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Cyberbullying Prevention: Which Design Features
Foster the Effectiveness of School-Based Programs?
A Meta-Analytic Approach

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Abstract

Cyberbullying is a global phenomenon that affects 10–40 per cent of youth (Hinduja & Patchin, 2014) and has severe consequences such as depression, anxiety, and suicidal thoughts. A large and growing body of literature discusses and assesses programs aimed at preventing cyberbullying, to which the present article aims to contribute. My purpose was to examine whether prevention programs that have certain features – in particular, social-emotional learning, a whole-school approach, mentoring and education on online safety, and cyberbullying – are more effective than others. This ambition is novel in the cyberbullying literature. The analysis is based on the results of 23 impact evaluation articles that examined 15 school-based cyberbullying prevention programs or program variants. It was found that programs that include social-emotional learning and mentoring are more effective at reducing perpetration, whereas those including education about e-safety and cyberbullying are more effective at reducing victimization. The policy implications and limitations of the study are also discussed.

Keywords: Cyberbullying prevention, Meta-analysis, Social-emotional learning, Mentoring, Education on e-safety and cyberbullying

1 Introduction

The phenomenon of cyberbullying arose with the diffusion of personal ICT devices and internet and social media, and had become a severe, global problem by the beginning of the twenty-first century. Cyberbullying has attracted considerable attention from both policymakers and researchers. Numerous prevention programs have been implemented and a large body of related research has been conducted. Cyberbullying studies usually cover the topics of possible consequences, risk factors, underlying psychological processes, prevalence, or similarities/differences with traditional bullying. Other studies discuss potential coping strategies or policy instruments for tackling the problem. There is a growing body of cyberbullying program evaluation literature and meta-analyses have also been conducted.

Although cyberbullying may occur in settings outside of schools, the phenomenon is the most severe and the most prevalent among schoolchildren (Cassidy et al., 2013). In the present study, I focus only on cyberbullying among children and adolescents in reference to school-based prevention programs.

In the cyberbullying prevention literature, there are two distinctive streams. One discusses potential intervention strategies and program elements (such as Ang, 2015; Betts, 2016; Chisholm, 2014) on the basis of mostly behavioral-psychological arguments. The other stream examines prevention programs on a quantitative basis, in the form of either impact assessments or meta-analyses (Gaffney et al., 2019; van Cleemput et al., 2014). However, to my knowledge, the two streams have not been connected yet, and no studies have examined the effectiveness of different program elements or strategies on an empirical basis. The purpose of the present article is to fill this gap.

In Section 2, I briefly discuss the phenomenon of cyberbullying. In Section 3, I present a framework of risk factors related to cyberbullying and prevention program elements that may address them. Then, in Section 4, on the basis of the preceding discussion, I formulate the research question and the hypotheses. In Section 5, I describe the methodology. I then present the findings of the analysis in Section 6. Finally, in Section 7, I discuss the implications as well as the limitations of the study.

2   The phenomenon of cyberbullying

It is debated whether cyberbullying is a form of traditional (face-to-face) bullying, or if it is a distinct form of behavior. Definitions of traditional bullying and cyberbullying are rather similar. According to a consensual definition, bullying is intentional, aggressive, and repetitive behavior involving a power imbalance between the perpetrator(s) and the victim (Smith, 2016). Cyberbullying, on the other hand, is most commonly defined as 'willful and repeated harm inflicted through the medium of electronic text' (Patchin & Hinduja, 2006: 152).

There seems to be clear evidence of the relationship between traditional bullying and cyberbullying. Cross et al. (2015) conducted a longitudinal study and found significant overlap between traditional bullies and cyberbullies/victims. Others, such as Hinduja and Patchin (2008) and Mehari et al. (2014), also identified an overlap between face-to-face bullying and cyberbullying. Dooley et al. (2009) point out that the overlap suggests that the core behavior of bullying is more important than the medium through which it is carried out.

On the other hand, several important characteristics suggest that digital technologies fundamentally alter the process of bullying (Englander, 2017). For instance, as opposed to traditional bullying, in the case of cyberbullying harm may be repeated even though this is not intended by the perpetrator (e.g. a Facebook post with harmful content may spread without the bully's intention). Other studies (Hinduja & Patchin, 2014; Cassidy et al., 2013) emphasize that since cyberbullies are not confronted with the immediate negative effects of their act on the victims, and since the digital environment gives a sense of anonymity (although the identity of the bully is usually known to victims), cyberbullies deindividualize their victims and tend to be less empathetic. It is also an important difference that, unlike traditional bullying, cyberbullying does not stop when school ends (Hinduja and Patchin,

2014). Due to the widespread use of the internet and smartphones among youths, victims may be faced with the harmful content at any time. Hinduja and Patchin (2014) also argue that due to these attributes, cyberbullying may cause more harm than traditional bullying.

The negative effects of cyberbullying on victims are severe. Multiple studies (among others, Cassidy et al., 2013; Betts, 2016) have found that victims of cyberbullying may experience depression, anxiety, frustration, and low self-esteem. Gámez-Guadix et al. (2013) examined the relationship between substance use and cyberbullying and found a significant correlation between them. As for the potential causal relation between cyberbullying and suicide, Hinduja and Patchin (2010) found that cyberbullies were more likely to report having attempted suicide than those who were neither bullies nor victims. On the other hand, Cassidy et al. (2013) concluded that, despite famous cases, there is no evidence that cyberbullying alone, without the presence of other important causes, leads to suicide. Raskauskas and Stoltz (2007) argue that victims may also experience feelings of hopelessness and powerlessness as they fear that the relative anonymity of the aggressor makes it impossible to stop the bullying.

Cyberbullying may take various forms, and may be carried out with different tools. The most common forms of cyberbullying include posting unkind or harmful comments, photos or videos, sharing embarrassing gossip, name calling, or creating defamatory voting polls. As for the tools of cyberbullying, the most common ones are social media platforms (such as Facebook or Instagram), instant messaging applications (Whatsapp, Viber), video sharing servers (Youtube), e-mail servers, blogs or other websites, and online multiplayer games. The literature also mentions phone calls and text messages as potential channels of bullying, but in modern times these means are less relevant. For a more detailed list of possible forms and tools, see Chisholm (2014).

Numerous studies have examined the prevalence of cyberbullying. According to a survey ordered by the European Parliament (2016), more than two-thirds of 20,000 respondents from 24 countries had encountered cyberbullying in some form.[1] As for the proportion of victims, most studies estimate that between 10 and 40 percent of 10 to 18-year-old children and adolescents have been cyberbullied, while slightly fewer have bullied others (Hinduja and Patchin, 2014). However, Chisholm (2014) argues that surveys may underestimate the actual prevalence of the phenomenon.

3   Cyberbullying prevention

In order to elaborate and evaluate cyberbullying prevention programs, it is essential to examine the related risk factors associated with cyberbullying; that is, the factors that increase the likelihood of becoming a cyberbully and/or a victim. Cyberbullying prevention efforts should address these risk factors in order to reduce the prevalence of the phenomenon. As noted above, although it is debated whether cyberbullying is a type of traditional bullying or a distinct behavior, there are surely important similarities between the two phenomena. Therefore, the risk factors of face-to-face bullying are also likely to be relevant in the case of cyberbullying. It is widely agreed upon that a lack of empathy and a bad school atmosphere that tolerates or endorses aggression are highly important risk factors (Casas et al., 2013; Hinduja & Patchin, 2008; 2011; Cassidy et al., 2013). Other

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[1]   They have bullied others, have been cybervictimized, have seen or heard of it.

studies also outline psychological problems (Ang, 2015), proactive aggression (Calvete et al., 2010), and bad parent-adolescent relationships as risk factors for cyberbullying (Ybarra & Mitchell, 2004).

There are several risk factors specific to cyberbullying. Many studies outline the importance of insufficient privacy concerns and excessive internet usage (Hinduja & Patchin, 2011; Casas et al., 2013; Ang, 2015). Insufficient privacy concerns may include the disclosure of private or sexual content or the use of weak passwords, increasing the likelihood of victimization. In addition, excessive internet use increases the probability of both becoming a bully and a victim. Several studies (Casas et al., 2013; Machmutow et al., 2012; Kowalski et al., 2012) have shown that there is a causal relationship between traditional bullying and cyberbullying; therefore the former can also be regarded as a risk factor of the latter.

I now turn to the discussion of cyberbullying prevention programs and potential program elements. First, it is important to clarify the notions of 'prevention program' and 'program element.' The term 'coping strategy' is often used in the literature as an equivalent of prevention program. However, sometimes the notion also includes any action that stakeholders (teachers, parents, victims, etc.) undertake to prevent or to deal with cyberbullying. In order to avoid this obscurity, here I only use the term prevention program, which I define as any intervention that schools, NGOs, local or central governments implement to reduce the prevalence of cyberbullying. I define program elements as constituent parts – or in other words, components – of prevention programs.

The large overlap between the risk factors associated with face-to-face bullying and cyberbullying suggests that traditional bullying prevention programs may be efficient against cyberbullying as well (Casas et al., 2013). Accordingly, many scholars suggest implementing traditional anti-bullying program elements in cyberbullying prevention programs. Among others, Cassidy et al. (2013) and Ang (2015) argue that empathy training may be an effective way to reduce cyberbullying. While more empathetic students are less likely to engage in cyberbullying, they are also more likely to support their bullied peers. Hutson et al. (2018) argues that program elements that foster social and communication skills should also be included in prevention programs. These elements are commonly referred to as social-emotional learning (hereafter SEL) (Smith & Low, 2013).

Other sources argue that the systemic, or whole-school approach (hereafter WSA), which has proven to be effective at tackling traditional bullying, should also be applied in cyberbullying prevention programs (Ang, 2015; van Cleemput et al., 2014). WSA means that, besides students, parents, teachers and other school personnel (most of all, psychologists) are also included in prevention programs. Hinduja and Patchin (2014) argue that the involvement of school personnel might improve the school atmosphere, whereas training for parents might foster closer monitoring of adolescents' online activities and better cooperation between parents and their children in relation to creating rules about internet use.

In the case of other kinds of educational programs, such as crime prevention or assistance for disadvantaged children, the effectiveness of peer mentors has been researched, and some supporting evidence has been found (Wood et al., 2012; Ciocanel et al., 2017). As for cyberbullying prevention programs, some scholars, such Cassidy et al. (2013), argue that children respond positively to peer-led interventions.

Some specific program elements (related to the digital world) are also needed to foster the effectiveness of prevention programs. Cassidy et al. (2013) argue that it is important to educate children about online safety and netiquette to improve their privacy concerns and skills and thus reduce the risk of victimization. Hinduja and Patchin (2014) point out that educating students about the phenomenon and its severe consequences may deter potential bullies and encourage positive bystander behavior. Table 1 summarizes the main risk factors and the program elements that may address them. I note that the above presentation of risk factors and program elements is not exhaustive; my purpose was rather to present the most important ones, and to provide a general framework for addressing the issue of cyberbullying prevention.

	Lack of empathy	Bad school atmosphere	Excessive internet usage	Insufficient privacy concerns
SEL program elements	X	X		
Teacher involvement		X		
Education of parents			X	
Mentoring[2]	*	*	*	*
Education about online safety				X
Education about cyberbullying	X			X

Table 1: Main program elements and the risk factors they address (source: author)

4   Research question and hypotheses

It seems to be clear that prevention programs can significantly reduce the prevalence of both cyberbullies and cybervictims. Van Cleemput et al. (2014) conducted a meta-analysis of eight studies that evaluated cyberbullying prevention efforts and found that the average effect was significant and positive in terms of both reducing perpetration and victimization. A more recent meta-analysis (Gaffney et al., 2019) reviewed 24 similar articles and found that prevention programs reduced the number of bullies by 10–15 per cent, whereas that of victims by 14 per cent, on average. The reviewed programs varied significantly in terms of both program elements and effectiveness.

These two studies did not seek to identify why a program is more or less effective, unlike in the work of Hutson et al. (2018), the latter who conducted a systematic literature review to examine which program elements are the most prevalent in prevention programs that have been implemented and inferred the effectiveness of the elements based on their prevalence. They ignored, however, the extent to which these programs were effective (or ineffective). The present study aims to fill the gap between these efforts and to identify key features that make programs more effective on an empirical basis. I thus formulate my main research question as follows: *Which design features foster the effectiveness of cyberbullying prevention programs?*

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[2]   Mentoring may affect all risk factors, depending on the content of the mentoring sessions (e.g. awareness raising mentoring sessions, empathy training with mentors, etc.).

Note that in the analytical part of the article I introduce the term 'design feature'; this is a broader concept than program element and may refer to different program characteristics such as elements, sets of similar elements, or approaches. The identification of key program features allows for a meaningful classification of prevention programs and the investigation of the reasons that make programs more or less successful.

Before turning to the presentation of the hypotheses, I outline an important distinction. A prevention program may be effective at reducing the prevalence of perpetration and/or victimization. Although the two might coincide, it is also possible that a given program is only effective in one of these two areas.

Based on the discussion in Section 3, I identified four key program features that may foster the effectiveness of prevention programs, which are (i) social-emotional learning (SEL); (ii) the whole school approach (WSA); (iii) mentoring; and (iv) education about cyberbullying and e-safety. In line with these features, I formulated four hypotheses, as follows:

H1: Prevention programs that include SEL (social-emotional learning) are more likely to be effective at reducing perpetration than those that do not.

Since social emotional learning and empathy training in particular address the risk factor lack of empathy, programs with an SEL focus are expected to be more effective at reducing perpetration.

H2: Prevention programs that adopt WSA are more likely to be effective at reducing both perpetration and victimization than those that do not.

Teacher and parent involvement addresses risk factors *(bad school atmosphere and excessive internet usage)* that are related to both perpetration and victimization, thus WSA programs are expected to be more effective in both areas.

H3: Prevention programs involving peer mentors are more likely to be more effective at reducing both perpetration and victimization than those without peer mentors.

Mentoring may affect all risk factors and therefore programs adopting this feature are expected to be more effective in both areas.

H4: Prevention programs that include e-safety and cyberbullying related elements are more likely to be effective at reducing victimization than those that do not.

Although raising awareness about the severe consequences of cyberbullying may also foster the more empathetic attitude of potential bullies, education about e-safety and the phenomenon in general is expected to reduce the risk of becoming a victim.

5   Data and method

Victor (2008) discerns three main types of meta-analyses. On the one hand, the evidence-based approach adopted from medical sciences seeks to address the question 'What works?' using quantitative methods. On the other hand, the theory-driven approach addresses the question 'What works and why?' typically by applying qualitative methods. Finally, these approaches may be mixed. The present article takes this last approach. The following anal-

ysis was conducted as follows; First, I collected quantitative data about the effectiveness of the selected prevention programs. Second, I operationalized the four key program features and classified the programs. Third, I tested the hypotheses.

As mentioned above, Gaffney et al. (2019) conducted a meta-analysis of cyberbullying impact evaluations. Since the article is recent, and its selection criteria are identical to those required in the present study, I relied on their results. The authors applied the following criteria: studies that were included had to '(1) use an adequate operational definition of cyber-bullying; (2) describe the evaluation of an intervention or prevention program implemented with school-aged participants; (3) include experimental and control conditions; (4) measure cyber-bullying behaviors using quantitative measurement instruments; and, (5) have been published from 2000 onwards' (Gaffney et al., 2019: 136). The authors identified 3994 articles and screened 192. They included 24 articles in the systematic review. The authors also provide a list of excluded articles and the reasons for their exclusion.

Odds-ratios (OR) were used to determine the impact of the examined programs with regard to both perpetration (OR_p) and victimization (OR_v). OR in general refers to the likelihood of the occurrence of a certain event in the experimental group divided by the likelihood of the occurrence of the same event in the control group. OR>1, therefore implies a positive program impact, whereas OR<1 implies a negative program impact. While odds-ratios are used to measure the effect size of programs when the pre-intervention odds-ratios are not equal in the intervention and in the control group, OR values can be calculated as the difference of the logarithm of post and pre intervention OR values. For the present analysis, the odds-ratios and standard errors calculated by Gaffney and colleagues (2019) were used. Some programs or program versions were evaluated in different studies. In such cases, the effect sizes were combined using standard error weighting (for details, see Farrington & Ttofi, 2009).

In order to operationalize the four key program features (in line with the four hypotheses), I created four binary variables and defined the necessary and sufficient program element(s) for each. I relied on the program elements that Hutson et al. (2018) list in their meta-analysis (in italics in the listing below).

SEL (Social-emotional learning: SEL=1 if a program includes both *empathy learning* and *social/communicational skills* elements; SEL=0 otherwise.

WSA (Whole-school approach): WSA=1 if a program addresses stakeholders other than students *(parent involvement and/or teacher education);* WSA=0 if the program addresses students only.

MENT (Peer mentoring): MENT=1 if includes *peer mentoring;* MENT=0 if it does not.

CYB (Education about cyberbullying and online safety): CYB=1 if a program contains at least two of the three following elements: *education about digital citizenship, awareness raising, and education about cyberbullying;* CYB=0 if a program contains fewer than two of the above elements.

In the case of studies that were included in Hutson et al.'s meta-analysis, data about the presence of the program elements were extracted from there. In other studies,[3] the presence of program elements was examined on the basis of the related articles. Table 2 displays all the variables and the description of the program elements on the basis of Hutson et al.

Variable name – short	Variable name – long	Related program element	Description
Dependent variables			
OR_p	Odds ratio of perpetration	–	Effect size measured by odds ratio of perpetration
OR_v	Odds ratio of victimization	–	Effect size measured by odds ratio of victimization
Independent variables			
SEL	Social-emotional learning	Communication/ social skills	Teaching youth effective and appropriate skills for communicating in a social setting, either online or in person
		Empathy training	Teaching youth to look at the cyberbullying situation from the perspective of the persons involved
WSA	Whole-school approach	Parent education	Educating parents about important cyberbullying topics
		Teacher involvement in bullying situation	Having teachers moderate the cyberbullying situation
MENT	Peer mentoring		Peer mentors taking part in the program
CYB	Education on cyberbullying and online safety	Digital citizenship	Using technology in a responsible way or being a good citizen online
		Awareness raising	Increasing knowledge and awareness of cyberbullying
		Education on cyberbullying	Teaching youth what cyberbullying is and other information related to cyberbullying awareness

Table 2: Dependent and independent variables
(source: author's compilation based on Hutson et al., 2018)

To test the hypotheses, I examined whether the mean effect sizes of prevention programs in different subgroups differ significantly. Each subgroup is defined by a program design feature (such as the presence or absence of social-emotional learning). The reliability of estimated effects sizes differs from study to study. In order to account for this variance, I calculated weights so that more reliable studies (observations) received a larger weight. To do so, in line with Farrington and Ttofi (2009) and Borenstein et al., (2011), I

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[3]   Namely: DeSmet et al. (2018) – Friendly Attac; Williford et al. (2013) – KiVA; Chaux et al. (2016) and Schultze-Krumbholz et al. (2016) – Mediaheroes; Espelage et al. (2015) – Second Step; Gradinger et al. (2015); Gradinger et al. (2016) – ViSC.

first calculated inverse effect size variances for each study. These were used to weight the observations. In the next step, for each program design feature (H1 to H4) differences between the mean effect sizes of subgroups were calculated. In the third phase, I tested (for each hypothesis H1 to H4) whether the mean differences between effect sizes in the two sub-groups were significant. These differences were tested using Z test scores (Borenstein et al., 2009) (confidence level=95 %). The above procedure was applied to both outcome variables used in the study (perpetration as well as victimization). The formulas that were used can be found in Annex 1, whereas a more detailed description and rationale for the weighted mean effect size and mean difference calculus is provided in Borenstein et al. (2011: Ch. 19).

Studies (n=23)	Design[4]	Programs or program versions (n=15)
Athanasiades et al. (2015)	RCT	Tabby
Chaux et al. (2016)	RCT	Mediaheroes
Cross et al. (2016)	RCT	Cyber Friendly
Del Rey et al. (2012)	QE	ConRed
Del Rey et al. (2016)	QE	ConRed
DeSmet et al. (2018)	RCT	Friendly Attac
Espelage et al. (2015)	RCT	Second Step
Fekkes et al. (2016)	RCT	Skills for Life
Garaigordobil and Martínez-Valderrey (2015)	RCT	Cyberprogram 2.0
Garaigordobil and Martínez-Valderrey (2016)	RCT	Cyberprogram 2.0
Gradinger et al. (2015)	RCT	ViSC (Aus)
Gradinger et al. (2016)	RCT	ViSC (Aus)
Menesini, Nocentini, and Palladino (2012)	QE	NoTrap! v1
Ortega-Ruiz et al. (2012)	QE	ConRed
Palladino et al. (2012)	QE	NoTrap! v2
Palladino et al. (2016)	QE	NoTrap! v3
Pieschl et al. (2017)	QE	Surf Fair
Roberto et al. (2014)	RCT	Social Networking Safety Promotion and Cyberbullying Prevention Promotion
Schultze-Krumbholz et al. (2016)	RCT	Mediaheroes
Shaw et al. (2015)	RCT	Cyber Friendly
Solomontos-Kountouri et al. (2016)	QE	ViSC (Cyp)
Williford et al. (2013)	RCT	KiVa
Wölfer et al. (2014)	RCT	Mediaheroes

Table 3: Included studies and programs (source: own. Identical to the articles revised by Gaffney et al, 2019)

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[4]   RCT=randomized controlled trial; QE=quasi-experimental

6   Findings

The list of the articles that were included and the programs examined by them is presented in Table 3. Twenty-three studies were included[5] in the meta-analysis that had been published between 2012 and 2017. The studies examine 15 different programs or program versions. Two program versions were considered identical if the values of the four grouping variables were equal (this was the case with the Australian and the Cypriot versions of ViSC). In such cases, as described in Chapter 4.2, weighted mean effect sizes were computed. Some articles presented the same evaluation data. Figures 1 and 2 display all OR values with 95 % confidence intervals as well as mean effect sizes (using the fixed effects model[6]) for both perpetration and victimization, whereas the values (effect sizes and some statistics) are presented in Annex 2.
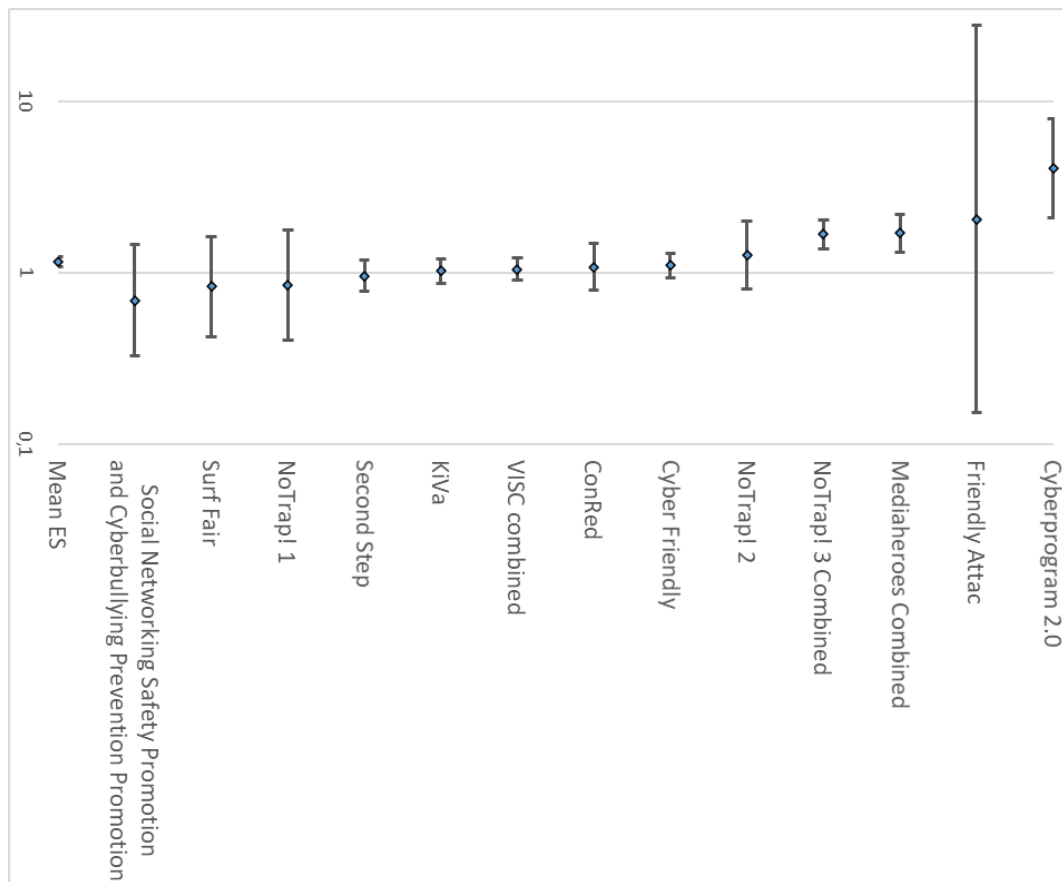

Figure 1: OR effect sizes with CI95% intervals for perpetration (source: author's calculations based on Gaffney et al., 2019)

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5   Gaffney et al. (2019) included 24 articles, but for Harshmman (2014) the necessary data was not available.
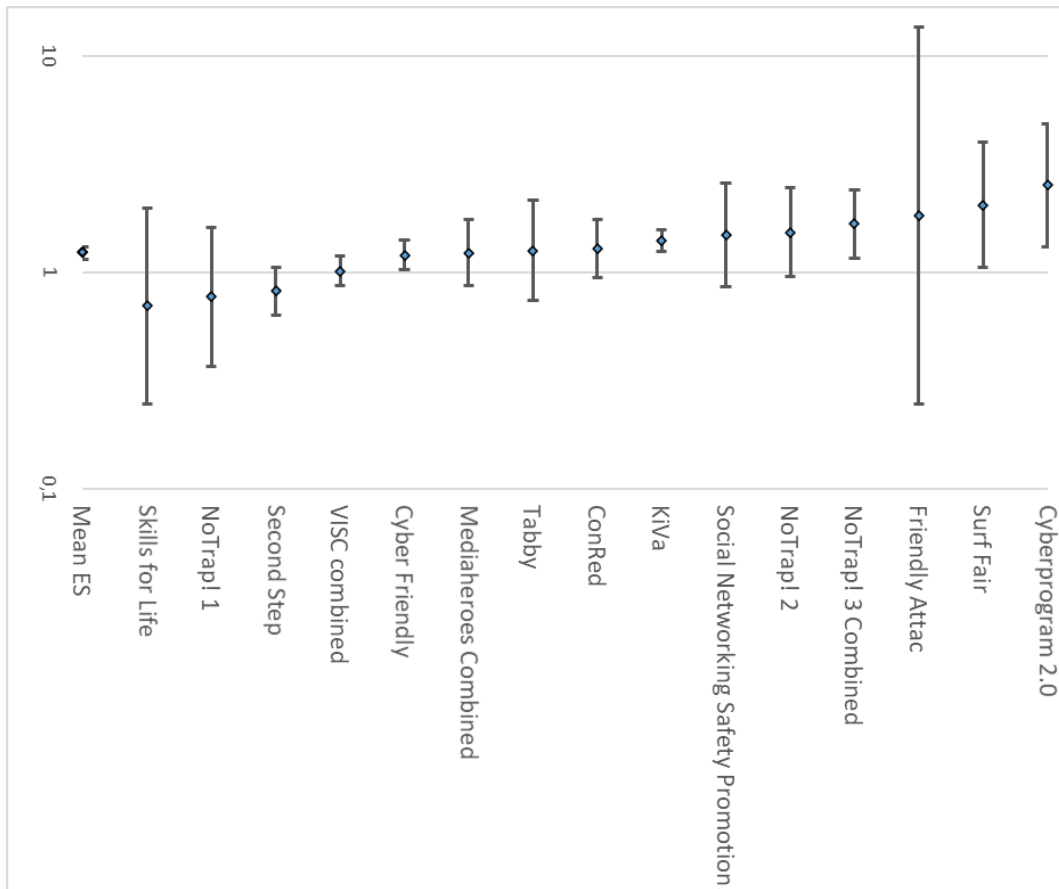6   For details see Farrington and Ttofi (2009).

Figure 2: OR effect sizes with CI95% intervals for victimization (source: author's calculations based on Gaffney et al., 2019)

H1: Prevention programs that include SEL (social-emotional learning) are more likely to be effective at reducing perpetration than those that do not.

Programs including SEL are found to be more effective at reducing perpetration (mean difference=0.33; CI: 0.29-0.38; p<0.01), therefore H1 is confirmed. The difference is relatively large: programs with SEL elements reduce the risk of bullying by 38 per cent, whereas the same proportion is only 4 per cent in the case of other programs. However, the difference is insignificant (p=0.81) in the case of victimization.

	Mean OR	Z	SE	p	n	CI95%$_{low}$	CI95%$_{up}$
SEL=0	1,04	0,92	1,05	0,36	7	0,95	1,14
SEL=1	1,38	5,56	1,06	0,00	6	1,23	1,54
Mean difference	0,33	3,77	1,08	0,00	13	0,29	0,38

Table 4: Test scores for perpetration – grouping: SEL (source: author's calculations)

	Mean OR	Z	SE	p	n	$CI95\%_{low}$	$CI95\%_{up}$
SEL=0	1,24	5,38	1,04	0,00	9	1,14	1,34
SEL=1	1,21	2,62	1,08	0,01	6	1,05	1,40
Mean difference	0,02	0,24	1,09	0,81	15	0,02	0,03

Table 5: Test scores for victimization – grouping: SEL (source: author's calculations)

H2: Prevention programs that adopt WSA are more likely to be effective at reducing both perpetration and victimization than those that do not.

Programs that addressed only children did not differ significantly from those that involved teachers and/or parents either in regard to perpetration or bullying. H2 is therefore rejected.

	Mean OR	Z	SE	p	n	$CI95\%_{low}$	$CI95\%_{up}$
WSA=0	1,23	3,04	1,07	0,00	6	1,08	1,40
WSA=1	1,14	3,04	1,04	0,00	7	1,05	1,24
Mean difference	0,09	0,97	1,08	0,33	13	0,08	0,11

Table 6: Test scores for perpetration – grouping: WSA (source: author's calculations)

	Mean OR	Z	SE	p	n	$CI95\%_{low}$	$CI95\%_{up}$
WSA=0	1,16	1,81	1,08	0,07	8	0,99	1,36
WSA=1	1,25	5,75	1,04	0,00	7	1,16	1,35
Mean difference	0,09	0,82	1,09	0,41	15	0,07	0,11

Table 7: Test scores for victimisation – grouping: WSA (source: author's calculations)

H3: Prevention programs involving peer mentors are more likely to be effective at reducing both perpetration and victimization than those without peer mentors.

Programs involving peer mentors are more effective at reducing perpetration (mean difference=0.30; CI95%: 0.26-0.35; p<0.01), but the difference is insignificant when victimization effect sizes are compared (p=0.68). In the case of perpetration, the difference is rather large: programs with mentoring decrease the chance of bullying by 35 per cent, whereas those without mentoring decrease the chance by only 4 per cent. H3 is therefore partially confirmed.

	Mean OR	Z	SE	p	n	$CI95\%_{low}$	$CI95\%_{up}$
MENT=0	1,04	0,89	1,05	0,38	8	0,95	1,14
MENT=1	1,35	5,40	1,06	0,00	5	1,21	1,50
Mean difference	0,30	3,53	1,08	0,00	13	0,26	0,35

Table 8: Test scores for perpetration – grouping: MENT (source: author's calculations)

	Mean OR	Z	SE	p	n	$CI95\%_{low}$	$CI95\%_{up}$
MENT=0	1,22	4,80	1,04	0,00	10	1,13	1,32
MENT=1	1,26	3,58	1,07	0,00	5	1,11	1,43
Mean difference	0,04	0,42	1,08	0,68	15	0,03	0,05

Table 9: Test scores for victimisation – grouping: MENT (source: author's calculations)

H4: Prevention programs that include e-safety and cyberbullying related elements are more likely to be effective at reducing victimization than those that do not.

The difference between programs focusing on e-safety and cyberbullying and programs that put less emphasis on these aspects was found to be significant with regard to victimization (mean difference=0.22; CI95%: 0.19-0.26; p=0.01) and insignificant with regard to perpetration (p=0.68). The 0.22 difference in odds-ratios means that the impact of CYB=1 programs is 22 percentage points higher than the impact of CYB=0 programs in terms of the risk of becoming a victim. The results are in line with the expectations, since education about online safety and cyberbullying mostly affects risk factors related to victimization. Accordingly, H4 is confirmed.

	Mean OR	Z	SE	p	n	$CI95\%_{low}$	$CI95\%_{up}$
CYB=0	1,18	3,38	1,05	0,00	8	1,07	1,30
CYB=1	1,14	2,51	1,05	0,01	5	1,03	1,27
Mean difference	0,03	0,42	1,07	0,68	13	0,03	0,04

Table 10: Test scores for perpetration – grouping: CYB (source: author's calculations)

	Mean OR	Z	SE	p	n	$CI95\%_{low}$	$CI95\%_{up}$
CYB=0	1,11	1,84	1,06	0,07	9	0,99	1,23
CYB=1	1,33	6,24	1,05	0,00	6	1,21	1,45
Mean difference	0,22	2,58	1,07	0,01	15	0,19	0,26

Table 11: Test scores for victimisation – grouping: CYB (source: author's calculations)

7   Implications and limitations

Cyberbullying is a severe and widespread phenomenon of the twenty-first century. The elaboration, implementation, and evaluation of prevention programs related to cyberbullying is therefore highly important. The aim of the present study was to connect the literature that discusses school-based cyberbullying prevention strategy options with empirical findings of impact assessments of prevention programs. My purpose was to examine the program features that may increase the effectiveness of cyberbullying prevention programs on an empirical basis. This is novel in the literature: although meta-analyses have examined the impacts (Gaffney et al., 2019), as well as the program elements (Hutson et al., 2018) of previous prevention programs, the two efforts have not been connected so far.

My results confirm some of the suggestions presented in the cyberbullying literature. First, programs with a strong social-emotional learning emphasis and those involving peer-mentors are more likely to be effective at reducing perpetration. Second, programs in which education about online safety and cyberbullying are emphasized are more likely to be effective at reducing victimization. The effect size of programs involving parents and/or teachers, on the other hand, was not found to be significantly higher with regard to either perpetration or victimization. These results suggest that:
(i) Similarly to traditional bullying programs, SEL is a key design feature in the case of cyberbullying, and should be included in prevention efforts;
(ii) Mentoring is also an effective way to tackle bullying, and
(iii) Education about e-safety and awareness raising about cyberbullying may effectively

help victims. This implies that although traditional bullying prevention program elements may also be effective against cyberbullying, specific cyberbullying-related measures may be equally useful.

Although the review presented here provides fairly strong evidence for the above statements, it is important to discuss some limitations of the study. First, the number of studies included in the sample was relatively small. Therefore, the reliability of the quantitative analysis is limited. Second, the simplistic methodological approach (z-test comparison of the subgroups), although robust, may hide more complicated causal relations (such as interactions). Finally, the effectiveness of interventions, as well as program elements, may depend largely on contextual factors (such as geographical and time scope, age, etc.). These aspects may be addressed once there is a sufficiently large body of evaluation literature that would allow for the inclusion of other independent (contextual) variables and for the application of more sophisticated statistical methods.[7]

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[7]   Ciocanel et al. (2017) conducted a meta-analysis of mentor programs, applying a similar analytical approach.

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Appendix

Annex 1: Formulas

Log of weighted mean effect size in a subgroup:

$$\log OR_{mean} = \frac{\sum \log OR_i * W_i}{\sum W_i}(1)$$

Log of standard error in a subgroup:

$$\log SE_{mean} = \sqrt{\frac{1}{\sum W_1}}(2)$$

Difference of means:

$$Difference = OR_{subgroupA} - OR_{subgroupB}(3)$$

Z-test score of the difference:

$$z = \frac{\log OR_{subgroupA} - \log OR_{subgroupB}}{\log SE_{mean}}(4)$$

P-value of the significance of the difference:

$$p = 2(1 - \Phi|z|)(5)$$

Annex 2: Effect sizes and main statistics of the impact evaluations

Program	n	Perpetration					Victimization				
		OR	CI95% (low)	CI95% (up)	Z	P	OR	CI95% (low)	CI95% (up)	Z	P
ConRed	891	1,08	0,79	1,48	0,48	0,63	1,29	0,94	1,77	1,59	0,11
Cyber Friendly	2893	1,10	0,94	1,29	1,16	0,25	1,20	1,03	1,40	2,27	0,02
Cyber-program 2.0	176	4,05	2,08	7,88	4,12	0,00	2,53	1,31	4,87	2,78	0,01
Friendly Attac	216	2,05	0,15	27,75	0,54	0,59	1,83	0,25	13,62	0,59	0,56
KiVa	5651	1,02	0,86	1,21	0,23	0,82	1,40	1,24	1,58	5,59	0,00
Mediaheroes Combined	1657	1,70	1,32	2,19	4,08	0,00	1,23	0,86	1,75	1,15	0,25
NoTrap! 1	174	0,85	0,41	1,78	-0,43	0,67	0,77	0,37	1,62	-0,69	0,49
NoTrap! 2	375	1,27	0,80	2,01	1,02	0,31	1,53	0,95	2,46	1,76	0,08
NoTrap! 3 Combined	892	1,67	1,37	2,04	5,03	0,00	1,68	1,17	2,40	2,81	0,01
Second Step	1 510	0,96	0,77	1,19	-0,37	0,71	0,82	0,63	1,06	-1,52	0,13
Skills for Life	1 394	.	.	.	.	.	0,70	0,25	1,99	-0,67	0,50
Social Networking…	418	0,69	0,33	1,46	-0,97	0,33	1,49	0,86	2,58	1,42	0,16
Surf Fair	150	0,83	0,42	1,63	-0,54	0,59	2,05	1,06	3,98	2,12	0,03
Tabby	263	.	.	.	.	.	1,26	0,74	2,15	0,85	0,40
VISC Combined	3 511	1,05	0,90	1,22	0,62	0,54	1,02	0,87	1,19	0,22	0,83
Mean ES	.	1,16	1,08	1,25	4,19	0,00	1,23	1,15	1,32	5,98	0,00