices indicate an excellent fit.

In order to uncover the extent to which groups of adolescents from the three countries differ, we ran a multi-group analysis (Arbuckle, 2012). The main purpose of this analysis was to test whether the groups have the same path diagram but with different parameter values for different groups. Estimates for each group were obtained from an unconstrained model, while estimates for all three countries were obtained from a fully constrained model, which required parameters to be equal between all groups. Because all of the six indicator measures were ordinal, the asymptotically distribution free weighted least squares estimation procedure was employed.

## Results

### Sample Characteristics

Characteristics of the studied samples are presented in Table 1. Owing to the large sample size in each country, small differences in the values of characteristics between countries seemed to be significant; however, there were several noticeable peculiarities in the samples. The sample of adolescents from Israel was distinguished from other countries by the highest rate of reported intact families (living with both parents) and the easy talking to both father and mother; in the sample of Lithuanian adolescents, the proportion of boys was higher than the proportion of girls while the sample of adolescents from Luxembourg was the smallest in size and distinguished by a relatively low proportion of adolescents who reported easy communication with their father. Overall, the mean age of respondents reached the required standard (85% of respondents were aged 15–16 years), the proportions of boys and girls were almost equal, and the distribution of respondents by family affluence was

| Characteristics          | Israel (n = 1,219) | Lithuania (n = 1,628) | Luxembourg (n = 967) | Total (n = 3,814) | p^a       |
|--------------------------|-------------------|-----------------------|----------------------|------------------|-----------|
| Age                      |                   |                       |                      |                  |           |
| Mean age (SD)            | 15.88 (0.23)      | 15.64 (0.32)          | 15.44 (0.36)         | 15.67 (0.35)     | < .001    |
| Gender                   |                   |                       |                      |                  |           |
| Boys                     | 532 (43.6)        | 852 (52.3)            | 438 (45.3)           | 1,822 (47.8)     | < .001    |
| Girls                    | 687 (56.4)        | 776 (47.7)            | 529 (54.7)           | 1,992 (52.2)     |           |
| Relative family affluence|                   |                       |                      |                  |           |
| Lowest 20%               | 182 (15.2)        | 352 (21.8)            | 162 (17.5)           | 696 (18.6)       | < .001    |
| Medium 60%               | 742 (62.1)        | 917 (57.0)            | 511 (55.2)           | 2,170 (58.1)     |           |
| Highest 20%              | 271 (22.7)        | 342 (21.2)            | 253 (27.3)           | 866 (23.2)       |           |
| Missing                  | 24                | 17                    | 41                   | 82               |           |
| Living with both parents |                   |                       |                      |                  |           |
| Yes                      | 1,021 (84.2)      | 1,086 (67.3)          | 632 (66.4)           | 2,739 (72.5)     | < .001    |
| No                       | 191 (15.8)        | 528 (32.7)            | 320 (33.6)           | 1,039 (27.5)     |           |
| Missing                  | 7                 | 17                    | 15                   | 39               |           |
| Talk to father           |                   |                       |                      |                  |           |
| Easy                     | 814 (69.9)        | 832 (62.6)            | 433 (52.7)           | 2,079 (62.7)     | < .001    |
| Difficult                | 350 (30.1)        | 497 (37.4)            | 388 (47.3)           | 1,235 (37.3)     |           |
| Missing                  | 44                | 208                   | 100                  | 352              |           |
| Talk to mother           |                   |                       |                      |                  |           |
| Easy                     | 982 (85.0)        | 1,100 (73.1)          | 647 (72.7)           | 2,729 (76.9)     | < .001    |
| Difficult                | 173 (15.0)        | 405 (26.9)            | 243 (27.3)           | 821 (23.1)       |           |
| Missing                  | 49                | 104                   | 58                   | 211              |           |

*Note. aSignificance of difference between countries, F or chi-square test. bBelow data are shown as n (%).
close to the expected ratio (20%:60%:20%). More than a quarter of adolescents did not report living with both father and mother and easy communication was more common with the mother than with the father, while non-response regarding communication with the father was high (352 cases or 9.2% of the total sample), likely due to a high proportion of adolescents living without a father.

### Bullying

Table 2 presents the prevalence of cyberbullying and bullying at school. A total of 6.5% of adolescents reported being victims of cyberbullying, with boys being twice as likely as girls (8.5% vs. 4.6%, \( p < .001 \)) to experience cyberbullying victimization. Comparison of the cyberbullying prevalence between countries showed significant differences among boys (the highest being 9.9% in Lithuania and the lowest 4.6% in Luxembourg), while this was not specific among girls.

In Lithuania and Luxembourg, bullying at school was still more prevalent than cyberbullying, but not so in Israel, especially among Israeli girls, who rarely reported bullying victimization and bullying others. Overall, the prevalence of school bullying victimization and bullying others was 15.6% and 16.7%, respectively. Across countries, boys were more likely to be involved in school bullying than girls were, except in Luxembourg, where the proportion of students who reported having been bullied at school was found to be slightly higher among girls than boys (12.5% vs. 9.1%, \( p > .05 \)).

### Suicidal Ideation and Behavior

Table 3 reports the prevalence of suicide-related mental health patterns, including suicidal ideation and suicide-related behavior. In the total sample of surveyed adolescents in the three countries, 38.6% of adolescents (excluding Israeli respondents) reported experiencing emotions that stopped them from being involved in activities during the previous 12 months, 17.8% of adolescents had seriously considered attempting suicide, 12.0% of adolescents had made a suicide plan, and 9.5% of adolescents admitted attempting suicide. Of all countries, Lithuania was distinguished by higher values for these prevalence rates with some of the suicide attempts being serious and requiring treatment (40.1% among Israeli and Lithuanian adolescents who attempted suicide). In Lithuania and Luxembourg, all suicidal outcomes were more prevalent among girls while suicide attempts treated by a doctor or nurse were more prevalent among boys. In Israeli adolescents, there was no significant difference in the prevalence of all suicidal outcomes between boys and girls and further analyses were based only on suicidal ideation, suicide plans, and attempts, as these outcomes were measured in all three countries.

### Association Between Bullying and Suicide-Related Variables

Table 4 presents the results of the univariate and multivariate binary logistic regression analysis for risk of suicidal ideation, suicide plans, and attempts. The subsequent

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**Table 2. Prevalence of bullying, by gender and country**

| Bullying-related behavior | Israel \( n = 1,219 \) | Lithuania \( n = 1,628 \) | Luxembourg \( n = 967 \) | Total \( n = 3,814 \) | \( p^a \) |
|--------------------------|------------------------|---------------------------|-------------------------|---------------------|------|
| Been cyberbullied        |                        |                           |                         |                     |      |
| Boys                     | 51 (9.6)               | 84 (9.9)                  | 20 (4.6)                | 155 (8.5)           | .003 |
| Girls                    | 26 (3.8)***            | 43 (5.6)***               | 23 (4.4)                | 92 (4.6) ***        | .259 |
| Total                    | 77 (6.3)               | 127 (7.8)                 | 43 (4.5)                | 247 (6.5)           | .003 |
| Been bullied at school   |                        |                           |                         |                     |      |
| Boys                     | 54 (10.2)              | 246 (28.9)                | 40 (9.1)                | 340 (18.7)          | <.001|
| Girls                    | 19 (2.8)***            | 170 (21.9)***             | 66 (12.5)               | 255 (12.8) ***      | <.001|
| Total                    | 73 (6.0)               | 416 (25.6)                | 106 (11.0)              | 595 (15.6)          | <.001|
| Bullying others at school|                        |                           |                         |                     |      |
| Boys                     | 75 (14.1)              | 288 (33.8)                | 73 (16.7)               | 436 (23.9)          | <.001|
| Girls                    | 19 (2.8)***            | 138 (17.8)***             | 45 (8.5)***             | 202 (10.1) ***      | <.001|
| Total                    | 94 (7.7)               | 426 (26.2)                | 118 (12.2)              | 638 (16.7)          | <.001|

*Note. Data are shown as \( n \) (%). *Significance of difference between countries, chi-square test. ***\( p < .001 \), significance of difference between boys and girls, \( z \) test.
analyses consist of only these three suicide-related variables, because the variable of stopped being involved in activities during the past 12 months was not measured in Israel and the variable of suicide attempts treated by a doctor/nurse was not measured in Luxembourg.

The results of the univariate analysis show that the crude association between cyberbullying and school bullying victimization and suicidal ideation, plans, and attempts was strong and highly significant in all three countries. Victims of cyberbullying had a significantly higher risk of suicidal ideation (in total: crude OR = 3.66, 95% CI = 2.80–4.79), plans (OR = 4.41, 95% CI = 3.32–5.86), and attempts (OR = 6.31, 95% CI = 4.72–8.43) than those who had not encountered such threats. By country, almost all of the aforementioned estimations were greater than the corresponding figures for the association between school bullying victimization and suicidal ideation (OR = 3.44, 95% CI = 2.84–4.18), plans (OR = 3.34, 95% CI = 2.68–4.15), and attempts (OR = 3.87, 95% CI = 3.06–4.89). These associations differed across countries. In Israel, being bullied at school had a greater impact on suicidal ideation and plans than being cyberbullied, and traditional bullying and cyberbullying had almost the same magnitude of effect on suicide attempts, while in Lithuania and Luxembourg the association between cyberbullying and all kinds of suicidality was greater than for being bullied at school. The crude association between bullying others at school and suicidality was found to be significant only among adolescents from Israel. Similar results were obtained from the multivariate analysis when controlling for gender, family affluence and structure, and child–parent communication.

Since bullying was more common among boys and suicidality was more common among girls, we analyzed the correlation between bullying and suicidality by gender. In the entire sample of all three countries, cyberbullied boys were about twice as likely to have attempted suicide than cyberbullied girls were (5.54%, 3.38–9.07 vs. 2.96%, 1.63–5.36, respectively) with the correlation being statistically significant in the Lithuanian sample, but not in the Israeli and Luxembourghish sample. There were no gender differences in the association between bullying at school and suicidality.

| Table 3. Prevalence of suicidal ideation, suicide-related behavior, and other patterns, by gender and country |
|---------------------------------------------------------------|
| **Suicide-related behavior** | **Israel** | **Lithuania** | **Luxembourg** | **Total** | **p*** |
| Stopped doing activities | | | | | |
| Boys | n/a | 267 (31.3) | 86 (19.6) | 353 (27.4) | < .001 |
| Girls | n/a | 437 (56.5)*** | 209 (39.7)*** | 646 (49.7)*** | < .001 |
| Total | n/a | 704 (43.3) | 295 (30.6) | 999 (38.6) | < .001 |
| Suicidal ideation | | | | | |
| Boys | 62 (11.7) | 130 (15.3) | 38 (8.7) | 230 (12.6) | .002 |
| Girls | 74 (10.8) | 247 (31.8)*** | 126 (23.8)*** | 447 (22.4)*** | < .001 |
| Total | 136 (11.2) | 377 (23.2) | 164 (17.0) | 677 (17.8) | < .001 |
| Suicide plans | | | | | |
| Boys | 39 (7.3) | 94 (11.0) | 43 (9.8) | 176 (9.7) | .076 |
| Girls | 41 (6.0) | 141 (18.2)*** | 101 (19.1)*** | 283 (14.2)*** | < .001 |
| Total | 80 (6.6) | 235 (14.4) | 144 (14.9) | 459 (12.0) | < .001 |
| Suicide attempts | | | | | |
| Boys | 40 (7.5) | 82 (9.6) | 20 (4.6) | 142 (7.8) | .006 |
| Girls | 43 (6.3) | 114 (14.7)*** | 63 (11.9)*** | 220 (11.0)*** | < .001 |
| Total | 83 (6.8) | 196 (12.0) | 83 (8.6) | 362 (9.5) | < .001 |
| Suicide attempts treated by a doctor or nursea | | | | | |
| Boys | 19 (47.5) | 46 (56.1) | n/a | 65 (53.3) | .331 |
| Girls | 20 (46.5) | 27 (23.7)*** | n/a | 47 (29.9)*** | .003 |
| Total | 39 (47.0) | 73 (37.2) | n/a | 112 (40.1) | .080 |

Note. Data are shown as n (%). n/a = Data not available. *p < .05. **p < .01. ***p < .001, significance of difference between countries, chi-square test. **Among those who reported suicide attempts.

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Table 4. Results of univariate and multivariate binary logistic regression analyses for suicidal ideation, suicide plans, and attempts risk: OR (95% CI) estimation, by country

| Independent variablesa | Univariate analysis | Multivariate analysisb |
|------------------------|---------------------|------------------------|
|                        | Israel | Lithuania | Luxembourg | Total | Israel | Lithuania | Luxembourg | Total |
| Suicidal ideation      |        |           |            |       |        |           |            |       |
| Been cyberbullied (not been) | 6.24*** | 2.50*** | 4.73*** | 3.66*** | 3.22*** | 2.33*** | 3.19*** | 2.74*** |
|                        | (3.79–10.3) | (1.72–3.64) | (2.53–8.84) | (2.80–4.79) | (1.62–6.42) | (1.45–3.73) | (1.43–7.11) | (1.95–3.85) |
| Been bullied at school (not been) | 7.32*** | 2.33*** | 3.43*** | 3.44*** | 4.22*** | 2.50*** | 2.50*** | 3.05*** |
|                        | (4.41–12.1) | (2.21–5.31) | (2.21–5.31) | (2.84–4.18) | (2.11–8.43) | (1.83–3.42) | (1.47–4.22) | (2.39–3.90) |
| Bullied others at school (did not)? | 3.76*** | 0.97 | 1.37 | 1.53*** | 1.40 | 0.93 | 1.59 | 1.22 |
|                        | (2.31–6.12) | (0.75–1.26) | (0.85–2.13) | (1.24–1.88) | (0.66–2.94) | (0.67–1.29) | (0.88–2.89) | (0.94–1.59) |
| Suicide plans          |        |           |            |       |        |           |            |       |
| Been cyberbullied (not been) | 6.88*** | 3.35*** | 6.31*** | 4.41*** | 2.43* | 2.75*** | 4.96*** | 3.03*** |
|                        | (3.91–12.1) | (2.25–4.99) | (3.37–11.8) | (3.32–5.86) | (1.04–5.69) | (1.67–4.53) | (2.26–10.9) | (2.11–4.34) |
| Been bullied at school (not been) | 11.2*** | 2.53*** | 2.31*** | 3.34*** | 6.54*** | 2.05*** | 1.32 | 2.32*** |
|                        | (6.45–19.4) | (1.89–3.37) | (1.44–3.70) | (2.68–4.15) | (3.00–14.3) | (1.43–2.95) | (0.74–2.35) | (1.76–3.06) |
| Bullied others at school (did not)? | 5.20*** | 1.18 | 1.46 | 1.76*** | 1.51 | 1.02 | 1.67 | 1.31 |
|                        | (2.99–9.02) | (0.87–1.60) | (0.89–2.39) | (1.38–2.19) | (0.63–3.64) | (0.70–1.50) | (0.92–3.02) | (0.97–1.77) |
| Suicide attempts       |        |           |            |       |        |           |            |       |
| Been cyberbullied (not been) | 10.95*** | 4.14*** | 7.84*** | 6.31*** | 3.61*** | 3.32*** | 7.72*** | 4.30*** |
|                        | (6.46–18.6) | (2.76–6.22) | (4.09–15.0) | (4.72–8.43) | (1.64–7.97) | (1.98–5.56) | (3.22–18.5) | (2.96–6.23) |
| Been bullied at school (not been) | 10.86*** | 2.76*** | 3.18*** | 3.87*** | 4.70*** | 2.35*** | 1.16 | 2.52*** |
|                        | (6.36–18.5) | (2.03–3.75) | (1.87–5.41) | (3.06–4.89) | (2.12–10.5) | (1.58–3.50) | (0.55–2.46) | (1.85–3.44) |
| Bullied others at school (did not)? | 8.51*** | 1.31 | 1.46 | 2.07*** | 2.92* | 1.06 | 0.97 | 1.40* |
|                        | (5.13–14.1) | (0.95–1.81) | (0.80–2.67) | (1.61–2.65) | (1.28–6.63) | (0.70–1.62) | (0.40–2.38) | (1.01–2.00) |

Note. aReference group is indicated in parentheses. bVariables entered: Been cyberbullied; been bullied at school; bullied others at school; gender; family affluence; family structure; talk to father; talk to mother.*p < .05. **p < .01. ***p < .001, significance of OR value.

Structural Model Testing the Direct Effect of Each Bullying Component on Adolescent Suicidality

Figure 1 presents the results of the SEM analysis conducted to test the direct effect of each of the three bullying components on adolescent suicidality. In this model, suicidality was defined as a latent construct (factor), which loaded on three measured indicators: suicide ideation, plans, and attempts. Each of these binary measures loaded significantly (critical ratio test) on the latent suicidality factor in data sets of all three participating countries; however, there were differences in the regression weights among the countries.

The model also presents the correlations between measured components of bullying (here and in other SEM analyses, bullying was measured on a five-category ordinal scale). A noticeable correlation between cyberbullying and having been bullied at school was observed in the data of each country as well as in the combined data. The results suggest that only bullying victimization by cyber technologies and at school, but not bullying others at school, had a significant effect on adolescent suicidality. The regression weights of this association differed across countries. In Israel and Lithuania, being bullied at school had a stronger association with suicidality than did cyberbullying, while in Luxembourg this association was stronger for cyberbullying than for being bullied at school. Thus, in the combined data samples from all three countries, these components of bullying can account for an almost equal direct effect on adolescent suicidality.

The fit of this structural model with the data was excellent in the samples of adolescents taken from each country (in the unconstrained model, $X^2 = 41.5, df = 18, p = .001, TLI = 0.928, CFI = 0.971, RMSEA = 0.019, 90% CI = 0.011–0.026$). In the multiple-group SEM analysis, however, the model did not fit the data of combined samples from the three countries as it did for each country separately. According to the difference chi-square test ($\chi^2 = 510.0, df = 30, p < .001$), the variables of interest are equivalent across countries (configural invariance), but the parame-
ters in the model cannot be set equally as they significantly vary across countries.

Structural Model Testing the Overall Effect of Bullying on Adolescent Suicidality

Figure 2 presents the results of the SEM analysis conducted with the purpose of examining whether cyberbullying victimization and traditional bullying at school (both victimization and aggression) are equally important for the overall understanding of bullying. It was hypothesized that there is a latent factor of bullying, which links three bullying measures (cyberbullying, being a victim, and being an aggressor at school). The analysis was then extended to assess the overall effect of bullying on adolescent suicidality.

The bullying measurement model shows that each of the bullying measures loaded significantly on the latent bullying factor in all the data sets. In Israel, regression weights of the measured variables (cyberbullying, having been bullied, and bullying others at school) loading on the bullying factor were nearly of the same magnitude. In Lithuania, having been bullied at school was the most important component of bullying, while cyberbullying was relatively less important. In Luxembourg, the component of cyberbullying victimization exceeded the importance of traditional bullying at school. For the data from all three countries, the regression weight of cyberbullying was midway between the regression weights of bullying others and being bullied.

The results also confirmed a significant overall effect of bullying on adolescent suicidality, with the highest magnitude of this effect being seen among Israeli students.

The results of this analysis suggest that the latent factor of bullying is reliably assessed by bullying measures. Overall, the measurement model provided an excellent degree of fit to the data of each country separately (in the uncon-
strained model, $\chi^2 = 69.8$, $df = 24$, $p < .001$, TLI = 0.896, CFI = 0.944, RMSEA = 0.022, 90% CI = 0.016 - 0.029). However, there was also considerable variability among countries in the extent to which each bullying measure was determined by the latent bullying factor. In order to test the hypothesis concerning the invariance of the model’s parameters in each country, the multiple-group measurement invariance analysis was employed. According to the difference chi-square test ($\chi^2 = 497.4$, $df = 26$, $p < .001$), it was concluded that parameters in the model significantly vary across countries.

**Discussion**

The aim of the study was to analyze the prevalence of bullying and cyberbullying and their association with suicidal behavior among adolescents in three countries – Israel, Lithuania, and Luxembourg. The comparison of data from three countries provides a substantial advantage over other studies in this field of research. The selected countries are modern countries, but culturally they differ substantially. Luxembourg’s population is multilingual and very diverse in itself (46% of the population are foreigners), as compared with Lithuania and Israel with a rather homogeneous population. Regarding religion, Luxembourg and Lithuania are mainly Catholic, while Israel is the only country in the world where a majority of citizens are Jewish and religion plays a major role in shaping Israeli culture. Lithuania represents East European countries undergoing the transition to a market economy that has resulted in enormous pressure on social wealth and lifestyle, whereas Israel and Luxembourg rank among the most affluent countries in the world. Therefore, we expected differences for the countries in our models.
This study was conducted using data from the HBSC cross-national survey from 2013/2014. The focus of the study was the population of 15-year-old adolescents, with a total sample of 3,814 participants. In comparing the prevalence of traditional bullying with cyberbullying, the current results were compatible with those of previous studies (Modecki et al., 2014; Waasdorp & Bradshaw, 2015), which indicate that traditional bullying is still a more prevalent phenomenon than cyberbullying among adolescents. Our findings show a high prevalence of traditional bullying victimization, with 15.6% of all reports indicating that participants had been victims of school bullying at some point in their life. Indeed, looking at each country separately we can see that these results are only valid for Lithuania and Luxembourg and not for Israel, where only a small number of participants, especially girls, reported being bullied at school. Nonetheless, the results of the present study show that cyberbullying, although less prevalent than traditional bullying, is still a relevant and important problem that exists among adolescents today, with 6.5% of the total studied sample reporting being victims of cyberbullying at some point in their life. Compared with the data from other studies, this percentage is not high. For example, Patchin and Hinduja (2012) reviewed the data of 35 studies and concluded that cyberbullying victimization rates ranged from 5.5% to 72%.

Taking the gender variable into account with regard to traditional bullying, a difference can be seen between boys and girls in all three countries studied. The current findings are in agreement with those of other studies (Waasdorp & Bradshaw, 2015) and show that boys are more likely to be involved in traditional (school) bullying than girls are, either as victims or as aggressors. An exception to this finding was in Luxembourg, where a higher likelihood that girls would be victims of traditional bullying than boys was found (12.5% vs. 9.1%, respectively).

A number of studies have attempted to determine the differences in cyberbullying experiences by gender. Most studies found that girls are just as likely, if not more likely, to be involved in cyberbullying (Navarro, Yubero, & Larranaga, 2016; Pettalia, Levin, & Dickinson, 2013; Sampasa-Kanyinga et al., 2014), or that there is no significant difference in cyberbullying victimization between boys and girls (Barlett & Coyne, 2014; Kowalski et al., 2014). Our findings show that boys were twice as likely as girls (8.5% vs. 4.6%, respectively) to be victims of cyberbullying. These findings are contrary to the aforementioned studies but they are supported by the study of Wong, Chan, and Cheng (2014), in a sample of adolescents taken from Hong Kong, who found that more males than females have engaged in some form of cyberbullying behavior.

Analyzing the prevalence of suicidal ideation and behavior in the current study yielded similar results to those of previous studies (Ford et al., 2017; Wasserman, 2016) and showed that suicidal behavior is a growing and serious problem among young people at present (Harel-Fisch et al., 2012; Zaborskis, Sirvyte, & Zemaitiene, 2016). By comparing the three countries studied, we can see that Lithuania has the highest prevalence of all the suicide-related variables listed earlier (i.e., stopped being involved in activities, considered suicide, made a suicide plan, attempted suicide, or needed medical help following a suicide attempt). Regarding suicidality in Lithuania and Luxembourg, the findings also show the presence of a gender paradox (McMahon et al., 2014), which shows that while suicidal patterns (considered suicide, made a suicide plan etc.) were more prevalent among girls, the prevalence of suicide attempts with an outcome serious enough to require medical attention was greater among boys.

The major contribution of the present study was to simultaneously test for the role of three different types of bullying in adolescent suicide risk. Two methodologies were used in these analyses: regression modeling and SEM.

In logistic regression analysis, by comparing adolescents who had experienced cyberbullying or traditional bullying with those who had never encountered any victimization by bullying, it is evident that those who were bullied in any way have a significantly higher risk for developing suicidal ideation, plans, and attempts. This association is consistent with previous studies, which conclude that the experience of any kind of bullying is a predictor for the increased risk of suicidality in adolescents (Barzilay et al., 2017; Daine et al., 2013; Hinduja & Patchin, 2010; Mark et al., 2012; Wasserman, 2016) but this association differs across countries.

In recent years SEM, as a developed modeling technique, has been considered to be a suitable method for analyzing relationships among variables (Arbuckle, 2012; Kline, 2005). At the same time, this methodology is capable of testing whether the generated model satisfactorily evaluates overall fit indices. In this paper we attempted to provide a valid and reliable model to measure the impact of bullying on adolescent suicidality. The new integrated model illustrates the overall impacts of both observed (measures of bullying) and unobserved indicators (bullying) that predict adolescent suicidality, which is an unobserved latent variable that has been defined by three observed indicators (suicidal ideation, suicidal plans, and suicide attempts). This model fully fits the data by country but significantly varies across the three selected countries.

Both the regression model and SEM highlight similar associations in the empirical data. In Israel, being bullied at school has a greater impact on suicidal ideation and plans than being cyberbullied, and traditional bullying and cyberbullying have almost the same magnitude of effect on...
suicide attempts; in Lithuania and Luxembourg, however, the association between cyberbullying and all kinds of suicidality is greater than for being bullied at school. Additionally, our results show that being a bully has a significant effect on adolescent suicidal plans and attempts in Israel but does not increase this risk in Lithuania and Luxembourg. This is in contrast to studies claiming that being a bullying aggressor also increases the risk for suicidality among adolescents (Shireen et al., 2014). This means that the effects of different bullying types on adolescent suicidality cannot be considered equal and may significantly vary across these three countries.

Combining all of the data for the samples from the three countries reveals that the risk of adolescent suicidality increases with the rise in both traditional bullying and cyberbullying victimization. The central finding of this analysis demonstrates that the impact of cyberbullying on adolescent suicidality is as severe and significant as the impact of school bullying, making cyberbullying a very strong predictor of adolescent suicidality. However, the combined model is not an arithmetic mean of three country models, having been constructed employing the multiple-group measurement invariance analysis with the purpose of demonstrating that the SEM models vary significantly across combined samples (Arbuckle, 2012).

It should also be emphasized that involvement in traditional bullying or cyberbullying affects adolescent health and results in many emotional and social issues in their lives. As mentioned in other studies (Hinduja & Patchin, 2010; Nixon, 2014), it is unlikely that cyberbullying by itself leads to youth suicide. Rather, it tends to exacerbate psychological ailments (loneliness, low self-esteem, parental disconnectedness, peer rejection, stressful life, substance addiction, etc.) that moderate the relationship between bullying or cyberbullying and the risk of suicide (van Geel, Vedder, & Tanilon, 2014; Wasserman, 2016). Subsequent studies should seek to identify and assess the contributive role of these moderating experiences. In addition, depression should also be included in such models, as it has been previously found to mediate the relationship between bullying experiences and suicidal ideation (Bauman et al., 2013). Future research should also seek to identify the factors that may serve as buffers against self-harm even after experiencing difficult bullying victimization (da Silva et al., 2016; Hinduja & Patchin, 2010). Several articles describe programs that are implemented widely in the educational setting of participating countries that promote mental health and teach children social and emotional antibullying skills (Pfetsch, Steffgen, Gollwitzer, & Ittel, 2011; Povilaitis & Bulotaite, 2014; Steffgen, 2009; Walsh et al., 2016; Yablon, 2017).

Results suggest that the different kind of adolescent bullying, especially cyberbullying, are early warning signs that indicate an increased risk for suicidal ideation and behavior. Detection and prevention of bullying victimization should be incorporated into suicide prevention programs in schools and youth settings and brought to the awareness of parents, teachers, youth workers, and other significant adults. Results also suggest the need to understand the importance of cultural contexts related to adolescent involvement in bullying behavior and its association with adolescent suicidality.

**Strengths and Limitations**

A strength of our study is that the data used here were taken from the HBSC study, which provided a large sample with a high participation rate of school-aged children to study and analyze. The HBSC study is a cross-national survey that involves 42 countries and this enabled us to access the relevant data for our study of 15-year-old children in the three countries in focus: Israel, Lithuania, and Luxembourg. The use and comparison of data from different countries provided a substantial advantage over other studies in this field of research.

Another advantage of using the HBSC survey for our study is that the HBSC questionnaire was developed by international experts, which enabled us to use standardized methods in the current study. For example, we controlled the associations between different variables (i.e., bullying, suicidality) for the effect of possible confounding variables (i.e., gender, FAS) by multivariate binary regression in order to give the study a more accurate and multidimensional analysis of associations between the different variables. The data analysis was generalized with the SEM techniques.

The limitations of this study that should be taken into account include the fact that the HBSC survey is a cross-sectional study based on self-report, which might be affected by recall bias as well as social norms. As a result, causality may be difficult to establish in this study. To overcome this bias, the participants were assured of anonymity and confidentiality, and the questions were pre-tested on national and international levels before conducting the actual survey (HBSC, 2013).

An important consideration was the periods that were asked about in the different instruments. For example, the YRBS questions about suicide risk were asked pertaining to the previous 12 months while the bullying questions were asked about the previous couple of months. As a result, it is hard to know whether the suicide risk existed prior to the bullying rather than as a result of the bullying. In the analysis we did not use any special corrections to eliminate disparities in the periods. Therefore, it is likely that
the suicidality risk that was assessed in the present study was underestimated as the predictor (bullying) exposition period was shorter than the period of the outcome variable (suicidality). Such an assumption does not impair the validity of the conclusions obtained in the present study.

Another limitation of the study is the relative high number of cases excluded from the analysis owing to missing values for any of the variables analyzed (827 cases of 4,641). The most common reason for missing data was nonresponse to the questions about suicide ideation and behavior. We did not evaluate the characteristics of these individuals and did not compare them with the characteristics of the main group of 3,814 subjects included in the present analyses. References (Cheung, ten Klooster, Cees Smit, de Vries, & Pieterse, 2017) indicate that nonrespondents often differ from respondents according to the outcome-predicting characteristics. It would, therefore, be worthwhile to clarify these differences in more detail.

Finally, the study was limited to Israel, Lithuania, and Luxembourg, as questions about suicidality were included in the HBSC 2013/2014 study of these countries only and, because of ethical concerns, only 15-year-old adolescents were asked about suicidality. In addition, further research should be conducted to explore these relationships in other countries and other age groups.

Despite these limitations, we believe that the current findings provide further evidence that adolescent bullying at school and cyberbullying must be seriously taken into consideration and that antibullying interventions are an essential component for suicide prevention among adolescents today.

**Conclusion**

Although the prevalence of cyberbullying among the sample of 15-year-old adolescents in Israel, Lithuania, and Luxembourg is still lower than that of traditional school bullying, this phenomenon, with a total rate of 6.5%, is worthy of consideration. Considering gender differences, in the total sample, boys were twice as likely to be involved in cyberbullying than girls were. Of the three countries, the highest prevalence of adolescents who were cyberbullied was found in Lithuania and the lowest was found in Luxembourg.

Adolescent suicidality is a prevalent and serious problem today with almost 10% of the studied sample admitting to having actually attempted suicide. When comparing the three countries, the Lithuanian data showed the highest prevalence of suicidal ideation and behavior.

The results of the study show a strong and significant association between being a victim of cyber- and/or school bullying and suicidal-related behaviors. Being a victim of any kind of bullying can have a crucial effect on adolescents by increasing the risk of suicide ideation, plans, and attempts. The impact of cyberbullying on adolescent suicidality is as severe and significant as the impact of school bullying, which makes cyberbullying a very strong predictor of adolescent suicidality.

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