AGE DIFFERENCES IN BULLYING AND CYBERBULLYING VICTIMISATION AND PERPETRATION: EVIDENCE FROM CROSS-CULTURAL SURVEYS

Publications on bullying have grown exponentially in the last 20 years (Smith et al., 2021). Following the seminal work of Olweus (1991), much of this has focussed on school bullying. Olweus (1991) described bullying as an intentional act to hurt or harm another with additional criteria of repetition and power imbalance. Repetition refers to a frequency of the behaviour more than just once or twice. Power imbalance implies that the victim finds it difficult to defend himself or herself. Although debate on definitional issues continues (Volk et al., 2017; Chang, 2021; Cornu et al., 2022), these criteria are generally taken to delineate bullying as a subset of aggressive behaviour. Main forms of bullying are physical, verbal, social or relational, and cyber (Harbin et al., 2019) whereby cyberbullying relates to bullying via electronic forms of contact (mobile phone and/or the internet) (Perren at al., 2010; Smith et al., 2008).

The concept of cyberbullying is especially in some debate, including the definition and clarification of its attributes. Peter and Petermann (2018) carried out an analysis of the definitions used in 24 investigations published in English, between 2012 and 2017. The most frequent conceptual attributes were: use of technologies, repetition, intentionality, harmful nature of the act, and being directed at a single victim. However, these attributes present some difficulties when it comes to being measured. Nevertheless, forms of the standard defintion (Olweus, 1991: Smith et al., 2008) are widely used, including in large-scale international surveys.

School bullying is generally taken as an international phenomenon; there are some differences in nuances of definition, and in the relative frequency or salience of

different types of bullying, but the concept is generally recognised across different countries (Smith et al., 2002). Indeed, a number of large-scale surveys have been assessing the prevalence of bullying (both bullying victimisation and sometimes perpetration) across a wide range of countries globally. Smith et al. (2019a) examined the consistency of gender differences in bullying across five such surveys: HBSC, EUKO, GSHS, TIMSS and PISA. In this article, we similarly report on the consistency of age differences, focussing on school-age children, and on three surveys, HBSC, EUKO and TIMSS, that report data on age differences.

Age differences

Most reports on age differences have relied on self-report data. Individual studies that provided reports on age differences in one country have been very frequent. Most findings suggest that bullying victimisation is highest around early to middle adolescence, and then declines with age. Bullying perpetration trends have been less frequently analysed than victimisation, and present a less consistent pattern.

An early review by Smith, Madsen and Moody (1999) reviewed age differences from several large-scale pupil-based self-report surveys, from Norway, Sweden, England, Ireland and Australia. Experiences of being bullied by other children in school showed a fairly steady downward trend through ages eight to 16 years, for both boys and girls. These decreases were monotonic for the Norwegian and English data and virtually so for the Swedish and Irish data, though with a temporary rise at starting secondary school in the Australian data. In contrast, the incidence of reported bullying others showed rather inconsistent trends, but often being highest during the mid-adolescent years.

Some more recent reports yield similar findings. For example in Germany, Scheithauer et al. (2006) analysed different forms of bullying for victims (physical, verbal, and social), gender and grade differences in fifth to tenth grade students. They

found that rates of being victimized were higher for younger students, with a steady decline by grade regardless of the form it took. Rates of bullying perpetration were highest in students from middle grades (approx. ages 11 to 14 years)

Although this study found a curvilinear trend for bullying perpetration, this was not replicated in a study in the USA of students in elementary (grades 4 and 5), middle (grades 6 to 8), and high school (grades 9 to 12) by Malecki et al. (2020). Bullying and assisting with bullying were significantly higher in middle and high school in comparison to elementary school, showing an upward trend with age. Trends in victimization were not significant.

Recent studies have also been able to examine whether trends in cyber victimization or perpetration are similar to those for more traditional kinds of bullying. An example comes from analysis of Spanish data by Pichel et al. (2021). They assessed both traditional and cyber forms of perpetration and victimisation, at 10-11, 12-13, 14-15 and 16-17 years. For victimisation, physical bullying showed a linear decline, but verbal and relational forms were highest at 12-13 years and cyber victimisation at 12-13 or 14-15 years (curvilinear trends). For perpetration, rates were mostly lowest in the 10-11 year age group, and for cyber, highest in the 16-17 age group.

While most early studies were in western societies, there are increasing reports from eastern societies. For example Chen and Chen (2020) reported data on cyberbullying victimisation and perpetration from Chinese societies (Mainland China, Hong Kong and Taiwan), over grades 7, 8 and 9 (ages 12-15 years in all 3 societies), for cyber victimisation, there were no significant grade differences in Hong Kong, but in Mainland China students in Grade 8 reported a higher level of victimisation than students in Grade 7 and Grade 9; in Taiwan, students in Grade 9 reported the highest level of victimisation in comparison with Grades 8 and 7. There were no significant grade level

differences in cyberbullying perpetration in any of the three samples.

Given the existence of many individual studies, a broader picture can be obtained both from meta-analyses, and from large cross-national surveys.

Craig et al. (2009) used HBSC data from 2005/2006 to compare the prevalence of bullying perpetration and victimisation among boys and girls and by age (11-, 13- and 15-year-old school children) in 40 countries. Rates of victimisation decreased by age in 30 of 40 (boys) and 25 of 40 (girls) countries. The prevalence of bullying perpetration showed a significant increase by age among boys in in 28 of 40 countries, but only in 19 countries for girls.

Regarding meta-analyses, an early but at the time comprehensive report by Cook et al. (2010) examined the predictors of 3 bully roles (bullies, victims, and bully-victims), including age. They analyzed 153 relevant articles on children and adolescents between 3 and 18 years old. Age was an individual predictor of bullying perpetration (r = .09), victimisation (r = -.01), and being a bully-victim (r=.01; this being non-significant). The results indicate an increase in bullying perpetration and a slight decline in victimisation with age; but effect sizes are small, and treating age as a linear variable over such a wide age range hides curvilinear or more complex trends.

Barlett and Coyne (2014) caried out a meta-analysis specifically on sex differences in cyberbullying perpetrator and if age moderated any sex effect. Using a sample of 109 articles (122 effect size estimates), they found that females were more likely to report cyberbullying during early to mid-adolescence than males, while males showed higher levels of cyberbullying during later adolescence and into college years.

Craig et al. (2020) analysed cyberbullying data from pupils aged 11, 13 and 15 years in 42 countries, using the HBSC data from 2017-18... For cyber victimisation, there was a non-significant dip at 13 years for boys, but an increase at 13 and 15 years in girls.

There was a linear increase in cyberbullying perpetration by age trend for boys, and a curvilinear trend for girls with a peak at 13 years.

While recent self-report data has been the predominant methodology employed, there are other possibilities. In Finland, Salmivalli (2002) examined grade-level differences in frequencies of victims bullied at school in elementary school children from the fourth, fifth and sixth grades (i.e. 9-12 years), as reported by themselves, their peers and their teachers. A downward trend in victimisation was found from self-report data, but not from peer and teacher report.

Another alternative to self-report data obtained at school, is retrospective reports by adults. Eslea and Rees (2001) reported on two retrospective studies assessing at what ages bullying is most likely to occur. Adults aged 18–55 years in England completed questionnaires about their memories of being bullied at school; this was most frequently remembered from around 11–13 years of age, with incidents from earlier and later childhood being reported comparatively rarely; thus, a curvilinear pattern.

In summary, while there have been many individual studies on age differences, the findings are somewhat varied. Two multi-country studies using HBSC data (Craig et al, 2009; 2020) only used data from one survey period each. A broader picture of age differences in bullying can be drawn from what is now a succession of 7 surveys reported by HBSC. In addition, such findings can be compared with data from two other large-scale surveys – EU Kids Online (EUKO), and Trends in International Mathematics and Science Study (TIMSS). Such an analysis can address several issues: overall age trends in bullying victimisation and perpetration, differences in age trends by gender, differences by historical period, differences by type (specifically, offline/online), and replicability of findings across different surveys.

Data from cross-national surveys

Age differences in bullying are available from the following 3 cross-national surveys:

Health Behaviour in School-age Children (HBSC) (www.hbsc.org), a World Health Organisation study, gathers data from mainly European and North American countries, every 4 years (1993/94, 1997/98, 2001/02, 2005/06, 2009/10, 2013/14, 2017/18).

EU Kids Online (EUKO) (www.eukidsonline.net) gathered data in European countries from children who use the internet, in 2010 (Livingstone et al., 2011) and again in 2018/19 with slightly rephrased questions (Smahel et al., 2020).

Trends in International Mathematics and Science Study (TIMSS) (http://timssandpirls.bc.edu) provides assessments of student achievement in mathematics and science, also including school safety and bullying, in a range of middle-income and high-income countries. Although TIMSS reports started in 1995, the 1995 and 1999 reports do not contain items on bullying comparable with later surveys. The 2003 and 2007 surveys report data on 5 items, but do not provide scale scores. We use the 2011, 2015 and 2019 data sets, which report scale scores (Mullis et al., 2012; 2016, 2020).

These surveys provide an opportunity to investigate age differences from a very wide range of countries. Other studies of overall victim prevalence rates reported by *Global School Health Survey* (GSHS) and *Program for International Student Assessment* (PISA) do not include age differences for pupil reports of being a victim or perpetrator of bullying; consequently, their data has not been included in this article.

The three surveys

All three surveys have common features: notably all used self-report data from school-age children. Summary details of each survey are given in Table 1; full information about the definition of bullying used in each survey, specific types, power imbalance, form of

question and time reference period and frequency, are given in Table A of Appendices.

Table 1 about here

All surveys ask about frequency of being bullied (or of experiencing behaviours representative of being bullied) and HBSC and EUKO also ask about bullying others. However, frequency measures and time reference periods vary. For HBSC, the frequency criterion reported in the two earliest surveys was that it happened at least once (1993/94), or once or more (1997/98), in a school term; but in the more recent five surveys it has been at least twice (2005/06; 2009/10), or at least 2 or 3 times (2001/02; 2013/14; 2017/18), in the past couple of months. For EUKO, the country data reported are for being bullied at all, or bullying others at all, over the past 12 months (2010, 2018/19). For TIMSS, frequency measures are reported without a time reference period; we have taken a scale score measure as reported on the TIMSS database, based on 6 types of bullying (2011, 2015) and 11 types in grade 4 and 14 in grade 8 (2019).

Following a standard definition of bullying (a student is being bullied when another student, or a group of students, say or do nasty and unpleasant things to him or her, when a student is teased repeatedly and when he or she is deliberately left out of things), HBSC asked a global question about bullying (How often have you been bullied at school in the past couple of months?) in the first 5 surveys. However, the 2013/14 survey included two questions specifically on being a victim of cyberbullying (see Inchley et al., 2016); but only one (How often have you been bullied through someone sending mean instant messages, wall-postings, emails and text message or had created a website that made fun of you?) was used and reported in their main analyses. The latest 2017/18 survey (see Inchley et al., 2020) included two questions on cyberbullying. One was on being a victim of cyberbullying (How often have you experienced anyone sending mean instant messages, wall postings or emails, or someone positing or sharing photos or

videos online without their permission at least once in the past couple of months); the other was a corresponding question on doing such behaviours to another person at school in the past couple of months. In both cases findings are reported for at least two or three times.

EUKO (2010, see Livingstone et al., 2011; 2018/19, see Smahel et al., 2020) provided the following introductory text: 'Sometimes children or teenagers say or do hurtful or nasty things to someone and this can often be quite a few times on different days over a period of time, for example. This can include: teasing someone in a way this person does not like, hitting, kicking or pushing someone around, leaving someone out of things'. Respondents were then asked whether they had been treated this way by someone (victims) or acted this way towards someone else in the past 12 months (2010) or past year (2018/19). Further response options then included whether this has happened 'in person face to face'; 'by mobile phones (calls, texts, image/video texts)' or 'on the internet' (response options 'Yes' or 'No') (2010) or how often this had happened 'in person face-to-face'; 'via a mobile phone or internet, computer, tablet, etc.' (response options 'Never' to 'Daily or almost daily') (2018/19).

TIMSS (2011, 2015, 2019, see Mullis et al., 2012; Mullis et al., 2016; Mullis et al., 2020) did not give a definition of bullying. Respondents are asked 'During this year, how often have any of the following things happened to you at school?' for various types of bullying behaviours (6 types, or 7 types for the 2015 data on eighth graders; see details in Appendix A). In the 2019 survey there were 11 types, plus 8th graders were also asked 'During the school year, how often have other students from your school done any of the following things to you, including through texting or the internet?' (3 types). TIMSS report scale scores, based on aggregated frequency of responses to the different types of bullying. The TIMSS scale scores (unlike all other measures reported here) are high for

low rates of being bullied, so the age trends derived were reversed to be comparable to the other surveys.

Method

Consistent with our previous review of gender differences (Smith et al., 2019a), data were obtained from the websites and reports of the surveys. These provided aggregated frequencies per country by age and gender; plus for EUKO, additional data was provided from the EU Kids Online team. We analysed the age trends for being a target/victim (all 3 surveys) and a bullying perpetrator (HBSC, EUKO). Gender breakdown is also available for HBSC, and for TIMSS 20211 and 2015 but not 2019.

The HBSC data sets all have 3 age points (11, 13 and 15 years). EUKO (2010) have data from 9-16 years; we dropped the 9-10 year data and used a 3 point age categorisation (11-12, 13-14 and 15-16 years), so as to best concord with the HBSC ages. The EUKO (2020) follow-up report has a 3 age point categorisation (9-11, 12-14, 15-16 years). The TIMSS surveys have just 2 grade points: grade 4 (about 10 years), and grade 8 (about 14 years).

For HBSC and EUKO, and given the importance of nonlinear trends from previous data, age trends in each country at each survey point were put into 5 categories: U (up=linear increase with age), S (same=no change with age), D (down = linear decrease with age), P (peak=curvilinear, highest at middle age point), or V (trough = curvilinear, lowest at middle age point). If the rate decreased from first to middle age point and was the same at the last age point, or if it was the same in the first and middle age points and decreased in the last age point, this was categorized as D (down). Corresponding decisions for increases were made for U (up) trend. For TIMSS we just classified the age trend for each country and each survey point as U (up=increase with age), S (same=no change with age), or D (down = decrease with age). We report findings in terms of these trends; the

prevalence figures on which they are based are available in Appendices B, C, D and E.

We compared trends rather than exact frequencies due to variations in measurement and survey procedures; these can lead to inconsistencies in exact prevalence estimates in cross-national surveys assessing bullying rates. Comparisons of trends should be more robust towards those biases (Görzig et al., 2021; Smith et al., 2016; Smith et al., 2019b). Statistical analysis by chi-square tests ($\chi 2$) was performed with IBM SPSS program (version 26), taking $p \leq .05$ as statistically significant.

Aims

Here we pursue four aims, using data from these three surveys.

Aim 1: we examine age trends in general bullying victimisation rates, and whether these vary by gender, and historical period. We used all HBSC data available (11, 13 and 15 years, from 1994, 1998, 2002, 2006, 2010, 2014, 2018), data from EUKO (11-16 years from 2010, 9-16 years from 2018/19), and from TIMSS (4^{th} and 8^{th} grades; from 2011, 2015, 2019). For HBSC and TIMSS it is assumed that the non-cyber questions are mainly picking up offline bullying; for EUKO 2010, the data extracted here were for 'face-to-face' (excluding 'online only').

Aim 2: we similarly examine age trends in general bullying perpetration rates, and whether these vary by gender, and historical period. We used all HBSC data available (11, 13 and 15 years, from 1994, 1998, 2002, 2006, 2010, 2014, 2018), and data from EUKO (11-16 years from 2010, 9-16 years from 2018/19).

Aim 3: we examine age trends specifically for online types of bullying – both for victimisation and perpetration. We used data from HBSC (2013/2014, 2017/2018) and EUKO (2010, 2018/19).

Aim 4: we examine for consistency of findings across the three surveys providing comparable data.

Results

Aim 1: Age trends for victim rates from 3 surveys, by gender, and historical period.

Table 2 shows data from HBSC (11, 13 and 15 years, from 1994, 1998, 2002, 2006, 2010, 2014, 2018), EUKO (11-16 years from 2010, 9-16 from 2018/19), and TIMSS (4^{th} and 8^{th} grade; from 2011, 2015, 2019). The numbers refer to the number of countries showing a particular trend in each survey.

The predominant trend from HBSC is D, with 334/504 or 66%; followed by P, with 132/502 or 26%. Rather few countries or survey years produced U, V or S patterns. This was true for both boys and girls. Nevertheless, the balance of D and P trends did vary by gender. D was higher for boys (182/252, 72%) than girls (152/252, 60%), with this being true especially for the last 2 survey periods of 2013/14 and 2017/18. P was higher for girls (81/252, 32%) than boys (51/252, 20%), this being true of 6 out of 7 survey years but most marked in the last two survey periods. The overall gender difference between D and P trends is significant on a chi-square test, $\chi^2 = 9.51$, $p < .01$.

The predominant D pattern is also found in TIMSS, in all 3 survey periods. Overall, 145/185 or 78% of countries/survey years produce a D pattern. For the 2011 and 2015 surveys this was similar for boys (60/75, 87%) and girls (64/75, 85%).

However, EUKO yields a different pattern, also varying substantially by survey period. From the 2010 survey the most common pattern was V, with 14/25 or 56%. In the 2018/19 survey, however, V is rare, and P at 8/19 or 42%, and U at 7/19 or 37%, are most frequent. D is quite infrequent; summing over both surveys it is only 6/44 or 14%.

Table 2 about here

Aim 2: Age trends for bully rates from 2 surveys, by gender, and historical period.

Table 3 shows data from HBSC (11, 13 and 15 years, from 1994, 1998, 2002, 2006, 2010, 2014) and data from EUKO (11-16 years from 2010, 9-16 years from 2018/19).

The predominant trends from HBSC are P (224/504 or 44%) and U (168/504 or 33%). However, there is a gender divide; boys more often show the U trend (100/252, 40%) whereas girls more often show a P trend (134/252, 53%). Both these gender differences are consistent for 6 out of 7 survey periods, and especially for the fifth survey period of 2005/06 and the last two survey periods of 2013/14 and 2017/18. This overall gender difference between U and P trends is significant on a chi-square test, $\chi^2 = 14.38$, $p < .001$.

By contrast, for EUKO the most common trend was U, in 2010 and 2018/19; overall U was found in 28/41 countries/surveys, or 68%.

Table 3 about here

Aim 3: Age trends for online victimisation and perpetration from 2 surveys

For online victimisation, Table 4 shows data from HBSC (11, 13 and 15 years, from 2013/2014 and 2017/18) and from EUKO (11-16 years from 2010, 9-16 years from 2018/19). The HBSC age trends are varied, but most commonly D for boys (34/87, 39%) but P (39/87, 45%) and then U (28/87, 32%) for girls. For EUKO (2010, 2020), the most common trend was U for 2010 but D for 2018/19.

Table 4 about here

For online perpetration, Table 5 shows data from HBSC (11, 13 and 15 years, from 2017/2018) and data from EUKO (11-16 years from 2010, 9-16 years from 2018/19). The HBSC age trend is mainly U for boys (31/45, 69%) and is most often U for girls (20/45, 44%) but with P also being common (17/45, 38%). For EUKO, the most common trend was U (17/25, 68%).

Table 5 about here

Aim 4: The consistency of findings from the 3 surveys

For victimisation rates, HBSC and TIMSS are in broad agreement with a predominant D

trend; but EUKO produces quite different findings, also varying by survey date (Table 2). For bullying perpetration, there is more agreement between HBSC with mainly P and U trends, and EUKO mainly U (Table 3). The patterns for cyber victimisation and perpetration are more complex, but with better agreement on cyber perpetration (mainly U) as compared to cyber victimisation with quite varied findings (Tables 5, 4).

A summary of the main findings is given in Table 6.

Table 6 about here

Discussion

The pattern of findings regarding age differences across these three large-scale surveys suggest some broad conclusions. Firstly, while not all countries in a survey show the same age trends, there is generally one trend (for victimisation) or two trends (for perpetration) that predominate; that is, the majority of countries usually show similar age trends. For HBSC and TIMSS, it is also the case the trends are consistent across different historical periods (survey dates), with an exception for the P and D trends in victimisation and bullying perpetration from HBSC. The two survey dates from EUKO do produce substantially different findings, but there were some methodological differences between the two surveys. Thirdly, it is clear that victimisation and perpetration show different age trends. Fourthly, age trends for cyber victimisation and perpetration appear more complex than for traditional victimisation. All these conclusions only apply to the age period from about 10 to 16 years. We put most weight on the HBSC findings (11 to 15 years), as they provide both victimisation and perpetration findings for both genders, over 7 consecutive historical periods.

Our first aim was to examine trends for victimisation. As shown in Table 2, the clearly predominant trend from HBSC surveys is for a steady downward (D) trend. This is in agreement with much earlier work (Smith et al., 1999; Scheithauer et al., 2006; Craig

et al. 2009). D is the predominant trend in all 7 survey points and for both genders. It is also the clearly predominant trend for all 3 TIMSS surveys, and for both genders in the two surveys where that information was available. Reasons proposed for this decline include that younger children have more children older than them in school, who are in a position to bully them; and that younger children have not yet acquired the social skills and assertiveness skills to deal effectively with bullying incidents and discourage further bullying (Smith et al., 1999). Another consideration is that younger children have a broader definition of what bullying is, including fights, which changes as they get older such that they may become more selective in reporting what is bullying (Monks & Smith, 2006; Salmivalli, 2002). These are not mutually exclusive, and all may play a role.

Even if older pupils are less likely to experience being bullied, an exception to this may occur during the transition between primary and secondary school; Pellegrini and Long (2002) highlighted an increase in being bullied experienced by pupils of both sexes at transition, possibly due to disruptions in friendships and peer group affiliations brought about through a change of school environment as well as moving from being in the oldest to the youngest group in the school setting. The timing of transition does vary between countries but is very often at around 10 to 12 years (Jessel, 2016). Thus, in the HBSC data sets, 13 year olds will be most likely to be experiencing effects of recent school transition, and also again being relatively younger in the new school environment. An increase at 13 years would lead to a peak (P) trend, and indeed this is the second main trend coming from all the HBSC data sets. By contrast, U, V and S trends are very infrequent (Table 2). Note however that the trend to be bullied by older school children outside of one's class is more prominent in Western compared to Eastern cultures (Kanatsuna, 2016), with Western countries also being overrepresented in the current data sets.

The P trends from HBSC do reveal interesting differences by gender and by historical

period. The P trend is relatively and significantly more frequent in girls than in boys; for boys, D very clearly predominates. Furthermore, this difference is most noticeable in the last two survey periods, 2012/14 and 2017/18; before that the gender differences are rather small and not always consistent. The D to P variation by gender is also found for cyber victimisation in these last two time periods (Table 4).

The peak for girls at around age 13 might be related to earlier puberty in girls; but if so, we might expect an increase in boys victimisation from ages 11 and 13 to 15, in other words a U trend, which is not the case. Another factor may be the earlier interest in social networking sites in girls compared to boys (Lenhart et al., 2015); in fact, the gender difference in cyberbullying has been shown to be due to social network use (Görzig & Ólafsson, 2013). This would be expected to manifest much more in the last two survey periods, as was found.

The data from TIMSS is more limited in just comparing 10 and 14 year olds (approximately), so cannot give P or V trends. However, the clearly predominant D trend is consistent with the HBSC findings. The findings from EUKO are much more mixed, which we consider in more detail later.

Our second aim was to examine trends for bullying perpetration. As shown in Table 3, the clearly predominant trends from HBSC surveys are P and U. P is the most frequent for girls, U the most frequent for boys; this gender difference is statistically significant, and is rather consistent over historical periods, somewhat more marked in the 2005/06 period and the last two survey periods. Here the influence of earlier puberty in girls might provide an explanation for P trends; with boys often continuing to reach puberty beyond 13 and up to 15 years, associated temptations to bully others as peer group status concerns increase at puberty could explain U trends (Pellegrini & Bartini, 2001). Perhaps in the years after puberty, young people become more socialised into understanding that you should not bully others. This explanation would predict a steeper decline in boys' perpetration rates, a few years later in

adolescence; this ptediction could be tested in future studies.

The findings from EUKO are very predominately for an upwards trend (U) at both survey points. We could not examine gender differences by age in these samples due to sample size limitations.

Our third aim was to compare age trends for cyber victimisation and perpetration, compared to traditional forms. Here, there is an implicit assumption that the HBSC figures in Tables 2 and 3 are mainly picking up traditional (offline) forms, even though this was not explicitly asked for.

Comparing cyber victimisation (Table 4) with general victimisation (Table 2), the picture for cyber victimisation is clearly more varied. There is some similarity in the predominance of P and D trends from HBSC, but with U being substantial for cyber victimisation, especially for girls, while boys are more consistently D. A substantial number of U trends is also found from EUKO. It appears that whereas being bullied generally shows a downward trajectory with age (D), this is not so strong or cyber victimisation, and girls especially do not show this trend much, but instead peak (P) or upward (U) trends, very likely linked to greater interest in social media sites and the risks involved in this.

Comparing cyber perpetration (Table 5) with general perpetration (Table 3), both U and P are the most common trends; however, whereas P predominates for general perpetration, U predominates for cyber perpetration. In both cases, U is more common for boys and P for girls. The greater upward (U) trend for cyber perpetration (and victimisation) may reflect an increase in social media use and in opportunities and skills in misuse such as cyberbullying. Motivation for bullying generally tends to be linked to status concerns with a peak in early adolescence (Salmivalli, 2010); this will be earlier in girls (experiencing puberty around 13 years) compared to boys (closer to 15 years) and provides a possible explanation for the greater P trend in girls.

Finally, we aimed to compare findings from the 3 surveys, HBSC, EUKO and TIMSS. TIMSS only provided data on victimisation, and only at two ages, but the findings generally concurred with those from HBSC. However, EUKO gave distinctly different findings, especially as regards victimisation (Table 2). In contrast to the prevailing D or else P trends from HBSC and TIMSS, EUKO 2010 found mainly V, while EUKO 2018/19 found mainly P or U, with few countries showing D. EUKO did only survey young people on the internet, but this is clearly the majority in most countries. A difference in procedure is that EUKO used face-to-face interviews, as compared to school-based surveys in HBSC and TIMSS; this might well affect prevalence rates (as perceived anonymity may vary in these two situations) but would seem unlikely to affect age differences unless such procedural differences interact noticeably with age. Finally, EUKO does have the smallest sample sizes of the 3 surveys, 1,000 per country in 2010, and we only used three of the four age categories for the 2010 age comparisons (i.e., 75% of the sample), so the reliability of the findings as regards age trends might be questioned. Also, the age division between the different survey periods is not strictly comparable.

Strengths and limitations

Strengths of our analyses lie in the ability to look at trends over 2 or 3 age points, in large samples, by gender, and especially in the case of HBSC surveys, by historical period. However this review also has important limitations. All the data relies on self-report from pupils. Data from peer nominations might give a different picture (Salmivalli, 2002). Also, only the (approximately) 10 to 16 year age range is covered (11 to 15 in HBSC surveys), so we cannot comment on younger, or older, age ranges. For younger children there are difficult issues about definition and measurement which limit comparison with middle childhood and adolescence (Holloway et al., 2013; Monks & O'Toole, 2021). For older ages, Cassidy et al.

(2021) and Wang et al. (2019) suggest a continuing but decreasing incidence of bullying and cyberbullying through the college and adult years.

Limitations also apply in terms of measurement and procedural issues that affect the comparisons of different cross-national surveys in general. Regarding bullying research, several factors (e.g., definitions and translations of the term *bullying*, time references periods considered, measurement scale used, sampling, nature of non-responses) have been shown to produce variations between surveys in terms of countries' prevalence rates and rank order (Görzig et al., 2021; Smith et al., 2016; Smith et al., 2019). We have attempted to circumvent these issues by looking at trends rather than exact estimates. However, bias in measurement may still have affected our data, especially if any of the factors leading to biases would have been confounded with age.

Summary: research and practical implications

Our analyses found predominant trends for age changes in victimization and perpetration, mainly downward (D) for victimization, and peaking at 13 years (P) or continuing upward (U) for perpetration (Table 6). These trends are in broad agreement with much of the earlier research, reviewed in the Introduction, generally with smaller samples or number of countries involved. Explanations for the downward trend in victimisation have been discussed by Smith et al. (1999) and Salmivalli (2002).

An explanation for the trends in perpetration, and especially for the gender differences, was proposed in terms of differing age of puberty – typically 1 to 1.5 years earlier in females. Puberty generally brings increased concern for social status, which may mean for some pupils greater incentives or rewards for bullying others in order to demonstrate status (Ellis et al, 2012; Volk et al., 2012). However, by later adolescence there is thought to be greater socio-emotional control (Blakemore & Mills, 2014). and combined with personal and social

curriculum work, as well as more specific anti-bullying work in schools, this may lead to reductions in involvement (both in victimization and in perpetration).

Besides being an explanation for the general age trends, puberty might help explain the gender differences (for the age range considered here). Specifically, these considerations predict the higher P trends for girls; they would also predict a later P trend for boys, which could be tested, ideally on longitudinal data.

Some historical differences (Table 6) remain to be explained. The age of puberty does show a secular trend (getting earlier in recent decades). Eckert-Lind (2020) reported a meta-analysis of 30 studies, showing that the age at thelarche (breast budding, indicating start of puberty in girls) has decreased by a mean of 0.24 years per decade from 1977 to 2013. While not insignificant, this change is relatively small, amounting to about 4 months for the 14 year span of the HBSC reports.

The main explanation we propose for the historical changes found, is social media use. We know both that this has grown enormously amongst young people (Ortiz-Ospina, 2019) since around 2006; furthermore, girls are more interested in social networking sites (SNS), on which much cyberbullying/victimisation occurs (it also occurs on internet gaming sites, which boys typically spend more time on, but this is generally less intensive than use of SNS by girls (Weiser, 2004).

We have reported average trends over countries, but not all countries show the same age trends, and this remains to be studied further. Countries differ in, for example, mean age of puberty, and also internet penetration and use. Future research could study age trends in online and offline bullying in relation to puberty, and social media use, which we have hypothesised to be playing a significant role. Relating age trends in bullying to how other factors change with age, such as empathy and moral disengagement, could also be informative.

These findings may also be of practical import, for schools and educational institutions implementing anti-bullying programs and curricula. Curricula may need to be sensitive to age and gender considerations, especially in the adolescent period. While the predominant downward trend for victimisation is encouraging, the effects of puberty in perturbing this need to be considered. Effects of puberty are perhaps even more important in considering prevention of bullying perpetration (Ellis et al., 2016). Efforts to counter cyberbullying may need to take account of the importance of social networking site use for adolescent girls in particular.

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Table 1. Characteristics of three large cross-national surveys

	HBSC	**EU Kids Online**	**TIMSS**
What is measured	Being bullied and bullying others	Being bullied and bullying others	Being bullied
Age range (years); Gender	11, 13 and 15; boys and girls separately	9 to 16; separated into 9-10, 11-12, 13-14 and 15-16 years	4th and 8th grades (about 10 and 14); boys and girls separately for 2011 and 2015
Dates of survey	1993/94, 1997/98, 2001/02, 2005/06, 2009/10, 2013/14, 2017/18	2010, 2018/19	2011/2015/2019
Number of countries surveyed	Around 40; varies by survey year: 1993/94, n=24 1997/98, n=29 2001/02, n=35 2005/06, n=39 2009/10, n=38 2013/14, n=42 2017/18, n=45	25 in 2010; 19 for all questions related to bullying in 2018/19.	Around 60; varies by survey year: 2011, n= 38 2015, n=37 2019, n=35
Sample size per country	Minimum 1,500	2010: About 1,000 children who used the internet 2018/19: range of 935 (Romania) to 2892 (Spain) children who used the internet.	5,000-6,000
How administered	School-based survey	2010: Interview given face-to-face in child's home; parents may be in vicinity. 2018/19: Differed by country (household, school, online survey)	School-based survey
Main types of bullying	General (1993/94, 1997/98, 2001/02, 2005/06, 2009/10, 2013/14, 2017/18). Cyber (2013/14, 2017/18).	Face-to-face and by mobile phone or on the internet (2010). Face-to-face and cyber (2018/19).	Face-to-face (2011, 2015, 2019). Cyber (2019).

Table 2. Age trends for victim from all 3 surveys by survey and gender

SURVEY	YEAR	GENDER	TRENDS				
			U	**D**	**P**	**V**	**S**
HBSC	1993/94 (n= 24)	B	0	19	4	1	0
		G	0	19	5	0	0
	1997/98 (n= 29)	B	4	12	11	1	1
		G	3	16	10	0	0
	2001/02 (n= 35)	B	0	25	10	0	0
		G	0	19	15	1	0
	2005/06 (n= 39)	B	1	28	6	4	0
		G	0	29	9	1	0
	2009/10 (n= 38)	B	1	28	7	2	0
		G	2	24	8	1	3
	2013/14 (n= 42)	B	1	37	4	0	0
		G	1	23	16	1	1
	2017/18 (n= 45)	B	1	33	9	2	0
		G	0	22	18	4	1
	TOTAL HBSC	B	8	182	51	10	1
		G	6	152	81	8	5
		Both	**14**	**334**	**132**	**18**	**6**
EUKO	2010 (n= 25)	Both	2	4	5	14	0
	2018/19 (n= 19)	Both	7	2	8	2	0
	TOTAL EUKO	**Both**	**9**	**6**	**13**	**16**	**0**
TIMSS	2011 (n= 38)	B	6	29	-	-	3
		G	7	31	-	-	0
	2015 (n= 37)	B	6	31	-	-	0
		G	3	33	-	-	1
	2019 (n= 35)	Both	6	21	-	-	8
	TOTAL TIMSS	**Both**	**28**	**145**	**-**	**-**	**12**

Table 3. Age trends for bully from 2 surveys by survey and gender

SURVEY	YEAR	GENDER	TRENDS				
			U	**D**	**P**	**V**	**S**
HBSC	1993/94	B	5	6	12	1	0
	(n= 24)	G	1	7	16	0	0
	1997/98	B	9	7	13	0	0
	(n= 29)	G	7	6	16	0	0
	2001/02	B	14	4	16	1	0
	(n= 35)	G	12	5	16	2	0
	2005/06	B	21	2	10	4	2
	(n= 39)	G	14	4	21	0	0
	2009/10	B	3	9	24	2	0
	(n= 38)	G	6	1	31	0	0
	2013/14	B	21	6	8	7	0
	(n= 42)	G	14	6	17	2	3
	2017/18	B	27	5	7	6	0
	(n= 45)	G	14	9	17	1	4
	TOTAL	B	100	39	90	21	2
	HBSC	G	68	38	134	5	7
		Both	**168**	**77**	**224**	**26**	**9**
EUKO	2010	Both					
	(n= 25)		17	0	5	3	0
	2018/19	Both					
	(n= 16)		11	0	4	1	0
	TOTAL	**Both**					
	EUKO		**28**	**0**	**9**	**4**	**0**

Table 4. Age trends for cybervictimisation from 2 surveys by survey and gender

SURVEY	YEAR	GENDER	TRENDS				
			U	**D**	**P**	**V**	**S**
HBSC	2013/14 (n= 42)	B	5	15	8	7	7
		G	16	11	11	1	3
		Both	21	26	19	8	10
	2017/18 (n= 45)	B	7	19	7	12	0
		G	12	4	28	0	1
		Both	19	23	35	12	1
	TOTAL HBSC	B	12	34	15	19	7
		G	28	15	39	1	4
		Both	**40**	**49**	**54**	**20**	**11**
EUKO	2010 (n= 25)	Both	12	2	7	4	0
	2018/19 (n= 17)	Both	2	9	3	3	0
	TOTAL EUKO	**Both**	**14**	**11**	**10**	**7**	**0**

Table 5. Age trends for cyber perpetration from 2 surveys by survey and gender

SURVEY	YEAR	GENDER	TRENDS				
			U	**D**	**P**	**V**	**S**
HBSC	2017/18 (n= 45)	B	31	1	6	7	0
		G	20	4	17	1	3
		Both	**51**	**5**	**23**	**8**	**3**
EUKO	2010 (n= 25)	Both	17	0	3	4	1
	2018/19 (n=19)	Both	8	4	2	4	1
	TOTAL EUKO	**Both**	**25**	**4**	**5**	**8**	**2**

Table 6. Summary of main findings regarding age trends.

	Main trends	**Gender differences**	**Historical differences**
(1) victim	**D** (HBSC, TIMSS) **V** (EUKO 2020) **P, U** (EUKO 2018/19)	D higher for boys (HBSC) P higher for girls (HBSC)	Gender difference higher in last 2 survey years (HBSC)
(2) bully	**P, U** (HBSC) **U** (EUKO)	U higher for boys (HBSC) P higher for girls (HBSC)	Gender difference higher in 2005/06 and in last 2 survey years (HBSC)
(3) online victim	**P, D, U** (HBSC) **U, D, P** (EUKO)	D higher for boys (HBSC) P, U higher for girls (HBSC)	 More U in 2010 but more D in 2018/19 (EUKO)
(4) online bully	**U, P** (HBSC) **U** (EUKO)	P higher for girls (HBSC)	

Appendices

Appendix A. Fuller characteristics of the three large cross-national surveys.

	HBSC	**EU Kids Online**	**TIMSS**
Definition	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.	Sometimes children or teenagers say or do nasty or hurtful things to someone and this can often be quite a few times on different days over a period of time, for example. This can include: Teasing someone in a way this person does not like; Hitting, kicking or pushing someone around; Leaving someone out of things. When people are hurtful or nasty to someone in this way, it can happen: face to face (in person), by mobile phones (texts, calls, video clips), on the internet (e-mail, instant messaging, social networking, chatrooms)	None
Power imbalance	Yes	Not mentioned	Not mentioned
Types of bullying asked about	No specific types, but 2 questions on cyberbullying victimisation in 2013-14 survey; and two questions on cyberbullying perpetration and victimisation in 2017-18 survey.	<u>Face-to-face and Cyberbullying:</u> 2010: Face-to-face (in person); by mobile phones (calls, texts, image/video texts); on the internet (social networking site, instant messaging, email, gaming website, chat room, some other way on internet). 2018/19: In person face-to-face; Via a mobile phone or internet,	Made fun of or called names; left out of games or activities by other students; someone spread lies about me; something was stolen from me; hit or hurt by other student(s) (e.g. shoving, hitting, kicking); made to do things I didn't want to do by other students. The 2019 survey include the following

	HBSC	EU Kids Online	TIMSS
		computer, tablet, etc. Types of cyberbullying: a) Nasty or hurtful messages were sent to me b) Nasty or hurtful messages were passed around or posted where others could see c) I was left out or excluded from a group or activity on the internet d) I was threatened on the internet e) I was forced to do something I did not want to do (*2018/19 only*) f) Other nasty or hurtful things happened to me on the internet	types for 4th grade students: 1) made fun of me or called me names, 2) left me out of their games or activities, 3) spread lies about me, 4) stole something from me, 5) damaged something of mine on purpose, 6) hit or hurt me, 7) made me do things I didn't want to do, 8) sent me nasty or hurtful message online, 9) shared nasty or hurtful message about me online, 10) shared embarrassing photos of me online, 11) threatened me. For 8th grade students, there were some extra items as such 'shared my secrets with others', 'refused to talk to me', and 'insulted a member of my family'.
Form of question and time reference period	2013-14: Two questions on cyberbullying victimisation of which one is reported: Have you been a victim through someone sending mean instant message, wall-postings, emails and text message or had created a website that made fun of them. No time reference period. 2017/18: two questions, one on cyberbullying victimisation (had experienced anyone	2010: asked about victimisation (Has someone acted in this kind of hurtful or nasty way to you in the past 12 months?) and perpetration: (Have you acted in a way that might have felt hurtful or nasty to someone else in the past 12 months?) 2018/19: asked about victimisation (in the past year, has anyone ever treated you in such a hurtful or nasty way?) and on perpetration (in the past year, have you ever treated someone else in a hurtful or nasty	During this year, how often have any of the following things happened to you at school?

	HBSC	EU Kids Online	TIMSS
	sending mean instant messages, wall postings or emails, or someone positing or sharing photos or videos online without their permission at least one in the past couple of months) and one on cyberbullying perpetration (how often they had taken in bullying (an) other person (s) at school in the past couple of months).	way?).	
Frequency	I have not been bullied at school in the past couple of months; it has only happened once or twice; 2 or 3 times a month; about once a week; several times a week. [Country scores reported for it happened at least once (1993/94), or once or more (1997/98), in a school term; or at least twice (2005/06; 2009/10), or at least 2 or 3 times (2001/02; 2013/14; 2017/18), in the past couple of months].	2010: If answered 'yes' to the general bullying question (including face-to-face or online) 'how often' was assessed for victimisation as well as perpetration <u>in general</u>: Every day or almost every day; once or twice a week; once or twice a month; less often; never; don't know. [Country scores reported for those who responded 'yes' to the general question] 2018/19: If answered 'yes' to the general bullying question (including face-to-face or online) 'how often' was assessed for victimisation only and for face-to-face and cyberbullying <u>separately</u>: Never; A few times; At least every month; At least every week; Daily or almost daily	At least once a week; once or twice a month; a few times a year; never. [Country scores compiled over 6 types and summarised as almost never, about monthly, about weekly, and average scale score]

	HBSC	**EU Kids Online**	**TIMSS**
		[Age scores provided for those who answered ‘a few times’ or more]	

Appendix B. HBSC average of VICTIMS by age and year of data collection.

			11	13	15
1993/94	Victims	B	53	50	40
		G	46	41	29
1997/98	Victims	B	25	25	21
		G	22	22	16
2001/02	Victims	B	40	38	28
		G	35	34	25
2005/06	Victims	B	16	15	11
		G	13	13	8
2009/10	Victims	B	15	13	10
		G	12	11	7
2013/14	Victims	B	15	13	9
		G	11	11	8
	Cybervictims	B	4	3	3
		G	3	4	3
2017/18	Victims	B	12	11	8
		G	11	10	8
	Cybervictims	B	13	12	12
		G	12	15	13

Appendix C. HBSC average of BULLIES by age and year of data collection.

			11	13	15
1993/94	Bullies	B	53.3	56.3	52
		G	35.3	38.5	30.7
1997/98	Bullies	B	27	29	25
		G	20	22	18
2001/02	Bullies	B	37	44	42
		G	24	30	28
2005/06	Bullies	B	12	15	16
		G	6	9	7
2009/10	Bullies	B	11	13	10
		G	5	10	7
2013/14	Bullies	B	10	12	12
		G	5	6	6
2017/18	Bullies	B	7	8	9
		G	4	5	5
	Cyberbullies	B	10	12	14
		G	6	9	8

Appendix D. EUKO average of VICTIMS and BULLIES online and offline by year of data collection.

			9-10	11-12	13-14	15-16
2010	Victims	Online	2.8	5.1	6.1	8.2
		Offline	12.8	12.8	12.2	14.5
	Bullies	Online	0.8	1.7	2.9	5.0
		Offline	7.6	8.5	10.9	14.6
2018/19	Victims	Online	7.8	13.4	19.6	21.2
		Offline	14.1	17.0	21.9	20.8
	Bullies	Online	3.4	6.5	10.7	13.5
		Offline	5.6	8.3	12.3	14.8

Appendix E. TIMSS average of VICTIMS by age and year of data collection.

		4^{TH} GRADE	8^{TH} GRADE
TIMSS 2011	Victim	10.11	15.07
TIMSS 2015	Victim	10.3	10.3
TIMSS 2019	Victim	9.87	10.06

Note: TIMSS scores are higher for *less* victimization.