

# Cyberbullying perpetration and victimization among children and adolescents : a systematic review of longitudinal studies

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*Telematics and Informatics*, 25 Jan. 2020

Volume 49, June 2020, 101362

Published version: <https://doi.org/10.1016/j.tele.2020.101362>



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**ACCEPTED MANUSCRIPT**

Cyberbullying perpetration and victimization among children and adolescents:

A systematic review of longitudinal studies

Cite as:

Camerini, A. L., Marciano, L., Carrara, A., & Schulz, P. J. (2020). Cyberbullying  
perpetration and victimization among children and adolescents: A systematic review of  
longitudinal studies. *Telematics and Informatics*, 101362.

<https://doi.org/10.1016/j.tele.2020.101362>

**Abstract**

In this systematic review of exclusively longitudinal studies on cyberbullying perpetration and victimization among adolescents, we identified 76 original longitudinal studies published between 2007 and 2017. The majority of them approached middle school students in two waves at 6 or 12 months apart. Prevalence rates for cyberbullying perpetration varied between 5.3 and 66.2 percent, and for cyberbullying victimization between 1.9 and 84.0 percent. Person-related factors (e.g., traditional bullying, internalizing problems) were among the most studied concepts, primarily examined as significant risk factors. Evidence on the causal relationships with media-related factors (e.g., (problematic) Internet use), and environmental factors (e.g., parent and peer relations) was scarce. This review identified gaps for future longitudinal research on cyberbullying perpetration and victimization in childhood and adolescence.

**Keywords:** cyberbullying perpetration, victimization, children, adolescents, longitudinal, systematic review

## **Cyberbullying perpetration and victimization among children and adolescents:**

### **A systematic review of longitudinal studies**

#### **1. Introduction**

In 2018, almost every adolescent in the U.S. had access to a smartphone and 45 percent were near-constantly online, preferably on video and social media platforms such as YouTube, Instagram, and Snapchat (Pew Research Center, 2018). Similar data are available for European countries (Mascheroni & Ólafsson, 2016; Tsitsika et al., 2014). The pervasiveness of mobile technologies and social media among children and adolescents has refueled concerns about adverse health and psychosocial outcomes of cyberbullying perpetration and victimization (Garett, Lord, & Young, 2016; Hamm et al., 2015; Kowalski, Limber, & McCord, 2018). Indeed, while “traditional” bullying in offline contexts remains a problematic phenomenon (Modecki, Minchin, Harbaugh, Guerra, & Runions, 2014), the diffusion of online forms of bullying is by now considered a pressing issue, too, especially considering that cyberbullying was shown to be highly correlated with offline bullying (Görzig & Machackova, 2015), but it has unique features and worrisome prevalence rates. Prevalence rates of cyberbullying victimization reach up to 56.9 percent when assessed with reference to the last 6 months and 65.0 percent when assessed with reference to respondents’ lifetime (Brochado, Soares, & Fraga, 2017). Cyberbullying victimization peaks at 14 years of age with a constant decrease up to the age of 19 (Sumter, Baumgartner, Valkenburg, & Peter, 2012). More recent studies showed prevalence rates between 14 and 22 percent already in elementary school children (e.g., DePaolis & Williford, 2015). When it comes to cyberbullying perpetration, a scoping review of social media studies revealed that prevalence rates ranged from 5.8 to 29.0 percent (Hamm et al., 2015).

Cyberbullying perpetration is commonly defined as "...any behavior performed through electronic or digital media by individuals or groups that repeatedly communicates hostile or

aggressive messages intended to inflict harm or discomfort on others. In cyberbullying incidents, the identity of the cyberbully may or may not be known. Cyberbullying can occur through electronically mediated communication at school; however, cyberbullying behaviors commonly occur outside school as well " (Tokunaga, 2010, p. 278). There is an ongoing debate on whether cyberbullying is an extension of traditional bullying or a distinct form in itself (Menesini, 2012; Thomas, Connor, & Scott, 2015). Unique characteristics of bullying in cyberspace are its potentially ubiquitous nature as it can occur 24 hours seven days a week, the potential anonymity of the perpetrator, and the hypothetically larger audience making already single cyberbullying incidents a considerable threat for the victim (Nocentini et al., 2010; Slonje & Smith, 2008; Spears, Slee, Owens, & Johnson, 2009).

Although a number of reviews and meta-analyses have synthesized the plethora of research on cyberbullying perpetration and victimization (e.g., Chen, Ho, & Lwin, 2017; Guo, 2016; Hamm et al., 2015; John et al., 2018; Kowalski, Giumetti, Schroeder, & Lattanner, 2014; Moore et al., 2017; Tokunaga, 2010; Zych, Baldry, Farrington, & Llorent, 2018), past (meta-analytic) reviews included both longitudinal as well as cross-sectional studies. By not differentiating between the two study designs, they blend evidence on causality in longitudinal studies with weaker or stronger evidence from cross-sectional studies. Therefore, in the current review, we only look at studies that provide longitudinal evidence. It is important to know what are the causes and consequences of cyberbullying perpetration and victimization because they have a vast reach and will likely endure in the near future. Furthermore, as above, one could argue that including traditional bullying in the measure of cyberbullying, without differentiating between the two, weakens the evidence from longitudinal studies. Therefore, although we recognize that there are overlaps between traditional bullying and cyberbullying (Görzig & Machackova, 2015), we decided to focus on those studies that treated cyberbullying

perpetration and victimization as unique concepts and not in combination with traditional bullying and victimization.

## **2. Methods**

### **2.1. Search strategy**

In January 2018, we systematically searched twelve academic databases for publications until 31 December 2017: Communication and Mass Media Complete, Psychology and Behavioral Sciences Collection, PsycINFO, PsychARTICLES, and CINAHL (Cumulative Index to Nursing & Allied Health) (all via EBSCOhost), ERIC (Educational Resource Information Center) and ProQuest Sociology (both via ProQuest), Medline (via ProQuest, ISI Web of Knowledge, OVID, and PubMed), Web of Science, PubMed, EMBASE, and CENTRAL (Cochrane Central Register of Controlled Trials). In addition, we searched in the first 100 entries of Google Scholar, ProQuest Dissertations, Theses Global, and reference lists of topic-related reviews and meta-analyses. Our search strategy included terms with reference to the context (e.g. cyber\*, Internet, online), activity (e.g. bully\*, victim\*, harass\*), study population (e.g. child\*, adolescent\*, youth), and methodology (e.g. longitudinal, long term, prospect), which we combined with the Boolean AND and OR-operator to search in title or abstract (see Appendix A). We performed the systematic review following the PRISMA guidelines (Shamseer et al., 2015).

### **2.2. Study selection**

We imported all extracted publications into Zotero to remove any duplicates. After duplicate removal, the first three authors screened identified titles and abstracts for eligibility. Inter-coder reliability for title and abstract screening was strong (Fleiss' kappa = .851). Full text screening of retained publications was again performed by the first three authors. Studies were included in the systematic review if they were published in English, their title and/or abstract dealt with

any form of cyberbullying perpetration and/or victimization, made use of empirical longitudinal data from children and/or adolescents of up to 18 years of age. Publications were excluded if they referred to traditional bullying or victimization only or combined measures of traditional bullying and cyberbullying, if they referred to exposure to (new) media violence productions (e.g., videogames, fictional content, pornography), online sexual or dating violence, stalking, if the sample included emerging young adults above 18 years of age or older populations, or if the data stemmed from qualitative, cross-sectional, intervention, clinical, or experimental studies. Each author screened 101 publications; 40 of these were evaluated by all authors to obtain a measure of inter-coder reliability, which was again strong (Fleiss' kappa = .894). At each stage, discrepancies were resolved through consensus.

### **2.3. Data extraction**

The following information were extracted for each study: aspects related to the assessment of cyberbullying perpetration and/or victimization (number of items, time reference, informant, place and format of data collection), characteristics of the longitudinal design (time-frame, number of waves, country), information on the analytical sample (% of males, age, prevalence rates of cyberbullying perpetration and victimization), studied predictors and outcomes as well as underlying theories or models (if any), type of statistical analyses, significant causal relationships with focus on cyberbullying perpetration and victimization, and, finally, control variables considered in multivariate analyses.

### **2.4. Methodological quality assessment**

We assessed the quality of each study by considering: (1) sampling procedure, i.e. random or not, (2) reliability check for multi-item measures of cyberbullying perpetration and/or victimization, (3) the dropout rate (in %) between the initial and the final wave, (4) whether a

check for systematic dropout by comparing the initial sample with the analytical sample was performed, and (5) the type of missing data handling.

### **3. Results**

#### **3.1. Description of selection process**

As shown in the PRISMA flowchart in Figure 1, the database search resulted in 3567 publications, including 1827 duplicates. After title and abstract screening, 178 full texts based on the initial search and 46 full texts based on an additional hand search were screened for eligibility resulting in 76 retained studies published in 75 journal articles and one thesis.<sup>1</sup> Detailed characteristics of all included studies are available in Appendix B and C in the Supplement.

[Figure 1 about here]

All retained studies in this systematic review were published between 2007 and 2017, with a peak of 21 publications in 2016 (Figure 2). During this decade, the majority of publications appeared in journals predominantly located in the area of psychology (39 [52%]), medicine (10 [13%]), and social sciences/criminology (8 [11%]).

[Figure 2 about here]

#### **3.2. Study design**

The great majority of longitudinal studies included two waves (55 [72%]), 14 studies collected data at three, and the remaining seven studies at four or five time points. The length between the first and the last wave differed considerably with the shortest study lasting for 5 consecutive days (Espinoza, 2015) and the longest two for 48 months (Hemphill & Heerde, 2014; Kim, Song, & Jennings, 2017). The most frequent study designs included a baseline and a follow-up assessment after 6 months (16 [21%]) or 12 months (22 [29%]). Data collection was typically

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<sup>1</sup> All studies included in this review are marked with an asterisk in the reference list.

carried out in school settings ranging from 1 to 156 (Salmivalli, Sainio, & Hodges, 2013) schools for a single study (*median* = 6). Since schools were invited to collaborate in the study, this hurdle oftentimes resulted in convenience samples at school level. Three studies used alternative options for data collection including commercial online panels (Korchmaros, Mitchell, & Ybarra, 2014; Sumter et al., 2012) and a social media platform (Wright, 2015b). Seventy studies used self-report measures of cyberbullying, while five combined self-reports with peer nominations (Felmlee & Faris, 2016; Gradinger, Strohmeier, Schiller, Stefanek, & Spiel, 2012; Salmivalli et al., 2013; Wright, 2014a; Wright & Li, 2013). Only one study exclusively relied on peer nominations (Badaly, Kelly, Schwartz, & Dabney-Lieras, 2013). Paper-and-pencil questionnaires were used 26 (34%), online questionnaires in 14 (18%) studies, while the remainder combined different modes or did not specify them.

### **3.3. Study samples**

The longitudinal studies considered in this review were conducted in Europe (32 [42%]), North America (29 [38%]), Oceania (8 [11%]), and Asia (6 [8%]) (1 study location unknown). The analytical sample size varied greatly with the smallest study including 60 (Gonzalez-Cabrera, Calvete, Leon-Mejia, Perez-Sancho, & Peinado, 2017) adolescents and the largest 7850 (Salmivalli et al., 2013) (*median* = 838). On average, 47.9 percent of study participants were male. Considering only studies that reported an average age at baseline, students' age ranged from 10.5 to 15.5 years ( $M = 13.1$ ), making middle school students the preferred study population.

### **3.4. Assessment and prevalence rates of cyberbullying and cyber-victimization**

Longitudinal studies investigated equally often cyberbullying perpetration (52 [68%]) and cyberbullying victimization (55 [72%]). In addition, few studies considered being a bystander of cyberbullying perpetration (Gonzalez-Cabrera et al., 2017; Pabian, Vandebosch, Poels, Van

Cleemput, & Bastiaensens, 2016), while one study looked at the other side of the coin and also considered cyber prosocial behavior asking, e.g., “How often do you help other peers online or through text messages?” (Wright, 2014a). Another study assessed cyber-trolling in addition to cyberbullying, which differs from cyberbullying in that the intention of the disruptive online behavior is typically not clear (Wright, 2017b). Single-item indicators were a common form of measurement of cyberbullying perpetration and victimization (respectively 14 [18%] and 15 [20%]). In several studies, researchers introduced a general definition of cyberbullying (usually adapted from Olweus (1993) and complemented with examples) followed by a single question whether the person has done or experienced this behavior in a given time-frame (Pabian & Vandebosch, 2014, 2016a, 2016b, 2016c; Pabian et al., 2016). On the other hand, some studies chose a more detailed assessment of cyberbullying by differentiating between sub-dimensions such as verbal bullying (i.e., insulting someone online), social exclusion (i.e., excluding someone from online conversations or social media groups), or social manipulation (e.g., spreading rumors about someone online), or by separating public from non-public cyberbullying perpetration (Festl, 2016). The time period to refer to when reporting on cyberbullying or experiences of such a behavior varied from “the last day” to “ever”. However, most studies referred to the last 6 (12 [16%]) or 12 months (17 [22%]).

Twenty-seven studies provided prevalence rates for cyberbullying, which, dependent on the type of assessment and reference period, varied between 5.3 and 66.2 percent (*median* = 11.7%) at T1. Nearly half of the studies (35) reported on prevalence rates for cyberbullying victimization ranging from 1.9 to 84.0 percent (*median* = 14.4%) at T1. According to seven studies, the percentage of adolescents classified as cyberbully-victims ranged between 2.3 and 20.4 percent (*median* = 8.6), while two studies identified 23.4 respectively 28.8 percent of study participants as cyberbullying bystanders.

### **3.5. Qualitative summary of longitudinal findings**

In 33 out of 76 studies (43%), longitudinal research was explicitly guided by theory such as the Theory of Planned Behavior (Ajzen, 1985) (n=3), General Strain Theory (Agnew, 1992) (n=3), Social Information-Processing Model (Crick & Dodge, 1996) (n=3), or Social Cognitive Theory (Bandura, 1986) (n=3). Two studies chose the Ecological System Theory (Bronfenbrenner, 1979), focusing on the larger social context in which children and adolescents are embedded.

Structural equation modeling is a powerful statistical method to test theoretically sound predictors, mediators, and outcomes of cyberbullying and cyber-victimization. Thirty-one studies (41%) applied this method to analyze causal relationships. Of these, 13 studies (17%) tested cross-lagged models looking at the reciprocal effects between cyberbullying perpetration and/or cyberbullying victimization and related factors.

To summarize longitudinal findings on predictors and outcomes of cyberbullying perpetration and victimization, we grouped the predictor and outcome variables into person-related factors (e.g., socio-demographics, personal beliefs, but also internalizing symptoms such as anxiety or depression and externalizing problem behaviors such as delinquency or substance use), media-related factors (e.g., Internet use and problematic use), and environmental factors (e.g. school climate, relationship with both peers and parents, parental mediation). Similar and, thus, comparable categorizations have been used in other reviews (e.g., Chen et al., 2017; Kowalski et al., 2014; Zych, Farrington, & Ttofi, 2018).

Table 1 summarizes the number of longitudinal studies for each concept studied together with cyberbullying perpetration and cyberbullying victimization as a predictor and as an outcome.

[Table 1 about here]

In the following, we summarize most of the results according to our tripartite division. A brief description of the findings of each study can be found in Appendix C.

### ***3.5.1. Person-related factors***

Traditional bullying and peer victimization, internalizing symptoms, and externalizing problem behaviors were the most studied person-related factors in relation to cyberbullying perpetration and victimization.

More than twenty studies looked at the causal relationship between cyberbullying and traditional bullying (and victimization). Of these, twelve studies found that traditional bullying, i.e., in the school setting, significantly positively predicts cyberbullying perpetration at a later point (Athanasiaades, Baldry, Kamariotis, Kostouli, & Psalti, 2016; Fanti, Demetriou, & Hawa, 2012; Festl, 2016; Hemphill & Heerde, 2014; Hemphill, Kotevski, et al., 2012; Jose, Kljakovic, Scheib, & Notter, 2012; Kim et al., 2017; Low & Espelage, 2013; Murphy, 2009; Sticca, Ruggieri, Alsaker, & Perren, 2013; Yang et al., 2013; You & Lim, 2016). One study found a negative causal relationship (del Rey, Elipe, & Ortega-Ruiz, 2012). Concerning the reverse causal relationship, a cross-lagged analysis by Jose et al. (Jose et al., 2012) showed that cyberbullying perpetration is also a significant positive predictor of traditional bullying.

When it comes to the causal relationship with cyberbullying victimization, traditional victimization was identified as a risk factor in ten studies (Athanasiaades et al., 2016; del Rey et al., 2012; Erentaite et al., 2012; Fanti et al., 2012; Hemphill, Tollit, Kotevski, & Heerde, 2015; Holfeld & Leadbeater, 2015; Jose et al., 2012; Murphy, 2009; Pabian & Vandebosch, 2016a; van den Eijnden, Vermulst, van Rooij, Scholte, & van de Mheen, 2014), while three studies reported on cyberbullying victimization being a significant longitudinal risk factor of traditional victimization (Holfeld & Leadbeater, 2015; Jose et al., 2012; Pabian & Vandebosch, 2016a). Furthermore, traditional bullying was found to be a significant positive predictor of cyberbullying victimization in two studies (Athanasiaades et al., 2016; Yang et al., 2013), and a significant negative predictor in one study (del Rey et al., 2012). Yet, another study found differential effects for physical traditional bullying, which significantly negatively predicts cyberbullying victimization six weeks later only in boys but not in girls (Murphy, 2009). To

complete the picture, del Rey et al. (2012) found that cyberbullying victimization significantly negatively predicts traditional bullying three months later.

With regards to the reciprocal time-lagged relationships between cyberbullying perpetration and victimization, Jose et al. (2012) identified cyberbullying perpetration as a significant positive predictor of cyberbullying victimization, although more studies found cyberbullying victimization to be a significant positive predictor of later cyberbullying perpetration (Festl & Quandt, 2016; Holfeld & Leadbeater, 2015; Pabian & Vandebosch, 2016a; Wright, 2015b; Wright & Li, 2013).

Internalizing symptoms frequently identified as significant negative longitudinal outcomes of cyberbullying victimization are (social) anxiety, perceived loneliness, and depression (Calvete, Orue, & Gamez-Guadix, 2016; Cole et al., 2016; Fahy et al., 2016; Gamez-Guadix, Orue, Smith, & Calvete, 2013; Gonzalez-Cabrera et al., 2017; Herge, La Greca, & Chan, 2016; Landoll, La Greca, Lai, Chan, & Herge, 2015; Rose & Tynes, 2015; Salmivalli et al., 2013; Schultze-Krumbholz, Jäkel, Schultze, & Scheithauer, 2012; Smokowski, Evans, & Cotter, 2014; Wright, 2015b, 2016b, 2016a, 2017c). Fewer studies have also found mental health problems (including emotional problems), negative self-cognitions, perceived mistrust and defectiveness, negative body image, and anger to be significantly positively predicted by cyberbullying victimization measured at an earlier time point (Bannink, Broeren, van de Looij-Jansen, de Waart, & Raat, 2014; Calvete et al., 2016; Cole et al., 2016; Espinoza, 2015). Only one study found a significant causal relationship between cyberbullying perpetration and social anxiety, with perpetrators experiencing lower levels of social anxiety 12 months later (van den Eijnden et al., 2014).

Furthermore, internalizing symptoms were studied as predictors of cyberbullying perpetration and victimization. Among them, depression significantly increased future experiences of cyberbullying victimization (Frison, Subrahmanyam, & Eggermont, 2016;

Gamez-Guadix et al., 2013; Hemphill, Kotevski, & Heerde, 2015; Modecki, Barber, & Vernon, 2013; Rose & Tynes, 2015), so did (social) anxiety (Pabian & Vandebosch, 2016a; Rose & Tynes, 2015; van den Eijnden et al., 2014). Significant predictors of time-lagged cyberbullying perpetration include negative emotion regulation and anger, depression, and anxiety (den Hamer & Konijn, 2016; Modecki et al., 2013; Yang et al., 2013). The risk of becoming a cyberbully-victim significantly increases with previous experiences of psychological distress (Le et al., 2017).

A smaller number of studies investigated somatic problems, stress, and self- or parent-reported ADHD-related symptoms in relation to cyberbullying perpetration and victimization. For example, according to a short-term three-wave study over three months (Herge et al., 2016), cyberbullying victimization significantly increases future somatic complaints and sleep problems. Notably, one study collected cortisol secretion over the course of two days as a biomarker of psychosocial stress and anxiety, which were found to be caused by cyberbullying perpetration and victimization considered in combination (Gonzalez-Cabrera et al., 2017).

Among externalizing problem behaviors, including aggressive behaviors, substance use, theft, self-harm, and rule-breaking behaviors, all proved to be a significant longitudinal risk factor of cyberbullying perpetration (Hemphill, Kotevski, et al., 2015; Holfeld & Leadbeater, 2015; Kim et al., 2017; Low & Espelage, 2013; Modecki et al., 2013; Sticca et al., 2013; You & Lim, 2016) and cyberbullying victimization (Gamez-Guadix et al., 2013; Holfeld & Leadbeater, 2015; Korchmaros et al., 2014; Modecki et al., 2013). On the other hand, cyberbullying perpetration (Holfeld & Leadbeater, 2015) and cyberbullying victimization (Holfeld & Leadbeater, 2015; Schultze-Krumbholz, Jäkel, Schultze, & Scheithauer, 2012; Smokowski, Evans, & Cotter, 2014) were also found to be risk factors of aggressive behaviors towards peers. Both cyberbullying perpetration and victimization significantly increase conduct problems at school, including discipline referrals, and in-school and out-of-school

suspensions. The same study further revealed a negative longitudinal effect on academic achievements (Wright, 2015a). The opposite direction is also true as students with academic problems were found to significantly more often experience cyberbullying victimization measured at a later point (Korchmaros et al., 2014).

Furthermore, longitudinal studies have revealed that positive attitudes towards cyberbullying, perceived behavioral control with regards to cyberbullying, perceived anonymity, online disinhibition, moral approval of bullying, lower levels of self-control, and perceived subjective norms, confidence with not getting caught, all significantly increased time-lagged cyberbullying perpetration (Barlett, 2015; Barlett & Helmstetter, 2017; Festl, 2016; Heirman & Walrave, 2012; Kim et al., 2017; Williams & Guerra, 2007; Wright, 2014a; You & Lim, 2016). Positive attitudes towards cyberbullying also explain why adolescents become cyberbullying bystanders (Pabian et al., 2016). Emotion control turned out to be a significant protective factor of later experiences of cyberbullying victimization (Hemphill & Heerde, 2014; Hemphill, Tollit, et al., 2015).

To conclude the review of person-related factors, we briefly summarize the role of socio-demographic factors explicitly studied as predictors of cyberbullying perpetration and victimization (i.e. not control variables). Our review shows that males (Barlett, 2015; Low & Espelage, 2013; Yang et al., 2013) are at higher risk of cyberbullying perpetration, whereas males and females are at equal risk of cyberbullying victimization (Korchmaros et al., 2014; Yang et al., 2013, 2014). Inconsistent findings emerge for age, with older students at significantly higher risk of non-public cyberbullying perpetration (Festl, 2016) and cyberbullying victimization (del Rey et al., 2012), and younger students at higher risk of cyberbullying victimization in the study by Le et al. (2017). The latter study also revealed that males and younger students are at higher risk of becoming cyberbully-victims.

### ***3.5.2. Media-related factors***

Media-related factors, generally studied as predictors, were found to be linked to cyberbullying perpetration and cyberbullying victimization as follows: Internet access and use, including social network use, are significantly positively linked to cyberbullying perpetration measured at a later time (Festl & Quandt, 2016; Meter & Bauman, 2015; Sticca et al., 2013; You & Lim, 2016), especially in girls (Festl & Quandt, 2016). Both concepts are also predictors of cyberbullying victimization (Meter & Bauman, 2015). Moreover, the lack of Internet safety procedures positively predicts cyberbullying victimization (Korchmaros et al., 2014). For what concerns online risky behaviors, i.e. the exposure to violent media content, this media-use pattern significantly augments the risk to become a cyberbully, especially in males (den Hamer & Konijn, 2015; Fanti et al., 2012). At the same time, it presents a risk factor for becoming a victim in the cyberspace (Fanti et al., 2012). In a similar fashion, meeting strangers online increases the risk for cyberbullying perpetration (Gamez-Guadix, Borrajo, & Almendros, 2016). Another media-related factor studied in relation to cyberbullying perpetration and victimization is problematic Internet use, or Internet addiction, which was found to be significantly positively related to cyberbullying perpetration in the future (Gamez-Guadix et al., 2016), though, predicted by cyberbullying victimization in the past (Gamez-Guadix et al., 2013).

### ***3.5.3. Environmental factors***

Among environmental factors, we can distinguish between factors related to parents and the family context (e.g., family conflict, parent attachment, parental mediation), peers (e.g., popularity, peer recognition, peer attachment, perceived social norms), and the school context (e.g., school climate, teacher and school bonding, school safety and policy). For example, significant results underline the role of parental mediation in predicting future cyberbullying perpetration and victimization among children and adolescents. In particular, restrictive mediation decreases cyberbullying perpetration levels over time (Chng, Liau, Khoo, & Li,

2014; Wright, 2017a), thereby providing some kind of safety measure. Likewise, active mediation was found to negatively predict cyberbullying perpetration, especially among males (Chng et al., 2014), so did co-viewing (Wright, 2017a). On the other hand, cyberbullying victimization increases as a function of (restrictive) parental mediation (Athanasiaides et al., 2016; Wright, 2017a) but decreases when co-viewing or instructive mediation is applied (Wright, 2017a).

Family social support and parental attachment decrease the risk of becoming a bully and a victim in the cyberspace (Fanti et al., 2012; Hébert, Cénat, Blais, Lavoie, & Guerrier, 2016; Kim et al., 2017). Furthermore, social support functions as a buffer in the impact of cyberbullying victimization on depression (Wright, 2017c). On the other hand, problematic family background, in terms of low parental academic achievements and poor family management, increases the risk of becoming a cyberbullying perpetrator and a cyberbullying victim over time (Hemphill & Heerde, 2014; Yang et al., 2013; You & Lim, 2016), so do a negative parent-child relationship, parental violence, and conflict with siblings (Korchmaros et al., 2014; Le et al., 2017). Interestingly, one study found that “chronic” cyberbullying victimization leads to lower levels of social support from parents and friends, and to higher levels of peer rejection (Smokowski et al., 2014).

Peer-related environmental factors significantly associated with cyberbullying perpetration and victimization include social standing, popularity, social acceptance, and perceived social presence. For example, social standing and cyberbullying perpetration significantly predict each other over time in a study by Badaly et al. (2013). This result was partly confirmed by Wegge et al. (2016) who showed that cyberbullying perpetration significantly increases perceived popularity among peers eight months later. When it comes to popularity being the predictor of cyberbullying perpetration, Wright (2014b) identified a U-shaped relationship between the two. In other words, cyberbullying perpetration was higher

among adolescents who previously experienced either low or high levels of popularity compared to medium levels, although the reasons for engaging in subsequent cyberbullying may be very different for unpopular and popular students. Furthermore, the influence of friends, estimated from social network indicators, predicts higher levels of cyberbullying perpetration over time, especially when done publicly (Festl, 2016). Yet another longitudinal study found that peer violent delinquency significantly increases the risk of becoming a chronic cyber- and traditional bully over the course of 5 years (Kim et al., 2017), and peer rejection positively predicts both self-reported and peer-reported verbal and relational cyberbullying perpetration (Wright & Li, 2013). In sum, low and high levels of popularity, peer influences, peer violent delinquency, and peer rejection are all risk factors of cyberbullying perpetration. On the other hand, perceived peer support and peer attachment function as protective factors of cyberbullying over time (Kim et al., 2017). However, dyadic analyses showed that friendship and past dating between two persons significantly positively predicts cyberbullying perpetration and victimization among the two (Felmlee & Faris, 2016). Concerning cyberbullying victimization in girls, such experiences lead to higher levels of popularity (Gradinger et al., 2012). This somewhat odd finding was explained by the authors with the fact that “boys try to make contact with popular girls via mobile phones or on the internet and that these behaviours are perceived as cyber-victimization by these girls” (p. 240). In this case, the causal relationship between the two concepts is spurious and, in fact, determined by faulty interpretations of online peer behavior. Furthermore, peer reputation as a bully increases the risk of being victimized in the cyberspace (Salmivalli et al., 2013), which highlights that not only bullying behavior but also a bully reputation foster future cyberbullying victimization.

Among school-related factors, a positive overall school climate (including perceived fairness, equity in sharing of resources, parent involvement, student interpersonal relations and student-teacher relations) decrease cyberbullying victimization over time; *vice versa*

cyberbullying victimization decreases perceptions of a good school climate, though to a lesser extent (Holfeld & Leadbeater, 2017). A positive school climate also diminishes cyberbullying perpetration (Williams & Guerra, 2007). Negative cross-lagged effects were found between teacher bonding and cyberbullying perpetration measured at 6-months distance (Pabian & Vandebosch, 2016c).

### **3.6. Quality assessment of included studies**

Based on available study information, the methodological quality of the longitudinal studies varied considerably. Only 40 out of 76 studies (53%) reported to have applied a random sampling strategy at least at school level. Given the longitudinal nature of the studies, dropouts between the first and subsequent waves are oftentimes inevitable. The median reported dropout rate was 13.2 percent. Two studies had no dropouts and eleven studies did not report on sample attrition. A common procedure to check for systematic dropout is the comparison of socio-demographic characteristics and the distribution on the variables of interest in the initial sample and the analytical sample. This procedure was used in 28 studies. Furthermore, in 49 studies that reported on missing data handling, 24 applied some form of data imputation (e.g., EM, FIML, MCMC, (multilevel) multiple imputation, hotdeck imputation), 24 used listwise deletion, and one study controlled for missingness by including a covariate in the analyses. Another quality criterion assessed as part of this review considers the reporting of a reliability measure for multi-item indicators of cyberbullying and cyber-victimization. Scale reliability, commonly assessed with Cronbach's alpha, was reported in 50 studies; 19 studies used single-item indicators. Appendix C includes a quality assessment for each study in this systematic review.

## **4. Discussion**

Cyberbullying perpetration and victimization have been studied extensively in the last decades. Nonetheless, existing systematic reviews and meta-analyses (e.g., Chen et al., 2017; Guo, 2016; Hamm et al., 2015; John et al., 2018; Kowalski et al., 2014; Tokunaga, 2010; Zych, Baldry, et al., 2018) have primarily focused on cross-sectional findings. That said, a drawback of past reviews is that, in most cases, the identification of what constitutes a risk or a protective factor and what constitutes an outcome remains a purely arbitrary choice. Of course, socio-demographic factors such as gender or age are by their nature predictors and not outcomes of cyberbullying perpetration and victimization, but other factors such as traditional bullying and peer victimization, depressive symptoms, parental mediation, or peer relationships may be both predictors and outcomes. Furthermore, several reviews and meta-analyses have discussed findings on cyberbullying and traditional bullying in a combined format, despite the ongoing debate on whether the two are concomitant or unique phenomena. Thus, in the present systematic review, we draw on 76 exclusively longitudinal studies published in 74 journal articles and one thesis between 2007 and 2017, to synthesize the causal relationships between cyberbullying perpetration, cyberbullying victimization, and factors related to the bully and victim in the cyberspace (e.g., socio-demographic characteristics, internalizing symptoms, externalizing problem behaviors), the media (e.g., Internet use and problematic use, exposure to violent content), and the environment (e.g., family climate, school climate, relationship with parents, peers, and teachers, parental mediation). To be conclusive, we did not narrow our selection of related predictors and outcomes of cyberbullying perpetration and victimization *a priori*. However, given the high prevalence rates among younger populations (Brochado et al., 2017), we concentrated on studies with children and adolescents up to 18 years of age.

Our qualitative summary revealed that longitudinal studies to date are equally concerned with predictors and outcomes of actively bullying others in the cyberspace and experiencing this form of bullying. Less studies are concerned with, e.g., cyber-trolling

behaviors in addition to cyberbullying, though it has to be noted that a common agreement on what constitutes cyberbullying and what is meant by frequently used synonyms or extensions of cyberbullying such as cyber-aggression, cyber-trolling, or cyber-harassment, is still lacking (Englander, Donnerstein, Kowalski, Lin, & Parti, 2017). Therefore, we recommend to invest in the development of a holistic and commonly agreed conceptual framework of delinquent social behaviors in the cyberspace or via mediated communication to guide future (longitudinal) studies and aid the synthesis and comparison of their findings. Closely linked to the conceptualization of cyberbullying perpetration and victimization is the measurement of these concepts. The majority of reviewed studies used a single-item measure to assess cyberbullying perpetration and/or victimization, introduced by a general definition of the concept and the question to indicate how often this was done or experienced by the student during a given time period, in most cases during the last 6 or 12 months. A pitfall of this apparently short and straightforward assessment is the fact that it does not allow to distinguish between different types of (experienced) cyberbullying behavior, which includes, among others, direct verbal aggression, indirect defamation, and intentional exclusion through electronic media. Several longitudinal studies acknowledged the multidimensional nature and used dedicated scales. However, the variety of measures used to assess cyberbullying perpetration and victimization once again points out that an agreement on the definition, conceptualization, and measurement of these concepts is still lacking, challenging the comparability of study findings (Berne et al., 2013).

Furthermore, the majority of reviewed studies were conducted in Europe and North America, and focused on middle school students. Interestingly, our search and selection strategy did not come up with a single longitudinal study conducted in South America or in the Middle East, limiting the generalizability of our conclusions to children and adolescents from these parts of the world. The preferred access to the study populations was through schools,

resulting in comparatively large sample sizes with up to 7850 in the study by Salmivalli et al. (2013). The shortest longitudinal study lasted for 5 consecutive days (Espinoza, 2015) and the longest two for 48 months (Hemphill & Heerde, 2014; Kim et al., 2017). Most studies included a baseline and one follow-up assessment and applied multivariate regression analyses and structural equation modeling. Future studies should strive for three and more waves to allow more advanced meaningful statistical analyses such as latent transition analysis, longitudinal mediation analysis, and random intercept cross lagged panel models.

Another finding from our systematic review is that longitudinal research on cyberbullying perpetration and victimization seems to be driven by a predominantly practical need to identify risk and protective factors of the two concepts as well as negative outcomes to inform prevention programs and treatment measures. We draw our conclusion on the fact that most studies included in this review lack a theoretical background to guide the discussion of concepts and longitudinal relationships. The theories that were used in at least three studies each include the Theory of Planned Behavior, General Strain Theory, Social Information-Processing Model, and Social Cognitive Theory. These primarily behavioral and social development theories focus on attitudes, behavioral control, and socializing agents such as peers, highlighting the role of both person-related and environmental factors in explaining the occurrence of cyberbullying perpetration and victimization. As already pointed out by Espelage et al. (2012), future longitudinal studies should undertake to ground their study design in these promising theories to create a comparable knowledge base on determinants and outcomes of these pressing issues.

At person-level, much emphasis in the reviewed studies is put on risk factors and negative outcomes of cyberbullying perpetration and victimization, especially on traditional bullying and peer victimization, internalizing symptoms such as depression or anxiety, and externalizing problem behaviors such as delinquent behaviors. That said, this systematic

review underscores that traditional bullying shifts to the cyberspace over time, while the opposite direction is less evident. Likewise, victims of traditional bullying, e.g., in the school setting, are at risk of becoming cyberbullying victims at a later time point, while the opposite was once again confirmed in less studies. Our review of longitudinal studies, thus, gives first insights on the directionality of this “spill-over” effect as already discussed in reviews and meta-analyses of cross-sectional finding (e.g., Guo, 2016). In addition, internalizing symptoms such as (social) anxiety, perceived loneliness, and depression are frequently identified as negative outcomes of cyberbullying victimization, while (social) anxiety and depression are also risk factors. Among externalizing problem behaviors, including aggressive behaviors, substance use, theft, self-harm, and rule-breaking behaviors, all proved to be a significant longitudinal risk factor of cyberbullying perpetration and victimization. Fewer studies found cyberbullying perpetration and victimization to be risk factors of aggressive behaviors towards peers measured at a later time point.

Very few longitudinal studies have looked at person-related protective factors such as empathy and prosocial behaviors. The lack of research on these two makes it difficult to conclude on their role in protecting from future engagement in cyberbullying and experiences of cyberbullying victimization. Since prosocial attitudes and behaviors are considered key in cyberbullying interventions, more longitudinal research is needed to inform and justify interventions built around the enhancement of cyberbullies’ self-concept to prosocial behaviors (Espelage et al., 2012). In addition, we know little to date on the effect cyberbullying perpetration and victimization may have on empathy and prosocial behaviors. Given that both can change over time, especially in adolescent development (Davis & Franzoi, 1991), more longitudinal research is needed to identify the causal relationships with cyberbullying perpetration and victimization. Zych et al. (2018) came to the same conclusion after

systematically reviewing 25 primarily cross-sectional studies on the associations between empathy, cyberbullying perpetration, and cyberbullying victimization.

Among media-related factors studied in relation to cyberbullying, Internet access and (social media) use as well as online risky behaviors (e.g., exposure to violent content, meetings strangers online) all turned out to be significant longitudinal risk factors of both cyberbullying perpetration and victimization, while Internet addiction is significantly predicted by cyberbullying victimization but leads to future cyberbullying perpetration. Factors related to adolescents' media use have been scarcely studied using longitudinal designs. Thus, the mentioned causal relationships are based on comparatively few studies and more research collecting data over time is needed to provide solid evidence on the causal relationships. This is particularly relevant considering that Internet users are getting younger and younger and the ubiquitous presence of (mobile) media as well as adolescents' preferences for social media platforms repeatedly creates occasions for cyberbullying perpetration and victimization (Chassiakos et al., 2016).

Eventually, among factors related to the environment in which adolescents grow up (including their relationships with significant parents, peers, and teachers), poor parental attachment, poor family management, parental violence but also violent delinquency of peers, peer rejection, a negative school climate, and a lack of teacher bonding all increase the risk of becoming a cyberbully and, in part, a cyberbullying victim, while parental mediation, family and peer support function as protective factors. Longitudinal evidence on the opposite relationships, i.e. the impact of cyberbullying perpetration and victimization on the relationships with peers and parents, parental mediation strategies put in place, and perceptions of social support and school climate is weaker, yet equally important to understand the reciprocal effects and identify an adequate point of action for intervention.

## **5. Limitations**

This review has some limitations. More specifically, we limited our search strategy to identify longitudinal studies on cyberbullying perpetration and victimization leaving aside other behaviors such as cyber-bystander and cyber-defender actions. Although we identified one study looking at cyber-bystander behaviors studied alongside our concepts of interest, more longitudinal studies on these two phenomena may be available and should be summarized to better understand the prevalence and their role in situations of witnessing cyberbullying perpetration and victimization. Furthermore, the screening of the first 100 entries in Google Scholar as part of our additional hand search was not conclusive and potentially influenced by a user-specific search algorithm. During study selection, we excluded intervention and experimental studies and, thus, cannot provide a summary on the addressed predictors and longitudinal outcomes of these studies. A review on the effectiveness of intervention strategies and anti-cyberbullying programs, as done in the context of traditional bullying (e.g. Jiménez-Barbero, Ruiz-Hernández, Llor-Zaragoza, Pérez-García, & Llor-Esteban, 2016), is urgently needed to further inform programs and interventions to prevent cyberbullying perpetration and victimization and, eventually, the negative outcomes resulting from these behaviors and experiences. Furthermore, a meta-analysis would provide additional valuable information on the pooled effect sizes for the causal relationships between cyberbullying perpetration, cyberbullying victimization, and frequently associated person-related, media-related, and environmental factors. However, given the complexity and variety of statistical analyses of longitudinal data, a meta-analysis would require to limit the number of quantitatively synthesized studies to those including convertible and comparable effect sizes. Furthermore, the variety of concepts and their operationalization most likely induces high levels of heterogeneity, which would need to be accounted for in more detailed subgroup analyses. This was outside the scope of this systematic review but should be envisaged in the future.

## **6. Conclusion**

This systematic review is the first of its kind to summarize exclusively longitudinal research on predictors and outcomes of cyberbullying perpetration and victimization. We come to the conclusion that both concepts are part of a complex and oftentimes reciprocal interplay between factors pertaining to the cyberbully and victim, access to and the use of the Internet and mediated communication technologies, and the environmental context and significant others shaping the development of children and adolescents. However, more longitudinal research is needed, especially concerning less studied media-related and environmental factors, to obtain solid evidence on the protective and risk factors of cyberbullying perpetration and victimization as well as the consequences resulting from such behaviors and experiences.

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*Note: References marked with an asterisk (\*) are included in the systematic review. To facilitate the matching, the abbreviated format used in Appendix B and C in the Supplement is added in parentheses.*

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**Table 1. Number of studies examining factors in relation to cyberbullying perpetration and cyber-victimization**

	Cyberbullying		Cyber-	
	perpetration as	outcome	victimization as	outcome
	predictor		predictor	
<b>Person-related factors</b>				
Age, gender		8		5
Academic performance, school absence, school commitment, attention problems, school suspension	1	5	1	4
<i>Positive personality traits</i> : e.g., empathy, self-efficacy, self-esteem, emotional control		10		8
<i>Negative personality traits</i> : e.g., narcissism, psychopathic, impulsivity		3		1
Attitudes towards, (normative) beliefs about CB (e.g., justification)		6		1
Online disinhibition effect, perceived anonymity (behavioral control)		6		
Moral disengagement, moral responsibility, remorse, belief in moral order, blaming		2		1
<i>Internalizing problems</i> : anxiety, depression, suicidal ideation, loneliness, emotional distress, mistrust, defectiveness, social withdrawal, body image	6	9	22	13
<i>Externalizing problems</i> : delinquent behavior, theft, substance use, reactive and instrumental aggression, self-harm	3	8	4	7
Traditional bullying	13	20	8	13
Traditional peer victimization	8	17	10	17
Cyberbullying	27	--	16	13
Cyber-victimization	13	16	21	--
Life satisfaction			2	1
Somatic problems, sleep problems, strain, stress, ADHD symptoms	2	2	4	2
Experiences of sexual abuse				1
Sociality, prosocial behavior, social intelligence	1	3	1	2
<b>Media-related factors</b>				
(Private) Internet access, lack of Internet safety procedures	1	2	1	2
Internet use, social online behaviors, mobile phone use	1	8	1	4
Exposure to violent or antisocial media content		4		2
Risky media behaviors		2		1
Computer and Internet competencies		1		
Internet addiction, problematic Internet use		1	1	1

**Environmental factors (peers, parents, school context)**

Social norms perceived from parents and peers, norm enforcement, moral approval		1		1
Peer contagion effect, antisocial peers		2		2
Parent / family and peer attachment, relationship		4		4
Social support		3	1	3
Family background, family conflict, poor family management		6		4
Perceived popularity, social stratification	2	4	2	2
Parental / teacher monitoring / mediation		5		3
School climate and policy		2	2	2
School and teacher bonding, perceived safety at school	1	1	1	

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*Note: only concepts mentioned that were explicitly studied as predictors or outcomes (no control or moderator variables considered)*

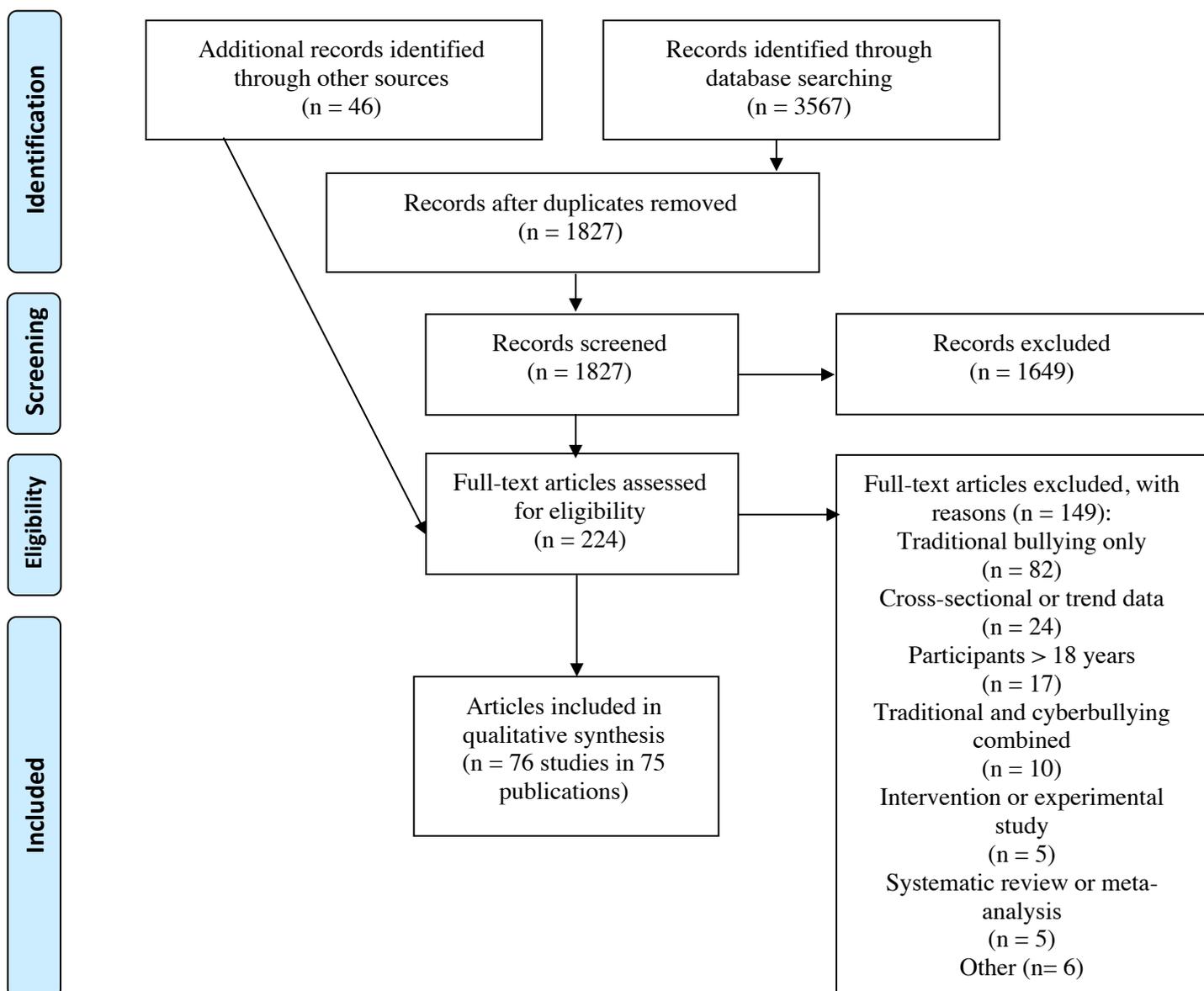
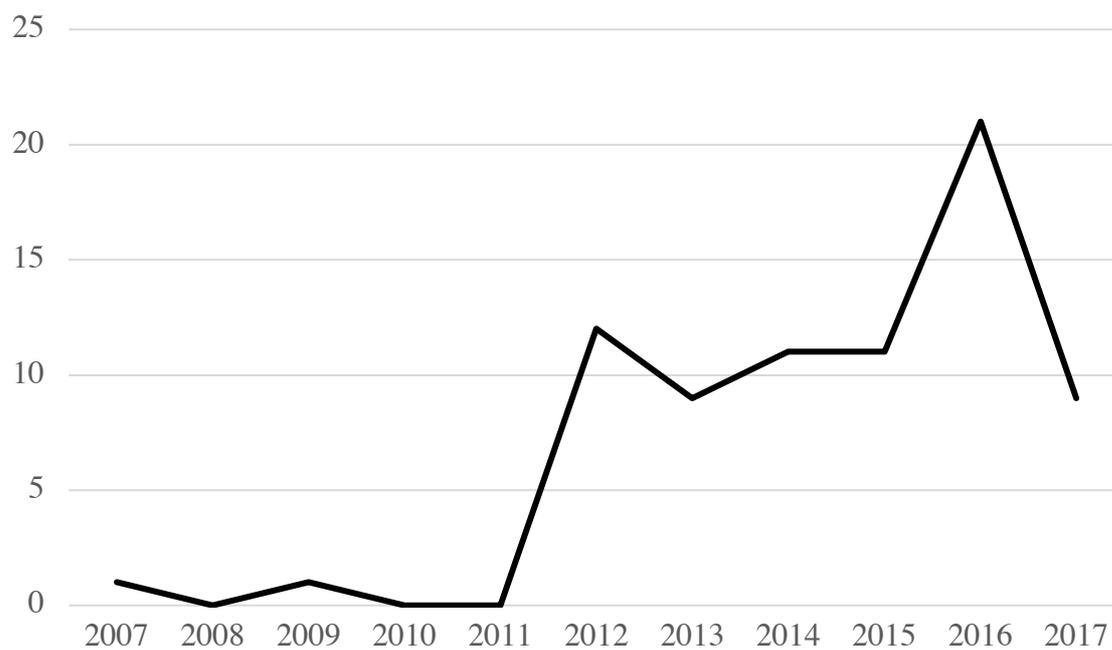


Figure 1. PRISMA flowchart of study selection



**Figure 2. Number of longitudinal studies published per year**

**Appendix A. Search terms and strategy using Boolean operators**

<b>Context AND</b>	<b>Activity AND</b>	<b>Population AND</b>	<b>Methodology</b>
cyber* OR Internet OR net OR web* OR online OR chat OR electronic OR mobile OR social media OR social net* OR media	harass* OR bully* OR victim* OR perpetr* OR violen* OR abuse OR maltreat* OR agressi* NOT sex*, NOT stalk*	infant OR child* OR preschool OR adolescent* OR teen* OR tween OR young OR youth	longitudinal OR long term OR wave* OR prospect OR cohort

**Appendix B. Methodological characteristics of longitudinal studies (n=76)**

First author and publication year	Cyberbullying perpetration and victimization concept and measurement			Longitudinal design			Analytical sample characteristics			All concepts studied in relation to cyberbullying perpetration and/or victimization	
	Concept (s) (Number of items)	Time reference	Informant (format and place of data collection)	Time-frame	N per wave (N of analytical sample)	Location	male (%)	Mean (SD) or range of age in years at T1	Prevalence rates at T1	Predictors	Outcomes
Athanasiade2016	CB (4) CV (3)	T1-T2: last 4 months	Self-report (online at school)	4 months (T1-T2, 4 months apart)	T1: 585 T2: 440 (440)	Greece, 6 schools	54	T(NI): 12.7 (0.7)	T(NI): CB 8% CV 10.5%	Internet use frequency, parental mediation, TB, TV, empathy, gender	CB, CV
Badaly2013	CB (1) CV (1)	NI	Peer nomination inventory (NI at school)	12 months (T1-T2, 12 months apart)	T1: 443 T2: 415 (415)	US, 1 school	47	T(NI): 14.7 (0.6)	NI	Social standing (popularity, social acceptance), TB, CB, TV, CV	Social standing (popularity, social acceptance), TB, CB, TV, CV
Bannink2014	CV (1)	T1: last month	Self-report (NI at school)	24 months (T1-T2, 24 months apart)	T1: 8272 T2: 3181 (3181)	The Netherlands, NI schools	51	12.5 (0.6)	T(NI): CV 5.1%	CV, TV, mental health status, suicidal ideation	Mental health status, suicidal ideation
Barlett2015	CB (3)	T1: last 12 months T2-T4: last 2 months	Self-report (NI at school)	6 months (T1-T4, each wave 2 months apart)	T1: 96 T2: 89 T3: 67 T4: 67 (NI)	US, 1 school	43	15.5 (1.1)	NI	Positive attitudes towards CB, perceived anonymity, CB, gender	CB, positive attitudes towards CB

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Barlett2017	CB (3)	T1-T2: last 6 months	Self-report (NI at school)	6 months (T1-T2, 6 months apart)	T1: 145 T2: 118 +22 newly sampled (NI)	US, 2 schools	NI	14.2 (2.1)	NI	Perceptions of anonymity, BI-MOB (belief in the irrelevance of muscularity online), online disinhibition, CB, mediator: CB attitudes	CB
Calvete2016	CV (9)	T1: ever	Self-report (NI at school)	12 months (T1-T3, each wave 6 months apart)	T1: 1015 T2: 903 T3: 767 (1015)	Spain, 8 schools	41	T(NI): 15.4 (1.1)	CV 52.5%	CV	Mistrust schema, defectiveness schema, body image (all mediators), depression
Chng2014	CB (3)	T1-T3: last 12 months	Self-report (NI)	NI (T1-T3, NI)	T1: NI T2: NI T3: NI (1084)	NI, NI	51	T3: range 10-17	NI	Active and restrictive parental mediation	CB
Cole2016	CV (4)	T1: current and previous year	Self-report (paper-pencil at school)	12 months (T1-T2, 12 months apart)	T1: 571 T2: 385 +256 newly sampled (NI)	US, 6 schools	45	10.9 (1.2)	T1 and T2: CV 63.1%	CV, TV, negative self-cognitions and depression	Negative self-cognitions, depression
delRey2012	CB (11) CV (11)	T1-T2: last 2 months	Self-report (paper-pencil at NI)	3 months (T1-T2, 3 months apart)	T1-T2: 274 (248)	Spain, 2 schools	52	T(NI): 14.1 (1.7)	NI	TB, TV, CB, CV, gender, age	TB, TV, CB, CV
denHamer2015	CB (8)	T1-T3: ever	Self-report (paper-pencil at school)	4-6 months (T1-T3, each wave 2 to 3)	T1: 792 T2: 740 T3: 762 (1005)	The Netherlands, 1 school	49	13.4 (1.1)	CB 17.4%	Exposure to antisocial media content, CB, gender	CB

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denHamer2016	CB (8) CV (9)	T1-T3: ever	Self-report (paper- pencil at school)	months apart) 4-6 months (T1-T3, each wave 2 to 3 months apart)	T1: 792 T2: 740 T3: 762 (1005)	The Netherlan ds, 1 school	49	13.4 (1.1)	NI	TV, exposure to antisocial media content, anger, emotion regulation, CB	CB
Erentaite2012	CV (7)	T1-T2: last few months	Self-report (paper- pencil at school)	12 months (T1-T2, 12 months apart)	T1: NI T2: NI (1667)	Lithuania , 8 schools	42	T2: 17.3 (1.0)	T2: CV 29.3%	TV	CV
Espinoza2015	CV (5)	T1-T5: on same day	Self-report (daily diary checklist)	5 days (T1-T5, each 1 day apart)	T0: 144 T1: NI T2: NI T3: NI T4: NI T5: NI (118)	US, 1 school	50	Range 9- 11 grade	T(NI): CV 19%	CV	CV, TV, distress, anger, shame, daily physical symptoms, school adjustment (belonging, safety, attendance problems)
Fahy2016	CB (3) CV (3)	T1-T3: last 12 months	Self-report (NI at school)	12 months (T2-T3, 12 months apart)	T1: 3088 T2: 3213 T3: 2480 (NI)	England, 25 schools	55	Range 11- 12	CB 8.3% CV 13.6% CBV 20.4%	CB, CV, CB and CV combined	Depressive symptoms, social anxiety, mental well- being
Fanti2012	CB (4) CV (4)	T1-T2: NI	Self-report (NI at school)	12 months (T1-T2, 12 months apart)	T1: 1513 T2: 1416 (1416)	Cyprus, 13 schools	50	12.9 (0.8)	NI	TB, TV, media violence exposure, psychopathic personality traits, social support	CB, CV

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Felmlee2016	CB/CV tie	T1-T4: during the previous week	Self-reported and peer nomination (dyads) (paper-pencil at NI)	Approximately 5 months (T1-T4, T1 at beginning of spring term, T2-T4, each wave 2 weeks apart at the end of the school year (merged to T2)	T1: 788 T2 (merged): 740 (788)	US, 1 school	52	Range grade 8-12	T1 and T2: CB 11.4% CV 5.8% CBV 2.3%	Friendship (dyadic data), dating partners (dyadic data)	CB/CV tie
Festl2016a	CB (6) CV (6)	T1-T2: last 12 months	Self-report (paper-pencil at school)	12 months (T1-T2, 12 months apart)	T1: 3515 T2: 1817 (1817)	Germany, 33 schools	44	14.3 (NI)	CB 19.0% CV 24.0%	CB, CV, online social activities, exposure to antisocial online content, risky online behaviors	CB, CV
Festl2016b	CB (8)	T1-T2: last 6 months	Self-report (paper-pencil at school)	6 months (T1-T2, 6 months apart)	T1: 1704 T2: 1428 (1428)	Germany, 7 schools	50	13.7 (NI)	CB 34.0%	Attitudes, subjective norms, perceived behavioral control with regards to CB, CB, CV, TB, TV, private Internet access, social Internet use, online competence, social network indicators	CB, public CB, non-public CB

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Festl2017	CB (6) CV (5)	T1-T3: last 12 months	Self-report (paper- pencil at school)	24 months (T1-T3, each wave 12 months apart)	T1: 4946 T2: 3344 T3: 1802 (1723)	Germany , 33 schools	44	T(NI): 13.3 (NI)	CBV 17.0%	CB/CV latent status group (n=5) derived from Latent Transition Analysis (LTA) of prior wave	CB/CV latent status group (n=5) derived from LTA of current wave
Frison2016	CV (12)	T1-T2: last 2 months	Self-report (paper- pencil at school)	6 months (T1-T2, 6 months apart)	T1: 1840 T2: 1577 (1621)	Belgium, 15 schools	52	14.8 (1.4)	CV 84.0%	CV, depression, life satisfaction, moderators: gender, age, perceived friend support	CV, depression, life satisfaction
GamezGuadix2013	CB (14) CV (9)	T1-T2: ever	Self-report (paper- pencil at school)	6 months (T1-T2, 6 months apart)	T1: 1021 T2: 845 (845)	Spain, 10 schools	40	T(NI): 15.2 (1.2)	T(NI): CV 52.7%	CV, depression, substance use, problematic internet use (internet addiction)	CV, depression, substance use, problematic internet use (internet addiction)
GamezGuadix2016a	CB (14) CV (9)	T1-T2: ever	Self-report (paper- pencil at school)	6 months (T1-T2, 6 months apart)	T1: 969 T2: 750 (750)	Spain, 12 schools	40	T(NI): 14.8 (1.0)	NI	CV, CB justification, moderators: gender, age, impulsivity	CB
GamezGuadix2016b	CB (14)	T1-T2: ever	Self-report (paper- pencil at school)	6 months (T1-T2, 6 months apart)	T1: 1009 T2: 888 (888)	Spain, various schools	40	T(NI): 15.4 (1.0)	CB 33.1%	Problematic internet use (internet addiction), meeting strangers online, impulsivity- irresponsibility	CB

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GonzalesCabrera2017	CB (15) CV (15) CB bystander (15)	T1-T2: last 12 months	Self-report (NI), biomarker (saliva samples 1-4 at school, saliva sample 5 at home)	20 months (T1-T2, 20 months apart)	T1: 371 T2: 74 (60)	Spain, 1 school	43	T2: 15.6 (1.1)	CB 23.5% CV 34.5% CB bystander 23.4%	CB and CV combined	Cortisol release through saliva (mediator), anxiety, perceived stress
Gradinger2012	CV (1 global + 7 specific)	T1-T2: last 2 months	Self-report and peer nominations (online at school)	12 months (T1-T2, 12 months apart)	T1: 447 T2: 589 (665)	Austria, 5 schools	53	11.6 (0.8)	T(NI): Range 0-11.0%	CV, TV, popularity, perceived popularity, moderator: gender	CV, TV, popularity, perceived popularity
Hébert2016	CV (1)	T2: last 6 months	Self-report (NI at NI)	6 months (T1-T2, 6 months apart)	T1: 8194 T2: 6780 (6531)	Canada, 34 schools	42	Range 14-18	T2: CV 17.5%	Child sexual abuse, maternal support	CV, TV, mental health problems
Heirman2012	CB (1) CV (ni)	T2: last 3 months	Self-report (NI at NI)	3 months (T1-T2, 3 months apart)	T1: NI T2: NI (1042)	Belgium, 6 schools	50	T(NI): 15.5 (NI)	T2: CB 12.1% CV 6.3% CBV 3.4%	Attitude, subjective norm, perceived behavioral control, mediator: intention to perform CB	CB
Hemphill2012a	CB (1) CV (1)	T1-T3: last 12 months	Self-report (paper-pencil at school)	24 months (T1-T3, each wave 12 months apart)	T1: 805 T2: 825 T3: 791 (T1: 775 T2: 795 T3: 696)	Australia, Victoria, 152 schools	48	14.7 (0.5)	CB 12.5% CV 14.4%	<i>no bivariate analyses, but development of prevalence rates</i>	-

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Hemphill2012b	CB (1)	T2: last 12 months	Self-report (paper-pencil at school)	24 months (T1-T2, 24 months apart)	T1: NI T2: NI (696)	Australia, Victoria, 152 schools	48	12.9 (0.4)	T2: CB 14.7%	TB, TV, relational aggression, antisocial friends, poor family management, school suspension, academic failure, low school commitment	CB
Hemphill2014	CB (1) CV (1)	T1-T2: last 12 months	Self-report (T1: paper-pencil at school, T2: paper-pencil, online, or telephone)	48 months (T1-T2, 48 months apart)	T1: 809 T2: 804 (658)	Australia, Victoria, 152 schools	45	15.2 (0.4)	T2: CB 6.0% CV 7.7% CBV 8.6%	Gender, age, TB, TV, TB and TV combined, Academic failure, low school commitment, emotion control, antisocial friends, poor family management, family conflict, attachment to mother and father	CB, CV, CB and CV combined
Hemphill2015a	CB (1) CV (1)	T1-T3: last 12 months	Self-report (paper-pencil at school)	24 months (T1-T3, each wave 12 months apart)	T1: 805 T2: 825 T3: 791 (T1 and T2: 651 T1 and T3: 680)	Australia, Victoria, 152 schools	46	15.1 (0.4)	CB 5.3% CV 7.9% CBV 8.6%	Suspension from school, theft, violent behavior, marijuana use, binge drinking, depressive symptoms, self-harm	CB, CV, CB and CV

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Hemphill2015b	CV (1)	T2: last 12 months	Self-report (paper-pencil at school)	24 months (T1-T2, 24 months apart)	T1: 927 T2: 673 (673)	Australia, Victoria, 152 schools	47	13.0 (0.4)	T2: CV 16.9%	Risk factors: TV, relational aggression, TB, academic failure, low school commitment, antisocial friends, poor family management, family conflict, school suspension; protective factors: emotional control, belief in the moral order, family attachment	CV, TV
Herge2016	CV (9), 1 item removed for further analyses	T1-T3: last 2 months	Self-report (NI at school)	3 months (T1-T3, each wave 6 weeks apart)	T1: 1067 T2: 1047 T3: 1000 (1162)	US, 2 schools	43	T(NI): 15.8 (1.2)	CV 8.4%	TV (overt, relational, reputational), CV, mediators: depression, social anxiety	Somatic problems, sleep problems
Holfeld2015	CB (4) CV (4)	T1-T2: last month	Self-report (NI at school)	12 months (T1-T2, 12 months apart)	T1: 714 T2: 638 (T1: 714 T2: 638)	Canada, 27 schools	48	11.0 (0.8)	CB 10.2% CV 22.0%	Technology access and use, aggression towards peers, TV, CB, CV	Technology access and use, aggression towards peers, TV, CB, CV
Holfeld2017	CV (4)	T1-T2: last month	Self-report (NI at school)	12 months (T1-T2, 12 months apart)	T1: 714 T2: 638 (638)	Canada, 27 schools	48	11.0 (0.8)	NI	Fairness, equity in sharing of resources, parent involvement,	Fairness, equity in sharing of resources,

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				months apart)						student interpersonal relations, student-teacher relations, all combined to overall school climate, CV	parent involvement, student interpersonal relations, student- teacher relations, all combined to overall school climate, CV
Jang2014	CB (2)	T1-T5: last 12 months	Self-report and face- to-face interview (NI at NI)	48 months (T1-T5, each wave 12 months apart)	T1: 3449 T2: NI T3: NI T4: NI T5: NI (3238)	South Korea, NI schools	50	Grade 8	CB 43.0%	TV	CB
Jose2012	CB (2), CV (2)	T1-T2: last month	Self-report (online at school)	12 months (T1-T2, 12 months apart)	T1: NI T2: NI (1774)	New Zealand, 55 schools	48	T0 (not considered in the study): 13.1 (1.7)	NI	CB, CV, TB, TV	CB, CV, TB, TV
Kim2017	CB (2)	T1-T5: last 12 months	Self-report (NI)	48 months (T1-T5, each wave 12 months apart)	T1: NI T2: NI T3: NI T4: NI T5: NI (2721)	South Korea, NI schools	50	14 (NI)	CB 66.2%	TB, TV, time spent on computer, self- control, parent- child relationship, peer relationship	CB
										CB, TV, time spent on computer, self- control, parent- child relationship, peer relationship	TB

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Korchmaros2014	CV (9)	T1-T3: last 12 months	Self-report (online at home)	29 months (T1-T2, 15-17 months apart, T2-T3, 10-12 months apart)	T1: 1587 T2: 1205 T3: 1158 (1018)	US	50	12.6 (1.7)	T2 and T3: CV 56.0%	Gender, age, academic problems, latent risk factor I: experience with problem behavior; factor II: lack of Internet safety procedures; factor III: substance use; factor IV: negative parent-child relationship	CV
Landoll2015	CV (14), 5 items removed for further analyses	T1-T2: last 2 months	Self-report (NI at school)	6 weeks (T1-T2, 6 weeks apart)	T1: 839 T2: 761 (839)	US, 2 schools	42	T(NI): 15.8 (1.2)	NI	TV, CV, depression, social anxiety	Depression, social anxiety
Le2017	CB (4) CV (4)	T1-T2: last 6 months	Self-report (NI at school)	6 months (T1-T2, 6 months apart)	T1: 1539 T2: 1460 (1424)	Vietnam, 4 schools	45	T(NI): 14.7 (1.9)	CB 19.8% CV 11.9%	Demographics (age, gender, family structure), reaction when seeing bullying events, online activities, parents' and teachers' supervision of online activities, parents' and teachers' control of Internet and mobile phone	CB, CV, CB and CV combined: for all three types five categories of temporal patterns: not-involved, stable low, declining, increasing, stable high

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										usage, family, friend and school social support, witnessing parents serious arguing or fighting, conflict with siblings, perceptions of students and teachers trying to stop bullying at school, depressive symptoms, psychological distress, self-esteem, suicidal ideation	
Lester2012	CB (2) CV (2)	T2 and T4: NI	Self-report (NI at school)	19 months (T2 and T4, 19 months apart)	T1: 1782 T2: 1745 T3: NI T4: 1616 (1451 to 1563, model-based, only data from T2 and T4)	Australia, 11 schools	T2: 49	T2: 12 (NI)	NI	TB, TV, gender, problem behaviors, CB, CV	Problem behaviors
Low2013	CB (4)	T1-T3: last 12 months	Self-report (paper-pencil at school)	12 months (T1-T3, each wave 6 months apart)	T1: 1023 T2: NI T3: NI (1023)	US, 4 schools	50	T(NI): 13.9 (1.1)	NI	TB, family violence, perceived family rules, perceived parental supervision, hostility, depression,	CB

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										empathy, substance use	
Machmutow2012	CV (6)	T1-T2: last 4 months	Self-report (online at school)	5-6 months (T1-T2, 5-6 months apart)	T1: 835 T2: 820 (755)	Switzerland, 12 schools	48	13.2 (0.6)	NI	Age, gender, TV, CV, distant advice, close support, assertiveness, helplessness, retaliation	Depressive symptoms
Meter2015	CB (3) CV (3)	T1-T2: NI	Self-report (NI at school)	12 months (T1-T2, 12 months apart)	T1: NI T2: NI (1272)	US, 3 school districts	46	T(NI): range grade 3-8	NI	CB and CV combined, social networking participation, password sharing with friends	CB and CV combined, password sharing with friends
Modecki2013	CB (1) CV (1)	T4: last 6 months	Self-report (online at school, paper-and-pencil as alternative option)	36 months (T1-T4, each 12 months apart)	T1: NI T2: NI T3: NI T4: NI (1364)	Australia, 39 schools	45	13.0 (0.3)	NI	Problem behavior, depressed mood, self-esteem	CB, CV
Murphy2009	CB (1) CV (1)	T1-T2: last 4 weeks	Self-report (NI)	6 weeks (T1-T2, 6 weeks apart)	T1: 119 T2: NI (80)	Canada, 1 school	41	Range grade 9-10	CB 27.5% CV 30.0%	TB, TV, social aggression, victimization by social aggression, empathy, prosocial behavior, normative beliefs about aggression	CB, CV

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Pabian2014	CB (1)	T1-T2: last 6 months	Self-report (NI at school)	6 months (T1-T2, 6 months apart)	T1: 1814 T2: 1631 (1606)	Belgium, NI schools	45	T(NI): 13.7 (1.1)	T2: CB 11.7%	Indicators of beliefs, attitude, subjective norm, perceived behavioral control, mediator: intention to CB	CB
Pabian2016a	CB (1) CV (1)	T1-T2: last 6 months	Self-report (NI at school)	6 months (T1-T2, 6 months apart)	T1: 2333 T2: 2128 (2128)	Belgium, NI schools	43	T(NI): 13.0 (1.7)		CB, CV, TB, TV, social anxiety	CB, CV, TB, TV, social anxiety
Pabian2016b	CB (1)	T1-T4: last 6 months	Self-report (paper-and-pencil at school)	24 months (T1-T4, each 6 months apart)	T1: 1802 T2: 1671 T3: 1209 T4: 1103 (1103)	Belgium, NI schools	NI	T(NI): 12.1 (1.5)	CB 10.0% CV 11.2%	CB, TB	Social intelligence
Pabian2016c	CB (1) CV (1)	T1-T2: last 6 months	Self-report (NI at school)	6 months (T1-T2, 6 months apart)	T1: 2333 T2: 2128 (2128)	Belgium, NI schools	50	T(NI): 12.7 (1.8)	CB 6.7%	CB, TB, school bonding, teacher bonding	CB, TB, school bonding, teacher bonding
Pabian2016d	CB (1) CV (1) CB bystander (1)	T1-T2: last 6 months	Self-report (NI at school)	6 months (T1-T2, 6 months apart)	T1: NI T2: NI (1412)	Belgium, NI schools	50	T(NI): 11.6 (1.1)	CB 10.2% CV 11.3%	Attitudes towards CB, CB bystander, empathy	Attitudes towards CB, CB bystander, empathy
Rose2015	CV (6)	T1-T3: last 12 months	Self-report (online at school)	20 to 24 months (T1-T3, each 10 to 12 months apart)	T1: NI T2: NI T3: NI (559)	US, 12 schools	45	NI (NI)	CV 53.5%	CV, depression, anxiety	CV, depression, anxiety

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Salmivalli2013	CV (1)	T1-T2: last 2 months	Self-report and peer nominations (online at school)	12 months (T1-T2, 12 months apart)	T1: 17625, baseline intervention and control condition T2: 7850, control condition (7850)	Finland, 156 schools	49	Range 9-15	CV 1.9%	Gender, school type (indicator of age), TV, CV, social acceptance, bully reputation (TB), depression, school typexTV	CV, depression
SchultzeKrumholz2012	CB (12) CV (12) CBxCV	T1-T2: last 2 months	Self-report (paper-pencil at school)	3 months (T1-T2, 3 months apart)	T1: 412 T2: 307 (223)	Germany, 5 schools	51	T(NI): 13.1 (0.9)	CB 5.3% CV 7.9% CBV 4.4%	CB, CV, CBxCV	Depression, loneliness, reactive aggression, instrumental aggression
SchultzeKrumholz2013	CB (26) CV (26)	T1-T2: last month	Self-report (NI at school)	5 months (T1-T2, 5 months apart)	T1: NI T2: NI (77, control condition)	Germany, 1 school	55	T(NI): 12.5 (0.7)	NI	CB, CV, TB, TV, cognitive empathy (CE), affective empathy (AE), CExAE	CB, CV
Smokowski2014	CV (1)	T1-T2: last 12 months	Self-report (online at NI)	12 months (T1-T2, 12 months apart)	T1: NI T2: NI (3127)	US, 28 schools	48	T(NI): 12.7 (NI)	CV 7.0%	CB, CV, TB, TV, psychopathological symptoms, social withdrawal	Psychopathological symptoms, social withdrawal
										Gender, SES, language at home, family structure, TV, CV	School experiences, mental health, social support

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Sticca2013	CB (6) CV (6)	T1-T2: last 4 months	Self-report (online at school, for absent students online at home)	6 months (T1-T2, 6 months apart)	T1: 835 T2: 820 (820)	Switzerla nd, 12 schools	51	13.2 (0.6)	CB 14.0% CV 22.0%	Gender, moral disengagement, empathic concern, self- esteem, TB, TV, CV, rule- breaking behaviors, online communication	CB
Sumter2012	CV (2)	T1-T4: last 6 months	Self-report (online at home)	18 months (T1-T4, each wave 6 months apart)	T1: 1762 T2: 1444 T3: 1227 T4: 1016 (NI)	The Netherlan ds	51	T(NI): range 12- 17	T(NI): 22.0%	TV trajectory, CV trajectory, TV and CV combined trajectory	Life satisfaction
vandenEijnden2014	CB (7) CV (7)	T1-T3: last month	Self-report (NI at school)	24 months (T1-T3, each 12 months apart)	T1: 1777 T2: 1195 T3: 836 (836)	The Netherlan ds, 6 schools	50	13.2 (0.7)	NI	CB, CV, CBxCV, TV, loneliness  CB, CV, CBxCV, TV, social anxiety	CB, CV, TV, loneliness  CB, CV, TV, social anxiety
Wegge2016	CB (1)	T1-T2: last 6 months	Self-report (paper- pencil at school)	8 months (T1-T2, 8 months apart)	T1: 175 T2: 171 (154)	Belgium, 1 school	45	13.2 (0.4)	CB 10.4% CV 9.4%	CB, TB, sociometric popularity (friendship), perceived popularity	CB, TB, sociometric popularity (friendship), perceived popularity
Williams2007	CB (1)	T1-T2: ever	Self-report (online at school, paper- pencil for students absent the	6 months (T1-T2, 6 months apart)	T1: 3339 T2: 2293 (1519)	US, 46 schools	45	Range grade 5-11	T(NI): CB 9.7%	Moral approval of bullying, perceived positive school climate, perceived peer support	CB, TB

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			day of data collection)								
Wright2013	CB (14)	T1-T2: NI	Self-report (SR) and peer nominations (PN) (paper-pencil at school)	6 months (T1-T2, 6 months apart)	T1: 261 T2: 261 (261)	US, 4 schools	43	T(NI): 13.1 (0.8)	NI	SR CV, peer rejection, SR CVxpeer rejection  PN CV, peer rejection, PN CVxpeer rejection	SR verbal CB, SR relational CB  PN verbal CB, PN relational CB
Wright2014a	Cyber aggression (CA) as an extension of CB (6) anonymous CA (30)	T1-T2: NI	Self-report (paper-pencil at school)	12 months (T1-T2, 12 months apart)	T1: 286 T2: 274 (274)	US, 1 schools	51	12.6 (0.7)	NI	Attitudes towards the permanency of digital content, confidence with not getting caught, beliefs about anonymity, normative beliefs about CA	Attitudes towards anonymous CA through e-mail, instant messages, chatrooms, social network sites, and mobile phones
Wright2014b	CB (14) cyber prosocial behavior (CSB) (4)	T1-T2: NI	Self-report (SR) and peer nominations (PN) (NI at school)	6 months (T1-T2, 6 months apart)	T1: 261 T2: 261 (256)	US, 4 schools	43	T(NI): 13.1 (NI)	NI	Perceived popularity, social preference, PN CSB, PN CSBxperceived popularity, PN	PN relational CB, PN verbal CB, PN CSB, SR relational CB, SR verbal CB, SR CSB

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											CSBxsocial preference	
Wright2015a	CB (9) CV (9)	T1: NI	T1: Self-report (NI at school)	12 months (T1-T2, 12 months apart) T1: student report and teacher report, T2: teacher report, school records	T1: 703 T2: 673 (673)	US, 3 schools	49	T(NI): 13.6 (0.2)	NI		CB, CV, CVxCB, TB, TV	Academic performance, absenteeism, school behavioral problems, classroom conduct
Wright2015b	CB (13) CV (13)	T1-T2: NI	Self-report (online)	12 months (T1-T2, 12 months apart)	T1: 450 T2: 423 (423)	US, Facebook	50	T(NI): 16.7 (NI)	NI		CV, parental stress, peer stress, academic stress	CB, depression, anxiety
Wright2016a	CV (9)	T1: within current school year	Self-report (paper-pencil at school)	24 months (T1-T3, each wave 12 months apart)	T1: 977 T2: 924 T3: 867 (NI)	US, 6 schools	T3: 49	T3: 13.7 (NI)	NI		CV, CVxsocial support, CVxtechnology mediation from school resource officers	Depression, anxiety, loneliness
Wright2016b	CV (9)	T1: within current school year	Self-report (NI at school)	12 months (T1-T2, 12 months apart)	T1: 578 T2: 568 (568)	US, 6 schools	47	T(NI): 13.3 (NI)	NI		CV, parental restrictive, co-viewing, instructive mediation, CVxparental mediation	Depression, anxiety, loneliness

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Wright2017a	CB (6) CV (6) cybertrolling perpetration (CTP) (2) cybertrolling victimization (CTV) (2)	T1: NI	Self-report (NI at school)	12 months (T1-T2, 12 months apart)	T1: 578 T2: 568 (568)	US, 6 schools	48	T(NI): 13.5 (NI)	NI	Parental restrictive, co-viewing, instructive mediation, genderxparental mediation	CB, CV, CTP, CTV
Wright2017b (Study1)	CB (8)	T1: NI	Self-report (online at school)	12 months (T1-T2, 12 months apart)	T1: 461 T2: 441 (439)	US, 1 school	49	T(NI): 12.8 (NI)	NI	Face-to-face sadness, cyber sadness face-to-face anger, cyber anger, mediators: face-to-face hostile, self-blame, neutral attributions, cyber hostile, self-blame, neutral attributions	TB, CB
Wright2017b (Study2)	CB (8)	T1: NI	Self-report (online at school)	12 months (T1-T2, 12 months apart)49	T1: 493 T2: 475 (414)	US, 1 school	49	T(NI): 12.7 (NI)	NI	Face-to-face sadness, cyber sadness face-to-face anger, cyber anger, mediators: face-to-face aggressor-blame, self-blame attributions,	TB, CB

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										cyber aggressor-blame, self-blame attributions	
Wright2017c	CV (9)	T1: within current school year	Self-report (paper-pencil at school)	12 months (T1-T2, 12 months apart)	T1: 153 T2: 131 (131)	US, 10 school	T2: 73	T2: range 13-15	NI	CV, moderators: social support from parents and teachers and friends	Depression
Yang2013	CB and CV (4)	T2: NI	Self-report (paper-pencil at school)	24 months (T1-T2, 24 months apart) T1 and T2: self-report and parent report	T1: 1197 T2: 1106 + 129 newly sampled (1106)	Korea, 5 schools	51	Range 10-11	NI	Family background, TB, TV, depression, anxiety, self-esteem, ADHD symptoms	TB, TV, CB, CV
Yang2014	CV (4)	NI	Self-report (NI at school)	24 months (T1-T2, 24 months apart)	T1: 937 T2: 835 (835)	Korea, 3 schools	48	Range 13-14	T2: CV 19.2%	Environmental factors, TB, TV, depression, anxiety, self-esteem, coping, ADHD symptoms	CV, online inappropriate sexual exposure, computer-overuse
You2016	CB (6)	NI	Self-report (NI at school)	12 months (T1-T2, 12 months apart)	T1: NI T2: NI (3449)	Korea, NI schools	50	13.8 (0.4)	NI	Family background, PC use, mobile phone use, achievement, gender, TB, TV, lack of self-control, self-esteem, aggression, emotional	CB

regulation,  
sociality

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*Note: CB = cyberbullying perpetration, CV = cyberbullying victimization, x = interaction term, TB = traditional bullying, TV = traditional victimization, T1 = Time 1, T2 = Time 2 etc., NI = no information*

**Appendix C. Theoretical background, statistical analyses, results, and quality assessment of longitudinal studies (n=76)**

First author and publication year	Explicitly mentioned theoretical background	Statistical analyses	Predictors	Direction of significant relationships	Outcomes	Main results	Controls	Quality assessment <sup>1</sup>
Athanasiades2016	None	Hierarchical linear regression analysis	TB, TV, parental mediation TB, TV	+ +	CV CB	TV, TB, and parental mediation at – in descending order regarding the strength of the effect – significantly positively predicted CV at T2. TB and TV at T1 significantly positively predicted CB at T2, with TB being by far the stronger predictor.	Autoregressive effects	Yes, yes, 25.0%, no, listwise deletion
Badaly2013	None	Cross-lagged structural equation modeling	CB  Social standing (popularity, social acceptance)	+ (girls) +	Social standing (popularity, social acceptance) CB	CB at T1 significantly increased popularity at T2 in girls but not in boys. Popularity at T1 significantly increased CB at T2 in boys and in girls.	None	No, NA, 6.0%, yes, listwise deletion
Bannink2014	None	Logistic regression analysis	CV, TV	+	Mental health status	TV and CV at T1 predicted higher odds of mental health problems at T2. TV but not CV at T1 predicted higher odds of suicidal ideation at T2.	Gender, age, ethnicity, education, autoregressive effects	Yes, NA, 62.0%, yes, listwise deletion
Barlett2015	Barlett and Gentile model	Risk analysis using logistic regression analysis	Positive attitudes towards CB, perceived anonymity, CB, gender (male)	+	CB	A cumulative risk factor including gender (male), high CB, perception of anonymity, and positive CB attitudes (all at T1) predicted CB at T2, T3, and T4 with over 90% of accuracy.	Autoregressive effects	No, yes, 30.0%, no, NI

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Barlett2017	Barlett and Gentile model expanded by the concept of online disinhibition	Structural equation modeling	Perceptions of anonymity, BI-MOB (belief in the irrelevance of muscularity online), online disinhibition, CB	+	CB attitudes, CB	CB, perceptions of anonymity, and BI-MOB (belief in the irrelevance of muscularity online) at T1 significantly positively predicted CB attitudes (as an average of T1 and T2 measures), which, in turn, significantly positively predicted CB at T2.	Gender, age, time spent on the Internet, autoregressive effect of CB	No, yes, 19.0%, yes, NI
Calvete2016	Cognitive theories and schema theory	Structural equation modeling	CV	+	Mistrust schema, defectiveness schema, depression	CV at T1 significantly positively predicted images of defectiveness and mistrust at T2, which in turn significantly positively predicted depression at T3. CV at T1 significantly negatively predicted body image at T2, which, in turn, significantly negatively predicted depression at T3.	Autoregressive effects	No, yes, 24.0%, no, expectation maximization imputation
			CV	-	Body image	Overall, depression at T3 increased as a function of CV at T1 and the mediating role of body image at T2. No significant gender differences occurred for the link between CV at T1 and the mediators at T2. However, the effect of body image at T2 on depression at T3 was stronger in girls.		
			CV	+	Depression			
Chng2014	Parental mediation theory	Latent growth modeling separately for boys and girls	Active and restrictive parental mediation	-	CB	Parental mediation was operationalized as active and restrictive mediation. Gender-specific analyses showed that, for active mediation, decreasing mean rates of change over three waves had a significant negative effect on CB at T3 for boys, but not for girls. The same pattern occurs for restrictive mediation. However, for restrictive mediation, initial levels at each wave significantly decreased CB at T3 for both boys and girls.	None	No, no, NI, no, NI

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Cole2016	None	Linear hierarchical regression analysis	CV	+	Negative self-cognitions, depression	CV at T1 significantly increased negative self-cognitions and depressive symptoms at T2. CV was the less stable form of peer victimization over a 12-months period.	TV, autoregressive effects	No, yes, 32.5%, yes, full information maximum likelihood estimation
delRey2012	None	Linear regression analysis; partial and semi-partial correlation analysis	CV TV, age, TB TV, TB	- +/- +/-	TB CV CB	CV was a significant negative predictor of TB at T2. With regards to CV and CB as outcome variables, CV at T2 was significantly positively predicted by TV and age at T1, and significantly negatively by TB at T1. In contrast, CB at T2 was significantly positively predicted by TV at T1, and significantly negatively by TB at T1.	Gender, age, TB, TV, autoregressive effects	No, yes, NI, no, listwise deletion
denHamer2015	Social cognitive theory, downward spiral model, developmental theories	Mixed model	Exposure to antisocial media content	+	CB	Higher levels of exposure to antisocial media content significantly contributes to higher initial rates of CB and faster increases of CB over time. These findings are more prevalent in boys.	None	No, yes, 23.9%, no, hotdeck imputation
denHamer2016	Cyclic process model	Structural equation modeling	Negative emotion regulation, anger	+(short term)	CB	Negative emotion regulation increased the relation between anger and cyberbullying only for a short period of time (at T1 and T2, but neither at T3 nor across waves). Positive emotion regulation did not decrease the effect of anger on CB.	None	No, yes, 23.9%, no, hotdeck imputation
Erentaite2012	None	Cluster analysis, cross-tabulation	TV (relational)	+	CV	The cross-tabulation of TV clusters at T1 with CV clusters at T2 revealed a partial link between TV and CV over time, e.g., 35 percent of adolescents experiencing TV at T1 face CV at T2. Compared to verbal TV, relational TV increased the probability of CV to a greater extent.	None	No, no, NI, no, NI

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Espinoza2015	None	Hierarchical linear regression analysis	CV	+	Anger	CV significantly positively predicted persistent experiences of anger (on the same day and on the following day). No lagged effects were found for other outcome variables.	None	No, no, 16.0%, no, NI
Fahy2016	None	Hierarchical logistic regression analysis	CB, CV, CB and CV combined	+	Depressive symptoms, social anxiety	CV and CB/CV combined significantly positively predicted the odds of showing symptoms of depression and social anxiety. Controlling for autoregressive effects, neither CB nor CV or CB/CV combined increased the relative risk of mental well-being below or above average.	Gender, ethnicity, free school meals, family affluence, autoregressive effects	Yes, yes, 22.8%, no, multilevel multiple imputation
Fanti2012	Ecological model	Hierarchical linear regression analysis	TB, media violence exposure, psychopathic personality traits, family social support	+/-	CB	TB, media violence exposure, and psychopathic traits at T1 significantly increased CB at T2, while family social support at T1 decreased CB at T2.	Gender, parental marital status, autoregressive effects	Yes, yes, 6.4%, no, NI
			TV, media violence exposure, family social support	+/-	CV	TV and media violence exposure at T1 significantly increased CV at T2, while family social support at T1 decreased CV at T2. Furthermore, the 3-way interaction between marital status, family, and friend social support at T1 significantly predicted CV at T2.		
Felmlee2016	Formative theories of groups and networks	Exponential random graph modeling; lagged, multiple quadratic assignment procedure	Friendship (dyadic data), dating partners (dyadic data)	+	CB/CV	Friendship and past dating between two members of a network significantly positively predicted CB/CV among the two, controlling for network-level characteristics such as edges and reciprocity, individual-level data such as gender, grade, and sexual orientation, and dyadic data such as homophily, i.e., same gender, grade, sexual orientation.	Network-level data such as edges and reciprocity, individual-level data such as gender, grade, sexual orientation, dyadic data such	No, NA, 6.0%, no, multiple imputation

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							as homophily, i.e., same gender, same grade, same sexual orientation	
Festl2016a	Social cognitive theory, (internet) usage hypothesis	Structural equation modeling	CV, online social activities	+	CB	CV and online social activities at T1 significantly positively predicted CB at T2. Multi-group comparison revealed gender differences: Compared to boys, CB in girls at T2 significantly increased with CV, online social activities, and online contact with strangers.	Gender, age, education level, autoregressive effects	Yes, yes, 48.3%, yes, full information maximum likelihood estimation
Festl2016b	Theory of planned behavior	Structural equation modeling	Perceived behavioral control (PBC) with regards to CB, TB, age	+	non-public CB	Higher perceived behavioral control (PBC) TB, and age at T1 significantly positively directly predicted non-public CB at T2. Positive attitudes towards CB and in-degree and influence of friends (both social network indicators) significantly positively directly predicted public CB at T2. Indirect effects also occurred.	Autoregressive effects	No, no, 16.0%, yes, listwise deletion
			Positive attitudes towards CB, social network indicators	+	public CB			
Festl2017	None	Latent transition analysis	CB/CV latent status group (n=5) derived from Latent Transition Analysis (LTA) of prior wave	=/+	CB/CV latent status group (n=5) derived from LTA of current wave	Five distinct statuses best represent involvement in CB at 3 waves: (1) non-involved, (2) gossiping perpetrator-victim, (3) insulting perpetrator-victim, (4) heavily victimized with mild perpetration, and (5) heavy perpetrator-victim. The statuses remained quite stable over time with some fluctuation as heavily involved tended to transition into less frequently involved or even stopped to being involved in CB.	None	No, yes, 64.0%, yes, full information maximum likelihood estimation

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Frison2016	None	Cross-lagged structural equation modeling	Depression, life satisfaction	+/-	CV	CV (experienced on Facebook) at T2 was positively predicted by depression at T1, and negatively by life satisfaction at T1. Neither gender nor age moderated the relationships. However, perceived friend support (PFS) significantly moderated the relationships: Significant bidirectional effects were evident for group with low PFS. One-directional effects (depression and life satisfaction at T1 to CV at T2) were evident for group with medium PFS, no bidirectional effects were evident for group with high PFS.	Time spent on Facebook, autoregressive effects	Yes, yes, 33.0%, yes, listwise deletion
GamezGuadix2013	Stress generation model of depression, Problem behavior theory	Cross-lagged structural equation modeling	CV	+	Depression, problematic internet use (internet addiction)	CV at T1 significantly positively predicted depression and problematic internet use (internet addiction) at T2, while depression and substance use at T1 significantly positively predicted CV at T2.	Autoregressive effects	Yes, yes, 17.2%, yes, NI
			Depression, substance use	+	CV			
GamezGuadix2016a	General aggression model	Multilevel hierarchical linear regression analysis	2-way interaction of low CB justification and low impulsivity	-	CB	CV and justification of CB at T1 did not significantly predict CB at T2 at the individual level. Impulsivity significantly moderated the impact of CB justification at T1 on CB at T2, i.e. low levels of justification combined with low levels of impulsivity led to low levels of CB at T2.	Gender, age, autoregressive effects	Yes, yes, 22.6%, yes, expectation maximization imputation
GamezGuadix2016b	Theory of risk and problem behaviors during adolescence	Cross-lagged structural equation modeling	Problematic internet use (internet addiction), meeting strangers online	+	CB	Problematic internet use (internet addiction) and meeting strangers online at T1 significantly positively predicted CB at T2. These effects remained significant after including impulsivity-irresponsibility at T1 as an explanatory mechanism.	Autoregressive effects	No, yes, 12.0%, yes, NI

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GonzalesCabrera2017	None	Area under the curve and structural equation modeling	CB and CV combined	+	Cortisol release, anxiety, perceived stress	CB/CV at T1 significantly increased cortisol release at T2, which in turn was significantly positively related to anxiety and perceived stress at T2. The effect of CB/CV on anxiety and perceived stress was fully mediated by cortisol release.	Gender, autoregressive effects of anxiety and perceived stress	Yes, yes, 80.0%, no, listwise deletion
Gradinger2012	Transactional model of development	Cross-lagged structural equation modeling	CV	+(in girls)	Popularity, perceived popularity	Neither TV nor popularity and perceived popularity at T1 significantly predicted CV at T2. In contrast, CV at T1 significantly positively predicted popularity and perceived popularity at T2 in girls, not in boys.	Autoregressive effects	No, yes, 58.7%, yes, full information maximum likelihood estimation
Hebert2016	None	Moderated mediation model	Child sexual abuse, maternal support	+/-	CV, TV	Child sexual abuse at T1 significantly positively and maternal support at T1 significantly negatively predicted by both CV and TV at T2.  <i>Note: The authors also tested a moderated mediation model predicting mental health problems at T2 by child sexual abuse and maternal support (moderator) measured at T1 and CV and TV measured at T2. CV, TV, and mental health problems were measured at the same time point. Thus, no causal claims can be made.</i>	Gender, age	Yes, NA, 17.3%, no, NI
Heirman2012	Theory of planned behavior	Structural equation modeling	Positive attitude toward CB, subjective norm, perceived behavioral control	+	CB	Attitude, subjective norm, and perceived behavioral control were all significant predictors of intention to cyberbully at T1, which, in turn, positively significantly predicted CB at T2. Positive attitude towards CB was the strongest predictor of intention to cyberbully, followed by perceived behavioral control. Subjective norm was weakly negatively related to intention.	None	Yes, yes, NI, no, full information maximum likelihood estimation

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Hemphill2012a	None	Univariate descriptive analysis	NA	NA	NA	CB remains stable at T1 and T2 but decreases at T3. CV remains rather stable over all three time points. Likewise, the rates of CB/CV remain stable over time.	None	Yes, NA, 1.7%, no, listwise deletion
Hemphill2012b	None	Logistic regression analysis	TB (relational aggression)	+	CB	In the fully adjusted model with individual-level, family-level, peer group, and school-level risk factors, TB (relational aggression) towards peers at T1 was the only significant predictor of CB at T2.  <i>Note: The authors did not control for autoregressive effects of CB at T1 as CB was measured for the first time at T2.</i>	Gender, age, clustering of students in schools	Yes, NA, 23.2%, no, listwise deletion
Hemphill2014	Ecological systems theory	Logistic regression analysis	TB, TB and TV combined, poor family management	+	CB	In the fully adjusted model with gender, age, TB, TV, TB and TV combined, CB, CV, CB and CV combined, academic failure, low school commitment, emotion control, association with antisocial friends, poor family management, family conflict, attachment to mother and father as T1 (grade 9) risk factors, the following significant predictors emerged: TB, TB and TV combined, and poor family management increased the relative risk of CB at T2 (young adulthood); emotion control decreased the risk of CV at T2; being male decreased the relative risk and TB, CB and CV combined increased the relative risk of CB and CV combined at T2.	Clustering of students in schools	Yes, NA, 13.2%, yes, listwise deletion
		Emotion control	-	CV				
		CB and CV combined	+	CB and CV combined				
Hemphill2015a	None	Logistic regression analysis	Theft	+	CB	In the fully adjusted model with suspension from school, theft, violent behavior, marijuana use, binge drinking, depressive symptoms, and self-harm as T1 (grade 9) risk factors, none significantly predicted CB or CV or the co-occurrence of CB and CV at T3 (grade 11). When repeating the analysis for T2 (grade 10) risk factors, theft	Gender, clustering of students in schools	Yes, NA, 13.0%, no, listwise deletion
		Depressive symptoms	+	CV				
		Suspension from school, binge	+	CB, CV				

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			drinking, self-harm			significantly predicted CB at T3, depressive symptoms significantly predicted CV at T3, and suspension from school and binge drinking significantly predicted CB/CV at T3.		
Hemphill2015b	None	Logistic regression analysis	TV, emotional control	+/-	CV	In the fully adjusted model with individual-level, family-level, peer group, and school-level risk and protective factors, TV (individual-level risk factor) and emotional control (individual-level protective factor) at T1 were the only significant predictors of CV at T2. TV was the stronger predictor increasing the odds of CV to 1.9.	Gender, age, clustering of students in schools	Yes, NA, 27.0%, no, listwise deletion
Herge2016	None	Structural equation modeling	TV, CV	+	Somatic problems, sleep problems	CV at T1 significantly directly increased somatic complains and sleep problems at T3. Contrary to what the authors hypothesized, depression and social anxiety at T2 did not function as mediators.	Gender, age, ethnicity	No, yes, 4.5%, yes, imputation (type not specified)
Holfeld2015	None	Bivariate correlation analysis	CB, CV, TV, aggression towards peers	+	CB, CV, TV, aggression towards peers	Technology access and use, CB, CV, and aggression towards peers increase from T1 to T2, while TV decreases. CB, CV, aggression towards peers, and TV at T1 are positively related to each other at T2.	Gender, age, socio-economic background	Yes, yes, 10.6%, no, NI
Holfeld2017	None	Cross-lagged structural equation modeling	Overall school climate CV	- -	CV Overall school climate	A more positive experiences of overall school climate (including perceived fairness, equity in sharing of resources, parent involvement, student interpersonal relations, student-teacher relations) at T1 significantly negatively predicted CV at T2. CV at T1 also significantly negatively predicted perceived overall school climate at T2, but the effect was considerably smaller.	Gender, age, socio-economic background, TV, WITS program/control school designation	Yes, yes, 10.6%, yes, NI
Jang2014	General strain theory	Multilevel logistic	TV	+	CB	As TV increased, the odds of CB in the following year significantly increased. Among control variables, age (younger),	Gender, wave (age), household income, parental	Yes, no, 6.1%, yes, dummy

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		regression analysis				gender (male), all forms of strain, low self-control, and delinquent peer significantly positively predicted the odds of CB, but to a lesser extent.	strain, study strain, financial strain, low self-control, delinquent peer	variable for presence of missing data included as covariate
Jose2012	None	Cross-lagged structural equation modeling	CB, TB CV, TV CB, CV	+ + +/ns	CB, TB CV, TV CV, CB	CB and CV were moderately stable over a one year time period. Bidirectional path analysis showed that CB at T1 significantly positively predicted CV at T2, but not vice versa. CB and TB at T1 significantly positively predicted each other at T2. Likewise, CV and TV at T1 significantly positively predicted each other at T2, though the effect of CV at T1 on TV at T2 was marginal.	None	Yes, no, NI, 0, full information maximum likelihood estimation
Kim2017	Generality hypothesis	Latent group-based trajectory analysis, multinomial logistic regression analysis	TB, TV, lower levels of self-control, peer violent delinquency, male, peer and parental attachment, parental supervision	+/-	Risk for being part of the "chronic CB and TB" group compared to "non-involved" group	Latent group-based trajectory analysis revealed three groups for CB and TB with similar trajectories: "non-involved", "sharp-decreasing" and "chronic" group over the course of 5 years. TB, TV, lower levels of self-control, peer violent delinquency, and being male increased the relative risk of being in the "chronic" group compared to the "non-involved" group, while peer attachment, parental attachment, and parental supervision decreased the risk.	Gender, parental education, family income	Yes, no, 50%, no, multiple imputation
Korchmaros2014	None	Linear regression analysis	Academic problems, gender (female), latent risk factors (experience with problem behavior, lack of Internet safety	+	CV	CV at T3 was significantly positively predicted by academic problems, being female, and all latent risk factors identified at T1: experience with problem behavior, lack of internet safety procedures, substance use, and negative parent-child relationship characteristics.	Social desirability bias, Presence of somebody while responding	Yes, yes, 36.0%, yes, multiple imputation

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			procedures, substance use, negative parent-child relationship)					
Landoll2015	None	Structural equation modeling	CV	+	Depression	CV is a unique construct that differs from traditional forms of victimization including relational, reputational, and overt TV. CV at T1 significantly positively predicted depression but not social anxiety at T2.	Gender, ethnicity, TV, autoregressive effects	No, yes, 9.0%, no, full information maximum likelihood estimation
Le2017	None	Multivariate multinomial logistic regression analysis	Age (younger students) conflict with siblings gender (male), age (younger students), psychological distress, parental violence	+ + +	CV CB CB and CV combined	Numerous results (here summary of findings for students who showed increased involvement over time compared to not-involved students as the reference group): Increasing CV more likely in younger students, increasing CB more likely in students who are often in conflict with siblings, increasing cyberbully-victims more likely in male and younger students, students with psychological distress, students who often witness parental violence.	None	No, yes, 5.1%, no, NI
Lester2012	Problem behavior theory, social cognitive theory	Multilevel Tobit regression analysis	CB, CV	ns	Problem behaviors	Neither CB nor CV at T1 significantly predicted problem behaviors at T2.	Gender, TB, TV, interaction of TB and TV, autoregressive effects	Yes, yes, 8.0%, no, listwise deletion
Low2013	Social interaction learning theory	Hierarchical linear regression analysis	TB, gender (male), ethnicity (white) 3-way interaction between	+ +	CB CB	Being male, being white, and TB at T1 significantly positively predicted CB at T3. A three-way interaction between substance use, ethnicity, and gender was also significant: white females high in substance use at T1 had the highest CB score at T3.	Gender, age, race, parental education, autoregressive effects	No, yes, NI, no, imputation with Markov Chain Monte Carlo maximum

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			gender(female), ethnicity (white), and substance use					likelihood algorithm
Machmutow2012	Coping theory	Generalised linear modeling	Age, gender, TV, CV, distant advice, close support, assertiveness, helplessness, retaliation	ns	Depressive symptoms	None of the predictors, including CV, at T1 significantly impacted depressive symptoms at T2.	Situational variability in CB scenarios, autoregressive effects	Yes, yes. 1.8%, no, NI
Meter2015	Social-ecological model	Structural equation modeling	Social networking participation CB, CV, social networking participation	+ -/+	CB and CV combined Password sharing with friends	CB and CV combined at T2 was significantly positively predicted by social networking participation at T1, but not by password sharing with friends at T1. Password sharing with friends at T2 was significantly negatively predicted by CB and CV combined at T1 and significantly positively by social networking participation.	Autoregressive effects	No, yes, around 40%, no, full information maximum likelihood estimation
Modecki2013	None	Latent growth modeling	Problem behavior, depressed mood, self-esteem	+	CB, CV	Steeper problem behavior trajectories across grades 8–10 (slope) predicted higher CB and CV in grade 11. Higher grade 8 depressed mood predicted higher subsequent grade 11 CB and CV. Steeper declines in self-esteem across grades 8–10 (slope) predicted higher CB and CV.	Gender, pubertal timing	No, NA, NI, no, NI
Murphy2009	None	Hierarchical linear regression analysis	TB (verbal) TB (social), TB(physical) Prosocial behavior	+(girls) +/(boys) -	CB CV CB	CB at T2 was significantly positively predicted by verbal TB at T1 in girls. CV at T2 was significantly positively predicted by social TB both in girls and boys, while physical TB at T1 significantly negatively predicted CV at T2 only in boys. Separate regression analyses showed that prosocial behavior at T1 significantly negatively	Gender, age (grade), autoregressive effects (CB at T1)	No, NA, 32.7%, yes, listwise deletion

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			TV (social)	+	CV	predicted CB at T2 in both boys and girls, while social TV at T1 significantly positively predicted CV at T2.		
Pabian2014	Theory of planned behavior	Structural equation modeling	Positive attitude toward CB, subjective norm, intention to CB	+	CB	CB at T2 was significantly positively predicted by positive attitude towards CB and subjective norm at T1. The causal relationship was fully mediated by intention to CB at T1. Perceived behavioral control was no significant predictor.	None	Yes, NA, 10.0%, yes, listwise deletion
Pabian2016a	None	Cross-lagged structural equation modeling	CV, TB, TV Social anxiety, TV CV, social anxiety	+ + +	CB CV TV	CB at T2 was significantly positively predicted by CV, TB, and TV at T1. CV at T2 was significantly positively predicted by social anxiety and TV at T1. TB at T2 was significantly positively predicted by CB and TV at T1. TV at T2 was significantly positively predicted by social anxiety and CV at T1. Social anxiety at T2 was significantly positively predicted by TB at T1.	Gender, age, autoregressive effects	Yes, NA, 8.8%, yes, listwise deletion
Pabian2016b	Social information processing model / social skills deficit model, theory of mind	Latent class analysis, latent class growth modeling, ANOVA	NA	NA	NA	Latent class analysis showed four profiles of bullies: nonstop traditional bullies, bullies with decreasing perpetration, bullies with increasing perpetration, and noninvolved. Latent class growth modeling showed that adolescents with a relatively high level of social intelligence seem to be more inclined to be a perpetrator of traditional and cyberbullying, while those with a relatively low level of social intelligence are more inclined to bully (only) traditionally.	None	Yes, NA, 38.8%, yes, NI
Pabian2016c	Control theory of delinquency, social development model	Cross-lagged structural equation modeling	CB, teacher bonding	-	Teacher bonding, CB	Teacher bonding and CB at T1 significantly negatively predicted each other at T2. No significant cross-lagged relations were found between CB and school bonding or TB and teacher/school bonding.	Gender, age, CV, TV, autoregressive effects	Yes, NA, 8.8%, yes, listwise deletion

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Pabian2016d	None	Cross-lagged structural equation modeling	CB bystander Positive attitudes towards CB, empathy	- +	Empathy CB bystander	Empathy at T2 was significantly negatively predicted by CB bystander at T1, CB bystander at T2 was significantly positively predicted by empathy and positive attitudes towards CB at T1. Positive attitudes towards CB at T2 was significantly negatively predicted by empathy at T1.	CB, CV, gender, age, autoregressive effects	Yes, NA, 7.0%, yes, NI
Rose2015	None	Cross-lagged structural equation modeling	CV, depression, anxiety	+	CV, depression, anxiety	CV and depression: CV at T1 significantly positively predicted depression at T3, while depression at T1 and T2 significantly positively predicted CV at T2 and T3. CV and anxiety: CV at T1 and T2 significantly positively predicted anxiety at T2 and T3, while anxiety at T1 significantly positively predicted CV at T3.	Autoregressive effects	No, yes, 47.0%, no, imputation with Markov Chain Monte Carlo maximum likelihood algorithm
Salmivalli2013	Social dominance theory of bullying, participant role approach, cumulative risk model of poly-victimization	Multinomial logistic regression analysis, ANCOVA	Bully reputation TV, CV	+ +	CV Depression	Compared to non-victimization, CV at T2 was significantly positively predicted by peer reputation as a bully at T1. Compared to students experiencing TV and CV at T1, students experiencing only CV at T1 felt significantly less depressed at T2.	Gender, school level, autoregressive effects	No, NA, NI, yes, NI
SchultzeKrumholz2012	None	Structural equation modeling	CV CB, 2-way interaction of CV and CB	+ (girls) +/- (girls)	Depression, reactive aggression, instrumental aggression Reactive aggression	Results for girls: CV at T1 significantly positively predicted depression, reactive, and instrumental aggression at T2. CB at T1 significantly positively predicted reactive aggression at T2, while the interaction of CB and CV significantly negatively predicted reactive aggression. Results for boys: CB at T1 significantly negatively predicted depression and loneliness at T2, while the interaction of CV	Autoregressive effects	No, yes, 35.0%, no, NI

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			CB, 2-way interaction of CV and CB	-/+ (boys)	Depression, loneliness	and CB significantly positively predicted loneliness.		
SchultzeKrumholz2013	None	Hierarchical quasi-poisson regression analysis	TV, low affective empathy	+	CB	TV and below-average affective empathy at T1 significantly positively predicted being a CB at T2. No significant T1 predictor was found for CV at T2. Psychopathological symptoms at T2 were not significantly predicted by CB or CV at T1. Social withdrawal was significantly predicted by lower levels of TB at T1.	Autoregressive effects	No, yes, NI, no, multiple imputation
Smokowski2014	None	Hierarchical linear regression analysis	Chronic CV	+	Negative school experiences (hassles and discrimination)	CV at T1 significantly negatively predicted school hassles at T2 until chronic CV at T1 and T2 was added to the model. Chronic CV significantly positively predicted school hassles and perceived discrimination at school at T2. Chronic CV at T1 and T2 predicted significantly negatively parent and friend support and significantly positively peer rejection at T2. Past CV at T1 was no significant predictor of perceived social support. Chronic CV at T1 and T2 predicted significantly negatively self-esteem and significantly positively depression, anxiety, and aggression at T2. Past CV at T1 did not significantly predict any considered indicator of mental health at T2.	Autoregressive effects	Yes, NA, NI, no, NI
			Chronic CV	-	Social support, self-esteem			
			Chronic CV	+	Peer rejection, depression, anxiety, aggression			
Sticca2013	None	Multivariate logistic regression analysis	TB, rule-breaking behaviors, online communication	+	CB	TB, rule-breaking behavior and online communication at T1 significantly positively predicted the likelihood of CB at T2.	Autoregressive effects, TB at T2	Yes, yes, 2.%, no, NI
Sumter2012	Victim schema model	(Dual) Trajectory	Low CV trajectory	+	Life satisfaction	Two CV trajectories could be found: little or no CV trajectory group and moderate decreasing CV trajectory group. The latter	Autoregressive effects	Yes, yes, 42.3%, no, NI

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		analysis, ANOVA				showed peak in CV at the age of 14 followed by a decrease until the age of 19. Dual trajectory analysis revealed that CV was always accompanied by TV.  Low CV trajectory group reported more life satisfaction than moderate CV trajectory group.		
vandenEijnden2014	None	Cross-lagged structural equation modeling	Loneliness, CV TV Social anxiety, CV TV, CB	+/- + + +/-	CV, loneliness CV CV Social anxiety	In the model including loneliness, bidirectional effects were evident for loneliness and CV at T1 and T2, while only autoregressive effects were evident for loneliness and CV at T3. In addition, CV at T3 was significantly positively predicted by TV at T2.  In the model including social anxiety, social anxiety significantly positively predicted CV at T2 and T3, while social anxiety at T2 was significantly positively predicted by TV at T1 and social anxiety at T3 was significantly negatively predicted by CB at T2.  CB is not a significant moderator of the relationship between CV and loneliness/social anxiety.	Autoregressive effects	Yes, yes, 52.9%, yes, full information maximum likelihood estimation
Wegge2016	None	Cross-lagged structural equation modeling	CB	+	Perceived popularity	CB at T1 significantly positively predicted perceived popularity at T2. No other significant cross-lagged associations were found. Further, no gender differences were found for the cross-lagged associations between TB, CB, sociometric and perceived popularity.	Autoregressive effects	No, NA, 2.0%, yes, listwise deletion
Williams2007	None	Logistic regression analysis	Moral approval of bullying	+	CB	CB at T2 was significantly positively predicted by moral approval of bullying at T1 and more negatively by positive school climate and perceived peer support at T1.	None	No, yes, 31.3%, no, NI

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			Perceived positive school climate, perceived peer support	-	CB			
Wright2013	General strain theory	Hierarchical linear regression analysis	Self-reported CV, peer rejection, 2-way interaction of self-reported CV and peer rejection	+	Self-reported verbal CB, Self-reported relational CB	Self-reported relational and verbal CB at T1 were significantly positively predicted by self-reported CV and peer rejection as well as the interaction between CV and peer rejection at T1. The same results occurred for PN measures of the same concepts.	Gender, autoregressive effects	No, yes, 0.0%, NA, NA
			Peer-nominated CV, peer rejection, 2-way interaction of peer-nominated CV and peer rejection	+	Peer-nominated verbal CB, peer-nominated relational CB			
Wright2014a	Online disinhibition effect	Hierarchical linear regression analysis	4-way interaction of attitudes towards the permanency of digital content, confidence with not getting caught, beliefs about anonymity, normative	+	Anonymous cyberaggression (CB)	Four-way interactions among (1) attitudes towards the permanency of digital content, (2) confidence with not getting caught, (3) beliefs about anonymity, and (4) normative beliefs about cyber aggression measured at T1 significantly best predicted anonymous cyberaggression (CB) at T2 through e-mail, instant messages, and chatrooms. Three-way interactions (excluding (3)) significantly best predicted anonymous cyber aggression (CB) at T2 through social networking sites and mobile phones.	Gender, (anonymous) cyber aggression at T1	No, yes, 2.0%, no, NI

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			beliefs about cyberaggression (CB)					
Wright2014b	Co-construction theory	Hierarchical linear and curvilinear regression analysis	Perceived popularity, social preference	Curvilinear (U-shape)	CB	Linear and curvilinear associations were found between perceived popularity at T1 and Peer-nominated and self-reported CB at T2. Curvilinear relations fit the data better. A curvilinear relationship was also found between social preference at T1 and CB at T2.	Gender, autoregressive effect (only for cyber social behaviors)	No, yes, 0.0%, NA, NA
Wright2015a	None	Hierarchical linear regression analysis	CB, CV, 2-way interaction of CB and CV	-/+	Academic performance, school behavioral problems	CB and CV at T1 significantly negatively predicted academic performance at T2 and significantly positively school behavioral problems at T2. For both T2 outcomes, the interaction between CB and CV at T1 was also significant.	Gender, autoregressive effects	No, yes, 4.3%, no, NI
Wright2015b	General strain theory	Structural equation modeling	CV	+	CB, depression, anxiety	CB, depression, and anxiety at T2 were all significantly positively predicted by CV at T1 mediated by perceived parental, peer, and academic stress at T1.	Gender, autoregressive effects	No, yes, 2.0%, no, listwise deletion
Wright2016a	None	Structural equation modeling	CV, 2-way interaction of CV and social support, 2-way interaction of CV and technology mediation	+(moderators as buffers)	Depression	Social support and technology mediation from school recourse officers at T2 significantly moderated (buffered) the effect of CV at T1 on depression at T3. The effect was more negative at higher levels of social support and technology mediation, and more positive at lower levels of social support and technology mediation.	Gender, TV, autoregressive effects	Yes, but self-selection among randomly picked schools, yes, 11.0%, no, listwise deletion

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Wright2016b	None	Structural equation modeling	CV, parental mediation	+/-	Depression, anxiety, loneliness	CV at T1 significantly positively predicted depression, anxiety, and loneliness at T2. The association with depression was partly mediated by restrictive mediation (+), co-viewing mediation (-), and instructive mediation (-) at T1, while the association with anxiety was partly mediated by restrictive (+) and instructive mediation (-).  The moderations of parental mediation in the relationship between CV at T1 and depression at T2 as well CV at T1 and anxiety at T2 were significant. Parental mediation functions as a buffer against T2 outcomes.	TV	Yes, yes, 2.0%, no, listwise deletion
Wright2017a	None	Structural equation modeling	Parental restrictive, co-viewing, instructive mediation	-/+	CB, CV, cybertrrolling perpetration, cybertrrolling victimization	Restrictive mediation at T1 predicted significantly negatively CB and positively CV and cybertrrolling perpetration (CTP) at T2. Co-viewing mediation at T1 predicted significantly negatively CB, CV, and CTP at T2. Instructive mediation at T1 predicted significantly negatively CV and cybertrrolling victimization at T2. The interaction between parental mediation and gender at T1 was only significant for CV at T2.	Autoregressive effects	Yes, yes, 2.0%, no, listwise deletion
Wright2017b (Study 1)	Social information processing model	Structural equation modeling	Cyber hostile, self-blame, neutral attributions	+	CB	Cyber (hostile, self-blame, neutral) attributions to a hypothetical cyberbullying scenario at T1 significantly predicted cyberaggression (CB) at T2. Cyber attributions, in turn, were significantly associated with cyber sadness. In addition, cyber hostile attributions were significantly positively associated with face-to-face and cyber anger.	Gender, autoregressive effects	Yes, yes, 10.0%, no, listwise deletion of those with 75-100% missing responses to cyberaggression

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Wright2017b (Study 2)	Social information processing model	Structural equation modeling	Cyber aggressor-blame, self-blame attributions	+	CB	Cyber (aggressor-blame, self-blame) attributions to a hypothetical cyberbullying scenario at T1 significantly positively predicted cyberaggression (CB) at T2. Cyber attributions, in turn, were significantly positively associated with cyber sadness. In addition, cyber aggressor-blame attribution was significantly positively associated with face-to-face and cyber anger.	Gender, autoregressive effects	Yes, yes, 10.0%, no, NI
Wright2017c	None	Hierarchical linear regression analysis	CV, social support from parents and teachers and friends	+	Depression	Social support from parents and teachers at T1 significantly moderated (buffered) the effect of CV at T1 on depression at T2 in students with intellectual disabilities and/or developmental disorders. The effect was more negative at higher levels of social support and more positive at lower levels. No moderating role was found for perceived social support from friends.	Gender, TV, autoregressive effects	Yes, yes, 14.0%, no, listwise deletion
Yang2013	None	Multivariate logistic regression analysis	Gender (male), family background, TB, depression, anxiety, low self-esteem	+	CB, CV	CB and CV at T2 were significantly more likely in male, children of parents with low academic level, children who engaged in TB at T1 and children with depression, anxiety (only for CB), and lower self-esteem at T1.	None	No, yes, < 15%, yes, multiple imputation
Yang2014	None	Multivariate logistic regression analysis	Depression, anxiety, gender (male)	+	CV	CV at T2 was significantly more likely in male and children with depression or anxiety at T1.	None	No, yes, 10.8%, no, multiple imputation
You2016	None	Hierarchical logistic regression analysis	Computer use, TB, TV, lack of self-control, aggression	+	CB	The factors at T1 that significantly increasing the odds of CB at T2 were: computer (Internet) use, TV and TB, lack of self-control, and aggression level. Father's academic ability at T1 significantly decreased the odds of CB at T2.	None	Yes, yes, NI, no, full information maximum likelihood estimation

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Family  
background  
(father's  
academic  
ability) - CB

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*Note: CB = cyberbullying perpetration, CV = cyberbullying victimization, TB = traditional bullying, TV = traditional victimization, T1 = Time 1, T2 = Time 2, etc., NA = not applicable, ns = non-significant; <sup>1</sup>quality assessment includes an evaluation of methodological study characteristics in the following order: sampling procedure (random or not/not mentioned), reliability check for multi-item CB and CV measures (mentioned or not, NA = not applicable because a single-item indicator was used), dropout rate (in %) between initial and final wave, systematic dropout check between initial and analytical sample, type of missing data handling*