Association between cyberbullying and school bullying and suicidality among schoolchildren in Israel, Lithuania and Luxembourg

In the Department of Preventive Medicine

Submitted in partial fulfillment of the requirements for the degree of

Master of Medicine

Scientific supervisor:
Apolinaras Zaborskis, PhD, professor

June 2017
Kaunas
# TABLE OF CONTENTS

Summary ................................................................................................................................. 3

Acknowledgements .................................................................................................................. 4

Conflicts of interest .................................................................................................................. 5

Abbreviations list ....................................................................................................................... 6

Introduction ................................................................................................................................. 7

Aim and objectives of the thesis ................................................................................................. 8

1. Literature review .................................................................................................................... 9

2. Subjects and methods ............................................................................................................ 13

3. Results .................................................................................................................................. 18

4. Discussion ............................................................................................................................. 30

5. Conclusions ......................................................................................................................... 33

References ............................................................................................................................... 34

Annex ........................................................................................................................................... 37
SUMMARY

ASSOCIATION BETWEEN CYBERBULLYING AND SCHOOL BULLYING AND SUICIDALITY AMONG SCHOOLCHILDREN IN ISRAEL, LITHUANIA AND LUXEMBOURG.

Gabriela Ilionsky

Scientific supervisor: Apolinaras Zaborskis, PhD, professor

Department of Preventive Medicine, Faculty of Public Health, Medical Academy, Lithuanian University of Health sciences, Kaunas; 2017, 39 pages.

Aim of the study. To analyse the prevalence of bullying and cyberbullying and their correlation with suicidal behaviour among school aged children, by performing a comparison between children in three countries: Israel, Lithuania and Luxembourg.

Objectives. 1. To analyse and compare the prevalence of traditional bullying and cyberbullying among 15-years old children, according to their gender in the countries Israel, Lithuania and Luxembourg. 2. To analyse and compare the prevalence of suicidal ideation and behaviour among 15-years old children in Lithuania, Israel and Luxembourg. 3. To determine the correlation between traditional bullying, cyberbullying and suicidal behaviour among 15-years old children in Israel, Lithuania and Luxembourg, comparing their effects on the studied samples.

Methods. Study subjects (N= 3,814) were 15-years old adolescents from schools in Israel, Lithuania and Luxembourg who were surveyed in the Health Behaviour in School-aged Children (HBSC) cross-national survey carried out in 2013/2014 with the support of the World Health Organization (WHO). The survey was conducted by means of self-report standardized questionnaires that were administrated in school classrooms ensuring confidentiality and anonymity of the participants.

Results. 6.5% of adolescents reported being cyberbullied, 15.6% reported being bullied at school (also called traditional bullying), and 16.7% bullied others at school. 38.6% of adolescents reported experiencing emotions that stopped them from doing activities during the last 12 months, 17.8% seriously considered attempting suicide, 12.0% made a suicide plan and 9.5% attempted suicide, among them 40.1% needed medical attention for their attempt. Victims of cyberbullying and school bullying were found to have a significantly higher risk of suicidal ideations, plans and attempts.

Conclusions. Being a victim of any kind of bullying increases the risk for adolescent suicidality. The impact of cyberbullying on adolescents suidality is as severe and important as the impact of school bullying, making cyberbullying a very strong predictor for adolescent suicidality.

Key words. Cyberbullying, School (traditional) Bullying, Suicidal ideation, Suicidal behaviour, Health Behaviour in School Aged Children (HBSC), Israel, Lithuania, Luxembourg.
ACKNOWLEDGEMENTS

We would like to express our gratitude to professor Riki Tesler (Ariel University, Israel) who helped with the interpretation of the study results and editing of the manuscript.
CONFLICTS OF INTEREST

The author reports no conflicts of interest.
ABBREVIATIONS LIST

HBSC - Health Behaviour in School-aged Children

WHO - World Health Organization

FAS - Family affluence scale

YRBS - Youth Risk Behaviour Survey

p - statistical significance

OR – odds ratio

CI – confidence interval

SEM - Structural Equation Modeling

CFI - Comparative Fit Index

TLI - Tucker–Lewis Index

RMSEA - Root Mean Square Error of Approximation

df - degree of freedom
INTRODUCTION

Bullying during the adolescence period is a worldwide public health problem that has been on a rising trend for years. Nowadays, due to the ever growing and expanding developments in communicational technologies, i.e. more sophisticated computers and phones, a new form of bullying, called cyberbullying, has risen. Cyberbullying is a relatively new tool for bullies that enable them to carry out their aggression using technology, and its continuous progression and growth is mainly due to the ever growing fast developments in technology [1].

Suicide is another worldwide public health problem that may be closely related to bullying. Nowadays suicide is one of the leading causes of death among young people worldwide, and adolescence is the period of time in which there is the highest risk in developing suicidal behaviours and ideations and even committing suicide [2]. Repeated exposure to bullying, especially during adolescence is a factor that may greatly contribute to the development of suicidal tendencies [3].

Bullying, cyberbullying and suicidality are serious and progressive problems around the world with varying negative effects on the world's adolescence and youth population. Therefore, a significant amount of attention must be given to them in further researches, in order to achieve a deeper and more extended understanding of these problems in all of their aspects.

This current thesis inspires to analyze the prevalence and correlations between this three serious public health problems (bullying, cyberbullying and suicidality) among school-aged children by using data that was obtained from the Health Behaviour in School-aged Children (HBSC) survey which was carried out in 2013/2014. The study focuses on 15-years old adolescents in three selected countries; Israel, Lithuania and Luxembourg. The hypothesis was that bullying, traditional and cyber, increases the risk of suicide ideations and behaviour in school-aged children, with cyberbullying being as much as a strong predictor of adolescent suicidality as traditional bullying.

As the author of the present thesis I formulated the aim and objectives of the study, also I was responsible for literature review and data analysis design, presentation and discussion of the data analysis results. The thesis was drafted individually by the author.
AIM AND OBJECTIVES

The aim of the thesis is to analyse the prevalence of bullying and cyberbullying and their correlation with suicidal behaviour among school aged children, by performing a comparison between children in three countries: Israel, Lithuania and Luxembourg.

Objectives of the study:

1. To analyse and compare the prevalence of traditional bullying and cyberbullying among 15-years old children, according to their gender in the countries Israel, Lithuania and Luxembourg.
2. To analyse and compare the prevalence of suicidal ideation and behaviour among children 15-years old children in Lithuania, Israel and Luxembourg.
3. To determine the correlation between traditional bullying, cyberbullying and suicidal behaviour among 15- years old children in Israel, Lithuania and Luxembourg, comparing their effects on the studied sample.
1. LITERATURE REVIEW

1.1 Traditional bullying and cyberbullying

Bullying is an intentional and repeated form of aggression, with a component of power imbalance between the victim and the bully \[^4\]. Traditional bullying, also called school based bullying, has three main features: first is an aggressive behaviour of one or several people, that is directed toward a victim, purposely wanting to cause them harm. Secondly, this behaviour should occur repeatedly, and the third feature is presence of a power imbalance, physical and/or social, between the bully and the victim \[^5\]. Bullying in its traditional way can be manifested in several forms, it can be direct forms which are physical (i.e. hitting, punching) or verbal (i.e. yelling, cursing), and an indirect form, which is also called relational bullying (i.e. social alienation, rumour spreading), this forms may co-exist with one another or may happen separately \[^6\].

The internet's influences on today's youth is both positive and negative, positively it can give a safe and friendly communication environment, but on the other hand, it can also provide a channel in which negative phenomenon's, i.e. cyberbullying, can take place \[^7\]. Rapid advances in today's technologies have contributed to the creation of cyberbullying, which is a new bullying form, that occurs by using emails, phone texting and internet social media sites \[^8\]. There is a debate regarding the definition of cyberbullying, but generally it can be described as an extension of traditional bullying, with similar characteristics, except that electronic media is used \[^5\]. One way to define cyberbullying is as intentionally harming an individual by using electronic means, it can take place anytime and anywhere, can gives the bully a degree of anonymity online, and is able to reach a large audience. Due to this unique abilities, cyberbullying may potentially be even more harmful than traditional bullying \[^6\].

1.2 Differences between traditional bullying and cyberbullying

Cyberbullying has features that differ it from traditional bullying, one of them is the bully's ability to remain anonymous, another feature is that even a single incident may have a reoccurring nature because it can be repeated online several times (i.e. forwarding of e-mail letters) \[^9\]. Furthermore, cyberbullying is occurring in a digital environment, so it has the potential to quickly reach a much larger number of audience online \[^10\]. Traditional bullying tends to happen in a certain environment and time, i.e. school setting, contrary to that, cyberbullying can happen at any place and time \[^11\].

Being a victim, as well as a bully of cyberbullying is less prevalent than traditional bullying, but there is evidence of a strong interaction between these two kindss, as findings show that youth who were involved in traditional bullying are more likely to also be involved in the cyber form \[^12\]. One reason
for this is that cyberbullying has been shown to be a mean by which a victim of traditional bullying can retaliate against the ones that been bullying him\textsuperscript{[11]}. Traditional bullying may involve physical and verbal aspects, but cyberbullying doesn't involve any physical contact, so it can only cause non-physical harm to its victims\textsuperscript{[13]}

While in traditional bullying the bully's identity is known to its victim and audience, the cyberbully enjoys the possibility to remain anonymous, this anonymity is a crucial factor influencing the severity of the bullying effect on the victim, as cyberbullying victimized children reported that the bully's anonymity is the feature of cyberbullying that scared them the most, and consequently caused them to lose trust in their friends and classmates\textsuperscript{[14]}

1.3 Gender differences in regard to traditional bullying and cyberbullying

Different studies have shown different results in the debate whether there is a difference between genders in relation to bullying and its types, but in general, a majority of studies show that males are much more likely to engage in traditional physical bullying\textsuperscript{[9]}. Regarding the other forms of bullying, in some studies, girls have reported being cyber, relational and verbal bullied more than boys, and to be twice more likely to be a cyberbullying victims\textsuperscript{[11]}. On the contrary, other studies have found that in the context of verbal, relational and cyber- bullying gender differences barely existed, and the small difference that did exist in regards of cyberbullying had an age moderator to it, meaning that females were more likely to report being cyberbullied during early adolescence, while males more likely during late adolescence. The reason to this may be due to females' maturity, both physical and social, that develops earlier than males, while males in later years of adolescence tend to be more equipped in using technologies\textsuperscript{[13]}

1.4 Suicide ideation, behaviour and suicide.

Approximately one million people worldwide die annually due to suicide. Young people progressively become more vulnerable to suicidal behaviour and currently suicide is the second most common cause of death among people between the age of 15 and 19 years\textsuperscript{[16]}. Even more alarming is that for each person that commits suicide, about twenty more are attempting it, and hundreds and thousands more are engaging in self harming behaviour\textsuperscript{[17]}. Suicidal behaviour is a growing phenomenon among young individuals nowadays, suicidality may be seen as a continuous sequence of first the presence of suicidal thoughts, then attempts without injury, continuing to attempts with serious injury and lastly a succeeded suicide\textsuperscript{[18]}

Silverman et al.\textsuperscript{[19]} defined different forms of suicidality expressions, they defined suicidal
behaviour as a self-inflicted behaviour with a potential for self-harm, suicide plan as a situation when a person proposes to themselves an action plan that may result in self injury, while suicide attempt is defined as a self-inflicted act with an intention to end one's life. Finally, the term suicide by itself means a suicide attempt that results in death.

Experiencing bullying of any kind is one the many varying predictors for adolescent's suicidal behaviour, among other predictors we can find psychiatric disorders, substance abuse, poor relationship with parents or the death of a parent, same sex orientation and child's exposure to sexual and/or physical abuse.

It is also essential to mention the existence of a gender paradox regarding suicide which shows that while the suicide mortality is higher in males than in females, females were found to more commonly exhibit suicidal ideations and behaviours of the non-fatal type, i.e. self-harm.

1.5 The severity of the problem and its importance

Being a victim of both bullying types, is associated with an increased risk of depression and suicidal behaviour, while cyberbullying victims are at a higher risk than traditional bullying victims. By increasing the risk of depression and suicidality, cyberbullying has a significant impact on adolescents' mental health. When comparing individuals that aren't exposed to any type of bullying with those that are, the bullying victims, and even the bullies themselves, are at a higher risk of suicidal ideation and attempts.

Bullying, in all its forms, together with its relation to youth suicidality is a severely growing problem worldwide. Majority of youth and teens these days are regularly using the online social network, which makes online harassment during teen years a common issue. Due to cyberbullying being a relatively new phenomenon, youth has less awareness and psychological ability to manage and cope with, and have an increased vulnerability to it. Cyberbullying has distinctive characteristics that differ it from traditional bullying, making it a unique challenge that needs further research in order to find and develop appropriate interventional techniques and management ways.

Another problem is that cyberbullying is generally less noticeable by adults that are present in the victims' environment, therefore adult help in dealing with the situation is less common. Contributing to that is the fact that victimized children generally reported to have a difficulty in seeking adult help, mostly because they feel embarrassed about being bullied and feel that somehow it was their fault to begin with. Also schoolchildren reported that they do not usually seek help in regards to cyberbullying because it is considered as a normal and unstoppable internet behaviour and it will be useless to report it.

Due to all that, different interventions need to be aimed at changing children's attitude toward
the possibility of seeking help, as well as adults' awareness to cyberbullying should be addressed [23], this different interventions may be of a significant help, as researches show a decrease in victimization prevalence in children who had participated in various social and emotional anti-bullying interventional techniques [24].
2. SUBJECTS AND METHODS

2.1 Subjects and study design

The data presented here were obtained from the Health Behaviour in School-aged Children (HBSC) study, a cross-national survey carried out in 2013/2014 with the support of the World Health Organization (WHO, Europe) in 42 countries. More detailed background information about the study is provided in the international report \cite{26}, and website: www.hbsc.org (HBSC, 2017). Due to reasons of available data on the suicide-related behaviour of adolescents the current study includes data from the following three countries only: Israel, Lithuania and Luxembourg. Although the population selected for sampling was 11-, 13- and 15-year old adolescents, the current study focused only on the oldest group.

Participants were selected using a clustered hierarchical sampling design, where the initial sampling unit was the school class. Data collection methods ensured that the student samples were country representative. The verified data were obtained via the HBSC Data Centre (Bergen University, Norway). The original data file included 4,641 individual records of 15-year-old children. Specifically, the 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 analysed. Table 1 indicates the samples by countries.

The data were collected by means of self-report standardized questionnaires. The surveys were administrated in school classrooms ensuring students’ confidentiality. Response rates at the school, class and student level exceed 80% in the majority of countries \cite{26}.

2.2 Ethics

The study conformed to the principles outlined in the Declaration of Helsinki. National and local educational institutions agreed upon the study protocol. Ethical approval was obtained for each national survey according to the national guidance and 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 \cite{26}.

2.3 Measures

The outcome variables were related to suicidal ideation and behaviour, and the explanatory variables were bullying-related behaviour. Analyses were controlled for gender, family affluence (FAS), family structure and parent-child communication. Detailed description of variables is given in the HBSC Protocol for the 2013/2014 survey \cite{26}.

**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." Then, the students were 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, emails 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=2 or 3 times a month; 3=about once a week; 4=several times a week. Answers to question (1) indicate whether bullying asserts in an aggressive form; this consisted of the variable "Bullying others at school". Answers to question (2) indicate victimization; this consisted of the variable "Been bullied at school". Both answers (a) and (b) to question (3) indicate cyberbullying, 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/bullying at least 2 or 3 times a month (2-4 response codes).

Suicide-related mental health included 5 items from the optional package "Suicide and self-harm" [26], which originates from the Youth Risk Behaviour Survey (YRBS) conducted in the United States [27]. The package of questions introduced the topic of suicide using a short preamble that defines suicide, and infers that this is a recognised health problem. Students were asked to think about the recent 12 month period of their life. Questions were then 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 (4), was structured with dichotomous (0=no/1=yes) response options. The response to question (4) indicated the number of suicide attempts during the past 12 months, but in all analyses it was also recoded into 0=never/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 behaviour, and the final fifth variable was considered an indicator of seriousness of the suicide attempt.

Family wealth was measured by FAS, which was specially developed to suit the international
nature of the HBSC study \cite{20-22}. The scale is simple and easy to answer even for young adolescents. FAS include six questions with answers: *Does your family own a car, van or truck?* 0=no, 1=yes, one, 2=yes, two or more; *Do you have your own bedroom?* 0=no, 1=yes; *During the past 12 months, how many times did you go to a holiday (vacation) with your family?* 0=not at all, 1=once, 2=twice, 3=more than twice; *How many computers does your family own?* 0=none, 1=one, 2=two, 3=more than two; *How many bathrooms (room with a bath/shower or both) does your home have?* 0=none, 1=one, 2=two, 3=three or more; *Does your family have a dishwasher at home?* 0=no, 1=yes. A FAS score was calculated by summing the scores on these six questions. Then, the respondents from each country were classified into three relative groups of family affluence. The first group included young people in the lowest 20% (low affluence), the second group 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 \cite{25}.

To identify *family structure*, respondents were given a checklist of adult people ('father', 'stepfather', 'mother', 'step-mother', 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 broken families, which included single parent families, stepfamilies or reconstituted families, and looked-after children, i.e. 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 and 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 highest response to the questions about ease of communication with fathers and stepfathers was selected the level of “talk to father”. If a respondent did not respond or responded “0” to both items, the resulting “talk to father” variable was coded as missing. A similar process was used to compute the variable “talk to mother”. The resulting child-parent communication variables were dichotomized and recoded as 0=very easy/easy and 1=difficult/very difficult.

### 2.4 Statistical analysis

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

The first stage of analysis was performed using SPSS software (version 21.0; SPSS Inc, Chicago,
Here, to summarize the characteristics of our research sample, we produced descriptive statistics (frequencies, percentages, means, standard errors), including all the demographic, independent and dependent variables of interest. To evaluate potential differences between respondents’ groups in all categorical variables, we applied a z-test (for binary variables) or a Chi-square test (for remaining variables). To test the association between bullying and suicide-related behaviour, 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 insignificant. \( P<0.05 \) was considered statistically significant.

At the second stage of analysis, Structural Equation Modelling (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) \(^{28}\). Here, two explicit models were tested against the data's plausibility. The first model was the structural model, in which suicide ideation, plans and attempts were hypothesized to reflect one latent “suicidality” factor. The model estimated and compared 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 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 can be assumingly visualized by a path diagram. In graphs, 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. Usually, these graphs are presented with the standardized estimations, which significance levels are determined by critical ratios on not standardized estimations.

Several measures are provided by AMOS, to evaluate the fit between a structural equation model
and the data \cite{28}. In the present study the goodness of the models was evaluated using the following indices on goodness-of-fit: 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 ($\geq .90$), and RMSEA values of close to 0 ($\leq .08$) indicate a good fit. The likelihood-ratio Chi-square measure of fit should be insignificant for a well-fitting model, indicating no significant discrepancy between the observed and the 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 three countries differ, we ran a multi group analysis. 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.
3. RESULTS

3.1 Sample characteristics

Characteristics of the studied samples are presented in Table 1. Due 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 of 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 easy talking to both father and mother. In the sample of Lithuanian adolescents the proportion of boys was higher than the proportion of girls. 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 the father. Overall, the mean age of respondents reached the required standard (85% of respondents were aged 15-16), the proportions of boys and girls were almost equal, and the distribution of respondents by family affluence was close to the expected ratio (20%:60%:20%). More than a quarter of adolescents didn't report living with both father and mother. Easy communication was more common with the mother than with the father. Moreover, the number of unreported items about 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.

3.2 Prevalence of bullying

Table 2 presents the prevalence of cyberbullying and bullying at school. A total of 6.5% of adolescents reported being victims of cyberbullying. Boys were twice as likely (8.5% vs 4.6%, p<0.001) to experience cyberbullying victimization than girls. Comparison of the cyberbullying prevalence between countries showed significant differences among boys (the highest was 9.9% in Lithuania and the lowest was 4.6% in Luxembourg) while this was not specific among girls.

Bullying at school was still more prevalent than cyberbullying in Lithuania and Luxembourg, but not in Israel, especially among Israeli girls, who reported bullying victimization and aggression only in a small number of cases. Overall, the prevalence of school bullying victimization and aggression was 15.6%, and 16.7%, respectively. Across countries, boys were more likely to be involved in school bullying than girls, except in Luxembourg, where the proportion of students reporting having been bullied at school was found to be slightly higher among girls than boys (12.5% vs 9.1%, p>0.05).

3.3 Suicide-related mental health

Table 3 reports the prevalence of suicide-related mental health patterns, including suicidal
ideation and suicide-related behaviour. 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 doing activities during the last 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 of prevalence studied. Some of the suicide attempts were serious and required treatment (40.1% among Israeli and Lithuanian adolescents who attempted suicide). In Lithuania and Luxembourg all suicidal patterns 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. Further analyses will be based only on suicidal ideation, suicide plans and attempts, as these outcomes were measured in all three countries.

3.4 Association between bullying and suicide-related variables

Table 4 presents the results of univariate and multivariate binary logistic regression analysis for risk of suicidal ideation, suicide plans and attempts. The further analyses consist only of this three suicide-related variables (ideation, plans and attempts) because this are the variables that were present in all three studied countries; while the variable of stopped doing activities in the past 12 months wasn't measured in Israel and the variable of suicide attempts that were treated by doctor/nurse wasn't included in Luxembourg.

The results of 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 odds ratio, 95% confidence interval = 3.66, 2.80 – 4.79), plans (4.41, 3.32 – 5.86) and attempts (6.31, 4.72 – 8.43) compared to those who had not encountered such threats. By country, almost all of the above estimations were greater than the corresponding figures for the association between school bullying victimization and suicidal ideation (3.44, 2.84 – 4.18), plans (3.34, 2.68 – 4.15) and attempts (3.87, 3.06 – 4.89). The crude association between bullying other at school and suicidal ideation, suicide plans and attempts was found to be significant only among adolescents from Israel. Similar results were obtained from the multivariate analysis after controlling for gender, family affluence and structure, and child-parent communication.

3.5 Structural model to test the direct effect of three bullying components on adolescent suicidality

Table 5 and Fig. 1 present results of the SEM analysis conducted with the purpose of testing the
direct effect of each bullying component on adolescent suicidality. In this model, "suicidality" was defined as a latent construct (factor), which loaded three measured indicators: suicide ideation, plans and attempts. Each of these binary measures loaded significantly (by critical-ratio test) on the latent suicidality factor in data sets of all three participating countries, however, there were differences in their regression weights among the countries.

The model also presents the correlations among measured components of bullying (here and in other SEM analyses, bullying was measured in 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 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 to the data was excellent in the samples of adolescents from each country (unconstrained model), however, it did not fit the data of combined samples from the three countries as it did for each country separately (Table 5). According to the difference Chi-square test (Chi-square = 551.8 - 41.8 = 510.0; df = 48 - 18 = 30; p<0.001) in multiple group SEM analysis, the variables of interest are equivalent across countries (configural invariance), however, parameters in the model cannot be set equal and significantly vary across countries.

3.6 Structural model to test the overall effect of bullying on adolescent suicidality

Table 6 and Fig. 2 present 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 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). Then, the analysis was 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 measured variables (cyberbullying, been bullied and bullying others at school) loading them to the bullying factor were almost
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 of being bullied. The results also confirmed a significant overall effect of bullying on adolescent suicidality. The highest magnitude of this effect was 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 (unconstrained model). However, there is also a considerable variability among countries in the extent to which each bullying measure is determined by the latent bullying factor. In order to test a 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-square = 566.7 - 69.8 = 497.4; df = 50 - 24 = 26; p<0.001), it was concluded that parameters in the model significantly vary across countries.
Table 1. Sample characteristics, by countries

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Israel, n=1,219</th>
<th>Lithuania, n=1,628</th>
<th>Luxembourg, n=967</th>
<th>Total, n=3,814</th>
<th>p-value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean age (SD)</td>
<td>15.88 (0.23)</td>
<td>15.64 (0.32)</td>
<td>15.44 (0.36)</td>
<td>15.67 (0.35)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Gender&lt;sup&gt;b&lt;/sup&gt;:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>532 (43.6)</td>
<td>852 (52.3)</td>
<td>438 (45.3)</td>
<td>1,822 (47.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Girls</td>
<td>687 (56.4)</td>
<td>776 (47.7)</td>
<td>529 (54.7)</td>
<td>1,992 (52.2)</td>
<td></td>
</tr>
<tr>
<td><strong>Relative family affluence:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lowest 20%</td>
<td>182 (15.2)</td>
<td>352 (21.8)</td>
<td>162 (17.5)</td>
<td>696 (18.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Medium 60%</td>
<td>742 (62.1)</td>
<td>917 (57.0)</td>
<td>511 (55.2)</td>
<td>2,170 (58.1)</td>
<td></td>
</tr>
<tr>
<td>Highest 20%</td>
<td>271 (22.7)</td>
<td>342 (21.2)</td>
<td>253 (27.3)</td>
<td>866 (23.2)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>24</td>
<td>17</td>
<td>41</td>
<td>82</td>
<td></td>
</tr>
<tr>
<td><strong>Living with both parents:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1,021 (84.2)</td>
<td>1,086 (67.3)</td>
<td>632 (66.4)</td>
<td>2,739 (72.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>No</td>
<td>191 (15.8)</td>
<td>528 (32.7)</td>
<td>320 (33.6)</td>
<td>1,039 (27.5)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>7</td>
<td>17</td>
<td>15</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td><strong>Talk to father:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy</td>
<td>814 (69.9)</td>
<td>832 (62.6)</td>
<td>433 (52.7)</td>
<td>2,079 (62.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Difficult</td>
<td>350 (30.1)</td>
<td>497 (37.4)</td>
<td>388 (47.3)</td>
<td>1,235 (37.3)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>44</td>
<td>208</td>
<td>100</td>
<td>352</td>
<td></td>
</tr>
<tr>
<td><strong>Talk to mother:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy</td>
<td>982 (85.0)</td>
<td>1,100 (73.1)</td>
<td>647 (72.7)</td>
<td>2,729 (76.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Difficult</td>
<td>173 (15.0)</td>
<td>405 (26.9)</td>
<td>243 (27.3)</td>
<td>821 (23.1)</td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>49</td>
<td>104</td>
<td>58</td>
<td>211</td>
<td></td>
</tr>
</tbody>
</table>

<sup>a</sup> significance of difference between countries, F or Chi-square test. <sup>b</sup> below data are shown as n (%).
Table 2. Prevalence of bullying, by gender and countries

<table>
<thead>
<tr>
<th>Bullying-related behaviour</th>
<th>Israel, n=1,219</th>
<th>Lithuania, n=1,628</th>
<th>Luxembourg, n=967</th>
<th>Total, n=3,814</th>
<th>p-value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Been cyberbullied:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>51 (9.6)</td>
<td>84 (9.9)</td>
<td>20 (4.6)</td>
<td>155 (8.5)</td>
<td>0.003</td>
</tr>
<tr>
<td>Girls</td>
<td>26 (3.8)**</td>
<td>43 (5.6)**</td>
<td>23 (4.4)</td>
<td>92 (4.6)**</td>
<td>0.259</td>
</tr>
<tr>
<td>Total</td>
<td>77 (6.3)</td>
<td>127 (7.8)</td>
<td>43 (4.5)</td>
<td>247 (6.5)</td>
<td>0.003</td>
</tr>
<tr>
<td><strong>Been bullied at school:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>54 (10.2)</td>
<td>246 (28.9)</td>
<td>40 (9.1)</td>
<td>340 (18.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Girls</td>
<td>19 (2.8)**</td>
<td>170 (21.9)**</td>
<td>66 (12.5)</td>
<td>255 (12.8)**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total</td>
<td>73 (6.0)</td>
<td>416 (25.6)</td>
<td>106 (11.0)</td>
<td>595 (15.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Bullying others at school:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>75 (14.1)</td>
<td>288 (33.8)</td>
<td>73 (16.7)</td>
<td>436 (23.9)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Girls</td>
<td>19 (2.8)**</td>
<td>138 (17.8)**</td>
<td>45 (8.5)**</td>
<td>202 (10.1)**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total</td>
<td>94 (7.7)</td>
<td>426 (26.2)</td>
<td>118 (12.2)</td>
<td>638 (16.7)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Data are shown as n (%). <sup>a</sup> significance of difference between countries, Chi-square test. **<sup>** p≤0.001, significance of difference between boys and girls, z-test.
Table 3. Prevalence of suicidal ideation, suicide-related behaviour, and other patterns, by gender and countries

<table>
<thead>
<tr>
<th>Suicide-related behaviour</th>
<th>Israel, n=1,219</th>
<th>Lithuania, n=1,628</th>
<th>Luxembourg, n=967</th>
<th>Total, n=3,814</th>
<th>p-value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stopped doing activities</strong>:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>n/a</td>
<td>267 (31.3)</td>
<td>86 (19.6)</td>
<td>353 (27.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Girls</td>
<td>n/a</td>
<td>437 (56.5)**</td>
<td>209 (39.7)**</td>
<td>646 (49.7)**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total</td>
<td>n/a</td>
<td>704 (43.3)</td>
<td>295 (30.6)</td>
<td>999 (38.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Suicidal ideation</strong>:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>62 (11.7)</td>
<td>130 (15.3)</td>
<td>38 (8.7)</td>
<td>230 (12.6)</td>
<td>0.002</td>
</tr>
<tr>
<td>Girls</td>
<td>74 (10.8)</td>
<td>247 (31.8)**</td>
<td>126 (23.8)**</td>
<td>447 (22.4)**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total</td>
<td>136 (11.2)</td>
<td>377 (23.2)</td>
<td>164 (17.0)</td>
<td>677 (17.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Suicide plans</strong>:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>39 (7.3)</td>
<td>94 (11.0)</td>
<td>43 (9.8)</td>
<td>176 (9.7)</td>
<td>0.076</td>
</tr>
<tr>
<td>Girls</td>
<td>41 (6.0)</td>
<td>141 (18.2)**</td>
<td>101 (19.1)**</td>
<td>283 (14.2)**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total</td>
<td>80 (6.6)</td>
<td>235 (14.4)</td>
<td>144 (14.9)</td>
<td>459 (12.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Suicide attempts</strong>:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>40 (7.5)</td>
<td>82 (9.6)</td>
<td>20 (4.6)</td>
<td>142 (7.8)</td>
<td>0.006</td>
</tr>
<tr>
<td>Girls</td>
<td>43 (6.3)</td>
<td>114 (14.7)**</td>
<td>63 (11.9)**</td>
<td>220 (11.0)**</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total</td>
<td>83 (6.8)</td>
<td>196 (12.0)</td>
<td>83 (8.6)</td>
<td>362 (9.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td><strong>Suicide attempts treated by a doctor or nurse&lt;sup&gt;b&lt;/sup&gt;</strong>:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>19 (47.5)</td>
<td>46 (56.1)</td>
<td>n/a</td>
<td>65 (53.3)</td>
<td>0.331</td>
</tr>
<tr>
<td>Girls</td>
<td>20 (46.5)</td>
<td>27 (23.7)**</td>
<td>n/a</td>
<td>47 (29.9)**</td>
<td>0.003</td>
</tr>
<tr>
<td>Total</td>
<td>39 (47.0)</td>
<td>73 (37.2)</td>
<td>n/a</td>
<td>112 (40.1)</td>
<td>0.080</td>
</tr>
</tbody>
</table>

Data are shown as n (%). n/a data not available.

<sup>a</sup> significance of difference between countries, Chi-square test.

<sup>* p≤0.05; ** p≤0.01; *** p≤0.001</sup>, significance of difference between boys and girls, z-test.

<sup>b</sup> among those who reported suicide attempt
Table 4. Results of univariate and multivariate binary logistic regression analyses for suicidal ideation, suicide plans and attempts risk: OR (95% CI) estimation, by countries:

<table>
<thead>
<tr>
<th>Independent variables(^a)</th>
<th>Univariate analysis</th>
<th>Multivariate analysis(^b)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Israel</td>
<td>Lithuania</td>
</tr>
<tr>
<td><strong>Suicidal ideation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Been cyberbullied (not been)</td>
<td>6.24***</td>
<td>2.50***</td>
</tr>
<tr>
<td>Been bullied at school (not been)</td>
<td>7.32***</td>
<td>2.33***</td>
</tr>
<tr>
<td>Bullied others at school (not been)</td>
<td>3.76***</td>
<td>0.97</td>
</tr>
<tr>
<td><strong>Suicide plans</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Been cyberbullied (not been)</td>
<td>6.88***</td>
<td>3.35***</td>
</tr>
<tr>
<td>Been bullied at school (not been)</td>
<td>11.2***</td>
<td>2.53***</td>
</tr>
<tr>
<td>Bullied others at school (not been)</td>
<td>5.20***</td>
<td>1.18</td>
</tr>
<tr>
<td><strong>Suicide attempts</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Been cyberbullied (not been)</td>
<td>10.95***</td>
<td>4.14***</td>
</tr>
<tr>
<td>Been bullied at school (not been)</td>
<td>10.86***</td>
<td>2.76***</td>
</tr>
<tr>
<td>Bullied others at school (not been)</td>
<td>8.51***</td>
<td>1.31</td>
</tr>
</tbody>
</table>

\(^a\) reference group is indicated in brackets. \(^b\) variables entered: Been cyberbullied; Been bullied at school; Bullied others at school; Gender; Family affluence; Family structure; Talk to father; Talk to mother. \(^* p<0.05; ^{**} p<0.01; ^{***} p<0.001, \) significance of OR-value.
Table 5. Results from Structural Equation Modelling: correlations and standardized regression weights of bullying variables in prediction of suicide-related behaviour and goodness-of-fit estimates for the association models (see Fig. 1)

<table>
<thead>
<tr>
<th>Estimates</th>
<th>Unconstrained model</th>
<th>Fully constrained model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Israel</td>
<td>Lithuania</td>
</tr>
<tr>
<td><strong>Correlations:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyberbullied ↔ Been bullied</td>
<td>0.436***</td>
<td>0.286***</td>
</tr>
<tr>
<td>Been bullied ↔ Bullying others</td>
<td>0.480***</td>
<td>0.333***</td>
</tr>
<tr>
<td>Cyberbullied ↔ Bullying others</td>
<td>0.367***</td>
<td>0.118***</td>
</tr>
<tr>
<td><strong>Standardized regression weights:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUICIDALITY ↔ Cyberbullied</td>
<td>0.211***</td>
<td>0.185***</td>
</tr>
<tr>
<td>SUICIDALITY ↔ Been bullied</td>
<td>0.261***</td>
<td>0.176***</td>
</tr>
<tr>
<td>SUICIDALITY ↔ Bullying others</td>
<td>0.037</td>
<td>-0.040</td>
</tr>
<tr>
<td>Ideation ↔ SUICIDALITY</td>
<td>0.785***</td>
<td>0.807***</td>
</tr>
<tr>
<td>Plans ↔ SUICIDALITY</td>
<td>0.788***</td>
<td>0.783***</td>
</tr>
<tr>
<td>Attempts ↔ SUICIDALITY</td>
<td>0.786a</td>
<td>0.651a</td>
</tr>
<tr>
<td><strong>Model goodness-of-fit estimates:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chi-square</td>
<td>41.8</td>
<td></td>
</tr>
<tr>
<td>Df</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>P-value</td>
<td>0.001</td>
<td></td>
</tr>
<tr>
<td>TLI</td>
<td>0.928</td>
<td></td>
</tr>
<tr>
<td>CFI</td>
<td>0.971</td>
<td></td>
</tr>
<tr>
<td>RMSEA</td>
<td>0.019</td>
<td></td>
</tr>
<tr>
<td>(90% CI)</td>
<td>(0.011-0.026)</td>
<td></td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001, significance of correlation and standardized regression weight (estimated by critical-ratio test); a constrained parameter.

TLI: Tucker–Lewis Index; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation; df: degree of freedom; CI: Confidence Interval.
Table 6. Results from Structural Equation Modelling: association between latent factors of bullying and suicidality, and goodness-of-fit estimates for the unconstrained and constrained models (see Fig. 2)

<table>
<thead>
<tr>
<th>Estimates</th>
<th>Unconstrained model</th>
<th>Fully constrained model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Israel</td>
<td>Lithuania</td>
</tr>
<tr>
<td>Cyberbullied ← BULLYING</td>
<td>0.614a</td>
<td>0.376a</td>
</tr>
<tr>
<td>Been bullied ← BULLYING</td>
<td>0.766***</td>
<td>0.801***</td>
</tr>
<tr>
<td>Bullying others ← BULLYING</td>
<td>0.599***</td>
<td>0.410***</td>
</tr>
<tr>
<td>Ideation ← SUICIDALITY</td>
<td>0.781***</td>
<td>0.806***</td>
</tr>
<tr>
<td>Plans ← SUICIDALITY</td>
<td>0.791***</td>
<td>0.774***</td>
</tr>
<tr>
<td>Attempts ← SUICIDALITY</td>
<td>0.791a</td>
<td>0.632a</td>
</tr>
<tr>
<td>SUICIDALITY ← BULLYING</td>
<td>0.485***</td>
<td>0.263***</td>
</tr>
</tbody>
</table>

Model goodness-of-fit estimates:
- Chi-square: 69.8, 566.7
- Df: 24, 50
- P-value: <0.001, <0.001
- TLI: 0.896, 0.436
- CFI: 0.944, 0.378
- RMSEA: 0.022, 0.052
- (90% CI): (0.016-0.029), (0.048-0.056)

* p<0.05; ** p<0.01; *** p<0.001, significance of standardized regression weight (estimated by critical-ratio test); a constrained parameter.

TLI: Tucker–Lewis Index; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation; df: degree of freedom; CI: Confidence Interval.
Fig. 1. Path diagrams of Structural Equation Modelling of association between reported components of bullying and suicidality latent factor among adolescents in: (a) Israel; (b) Lithuania; (c) Luxembourg; and (d) all three countries.
Fig. 2. Path diagrams of Structural Equation Modelling of association between latent factors of bullying and suicidality among adolescents in: (a) Israel; (b) Lithuania; (c) Luxembourg; and (d) all three countries.
The aim of our research was to analyze the predictive value of traditional and cyberbullying on suicidal behavior among school-aged children in three countries; Israel, Lithuania, and Luxembourg. This study was conducted using data from the HBSC cross-national survey from the years 2013/2014. The focus of the study was on the population of 15-years-old adolescents in the three countries that mentioned above, with a total sample of 3,814 participants.

By comparing the prevalence of traditional bullying to cyberbullying we found the results to be compatible to previous studies[12] which indicate that traditional bullying is still a more prevalent phenomenon than cyberbullying among adolescents. Findings of this study show a high prevalence of traditional bullying victimization with 15.6% of total sample reported being a victim of school bullying at some point of their lives. But when looking at each country separately we can see that these results are valid only for Lithuania and Luxembourg and are not valid for Israel, where only a minor number of participants, especially Israel girls, have reported being bullied at school. However, the results of this present study show that cyberbullying, although less prevalent than traditional bullying, is still a relevant and important problem that exists among adolescents nowadays, with a 6.5% of total studied sample having reported being victims of cyberbullying at some point of their lives.

Taking the gender variable into account regarding traditional and cyberbullying we can see the existence of a difference between boys and girls in all three studied countries. By looking at the prevalence of traditional bullying in regards with gender we can see that the findings of this study correspond to other researches[9] by showing that boys were more likely to be involved in traditional (school) bullying than girls, either as victims or as aggressors. An exception to this finding was in Luxembourg, where girls were found to more likely be victims of traditional bullying than boys (12.5% vs. 9.1% respectively).

In regards to the association between gender and cyberbullying, our findings show that boys were twice more likely than girls (8.5% vs. 4.6% respectively) to be victims of cyberbullying. Furthermore, by analysing cyberbullying prevalence between boys and girls across counties we found that while there were no significant differences among girls between counties, a significant difference did exist between boys, where the highest prevalence of boys that were victims of cyberbullying was in Lithuania and the lowest in Luxembourg (9.9 vs. 4.6% respectively). This findings come in contrary to other researches which found that girls were more likely to be cyberbullied than boys[11] or that there was no significant difference between boys and girls regarding cyberbullying victimization[13].

Analysing the prevalence of suicidal ideation and behaviour in our study has yield similar
results to previous studies \cite{18} and show that suicidal behaviour is a growing and serious problem among young people these days. According to this study's results 38.6\% of the total sample (excluding Israeli respondents) reported experiencing emotions that stopped them from doing activities during the last 12 months, 17.8\% considered committing suicide, 12.0\% made a suicide plan and 9.5\% have admitted to attempting suicide. Among those that attempted suicide 40.1\% (excluding Luxembourg respondents) of the attempts were serious enough to need medical help. By comparing between the three studied countries we can see that Lithuania has the highest prevalence to all of the suicide related variables that were given above (i.e. stopped doing activities, considered suicide, made a suicide plan, attempted suicide and needed medical help following a suicide attempt).

Our findings also show the presence of a gender paradox \cite{17} regarding suicidality in Lithuania and Luxembourg 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 need medical attention were more prevalent among boys than girls. However, in Israel there was no presence of a gender paradox regarding suicidality, with results showing no significant difference between adolescent boys and girls regarding suicide patterns and outcome.

In regards to the association between both types of bullying (traditional and cyber) and suicide-related variables in all three countries we can see that a strong and significant association exist between being a victim of cyber and/or school bullying and suicidal related variables. By making a comparison between adolescents that experienced cyberbullying or traditional bullying to those that never encountered any type of bullying, we can see that those that were bullied in any way have a significantly higher risk for developing suicidal ideation, plans and attempts. This association comes in consistence with previous studies which conclude that the experience of any kind of bullying is a predictor for increased risk of suicidality in adolescents \cite{19, 20, 22}. This association differs across countries; in Israel traditional and cyber-bullying had almost the same magnitude of effect on suicidality, while in Lithuania being bullied at school had a stronger association with suicidality than cyberbullying, and on the contrary, in Luxembourg the association of cyberbullying with suicidality was greater than for being bullied at school. This means that the effects of different bullying types on adolescent suicidality cannot be set as equal and can significantly vary across these three countries.

Additionally, by comparing bully aggressors to non-aggressors we can analyse the association between being a bully aggressor and suicidality. Current results show that being a bully aggressor has no significant effect on adolescent suicidality and doesn't increase the risk for it. This comes in contrast to researches which claims that being a bullying aggressor also increases the risk for suicidality among adolescents \cite{22}.

Combining all of the above data to samples from all each of three countries show us that all
the components of bullying (victim and aggressor) can give an almost equal direct effect on the variable of bullying (in any of its kinds) on adolescent suicidality. This results confirm a significant overall effect of any type of bullying on adolescent suicidality[20].

**Study strengths and limitations**

The strengths of this study are that the data used here were taken from the HBSC study, which gave us a large sample with a high participation rate of school-aged children to study and analyse. The HBSC study is a cross-national survey that involves 42 countries, due to that we were able to draw relevant data for our study about 15-years old children in the three countries in focus; Israel, Lithuania and Luxembourg.

Another advantage of using the HBSC survey in is that the HBSC questionnaire was developed by international experts, which gave us the opportunity to use standardized methods in this current study, for example controlling 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 multi-dimensional analysis of associations between the different variables.

Limitations of this study that should be taken into account include the HBSC survey being a cross-sectional study which is based on self reports and can be affected by recall bias as well as social norms. Due to that, interpretation of causality in this study may be difficult to establish. To overcome this bias, anonymity and confidentiality were given to the precipitants, as well as pre-testing of the questions at national and international levels was done before the actual survey was conducted [2].
5. CONCLUSIONS

1. Although cyberbullying is a rapidly growing phenomenon nowadays, its prevalence among the samples of 15-years old adolescents in Israel, Lithuania and Luxembourg is still lower than that of traditional school bullying. Considering gender differences, the boys in Israel and Lithuania were more likely to be involved in traditional bullying, as opposite to Luxembourg where girls were more likely to be involved in this bullying type. Looking at gender differences and cyberbullying in the total sample boys were twice more likely to be involved in cyberbullying than girls. When comparing the three countries, the highest prevalence of adolescents that were cyberbullied was in Lithuania while the lowest was in Luxembourg.

2. Adolescent suicidality is a prevalent and serious problem nowadays with almost 10% of the studied sample admitting to actually attempting suicide. When comparing between the three countries, Lithuanian data has shown the highest prevalence of suicide related behaviours.

3. The results of the study show a strong and significant association between being a victim of cyber and/or school bullying and suicidal related behaviours. Being a victim of any kind of bullying can have a crucial effect on the adolescent, by increasing the risk for suicide ideations, plans and attempts. The impact of cyberbullying on adolescent suicidality is as severe and important as the impact of school bullying making cyberbullying a very strong predictor for adolescent suicidality.
REFERENCES


9. Waasdorp TE, Bradshaw CP. The Overlap Between Cyberbullying and Traditional Bullying. *Journal of Adolescent Health*. 2015 May; 56: 483-488


ANNEX

Attachment 1. HBSC 2014 questionnaire regarding family structure and family affluence (FAS)

1. Please tick all the people who live at the home where you live all or spend most of the time

A. Adults:
1# Mother
2# Father
3# Stepmother (or father's girlfriend)
4# Stepfather (or mother's boyfriend)
5# Grandmother
6# Grandfather
7# There live someone else.
   Please write it down:
   ............................................
8# I live in a foster home or children's home

B. Children:
Please write how many brothers and sisters live at your home (including stepparent's and foster children). Please write in the numbers. If there are none write 0 (zero). Please don't count yourself.
How many brothers? .................
How many sisters? .................

2. Which of the following descriptions best describes your current family situation?
1# I live with BOTH parents
   I live NOT WITH BOTH parents, because:
   2# My parents are divorced
   3# Already years, as one of their living and working in another location
   3# One of them is dead
   4# One of them I'm not seeing a whole and I don’t know where he is
   5# I live in a foster home or children's home environment

3. During the last 12 months, how many times did you jaunt or travel away with your family?
1# Not at all
2# Once
3# Twice
4# More than twice

4. Do you have your own room?
1# No
2# Yes

5. Does your family have a dishwasher?
1# No
2# Yes

6. **How many bathrooms are at your home?**
   1# None
   2# One
   3# Two or more

7. **Does your family have a car?**
   1# No
   2# Yes, one
   3# Yes, two or more

8. **How many computers has your family (tablets, laptops included)?**
   1# None
   2# One
   3# Two
   4# Three or more

**Attachment 2. HBSC 2014 questionnaire regarding bullying**

1. **How often have you taken part in bullying another student at school in the past couple of months?**
   1# I have not bullied another student at school in the past couple of months
   2# It has happened only once or twice
   3# 2 or 3 times a month
   4# About once a week
   5# Several times a week

2. **How often have you been bullied at school in the past couple of months?**
   1# I have not been bullied at school in the past couple of months
   2# It has happened only once or twice
   3# 2 or 3 times a month
   4# About once a week
   5# Several times a week
3. How often have you been bullied in the following ways? *Please tick one box in each line:*

<table>
<thead>
<tr>
<th></th>
<th>Never bullied in this way</th>
<th>Once per week</th>
<th>2-3 times per week</th>
<th>Once per month</th>
<th>Couple times per week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Someone sent angry messages to you by phone or by computer, mocked you online</td>
<td># # # # #</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Without your consent, circulated on the Internet Your inappropriate pictures, videos</td>
<td># # # # #</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Attachment 3.** HBSC 2014 questionnaire regarding Suicide-related mental health

1. **During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more that you stopped doing some usual activities?**
   1# Yes
   2# No

2. **During the past 12 months, did you ever seriously think about suicide?**
   1# Yes
   2# No

3. **During the past 12 months, did you ever make a suicide plan?**
   1# Yes
   2# No

4. **During the past 12 months, did you attempt suicide?**
   1# Never
   2# Once
   3# 2 or 3 times
   4# 4 or 5 times
   5# 6 or more times

5. **If you attempted suicide during the past 12 months, did any attempt result in an injury, poisoning or other, that had to be treated by a doctor?**
   1# I didn't attempt suicide during the past 12 months
   2# Yes
   3# No