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Effectiveness of cyberbullying prevention programmes on perpetration levels: a meta-analysis

Eficacia de los programas de prevención del ciberacoso sobre los niveles de perpetración: un metanálisis

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Abstract

Cyberbullying is a new and growing bullying practice that generates more harmful consequences than even traditional bullying. In this situation, the role of education plays a decisive role in the fight against this type of practice. In fact, in recent years there has been a significant increase in the number of educational interventions on cyberbullying. However, the scientific literature shows hardly any conclusive results on the effectiveness of these interventions. Therefore, the aim of this meta-analysis is to analyse the effects that prevention programmes on cyberbullying have on the levels of perpetration among school students. To this end, a search strategy was carried out according to the PICOS framework and PRISMA criteria in five different databases: Web of Science (WoS), SCOPUS, Educational Research Information Centre (ERIC), PubMed, ScienceDirect, SpringerLink and Google Scholar. After searching and applying inclusion/exclusion filters, 9 studies were included in the meta-analysis, covering a total of 17 different interventions conducted between 2015 and 2019. These studies described the application of different intervention programmes to students aged between 10 and 17 years. The findings of this meta-analysis showed that educational prevention programmes could decrease levels of bullying perpetration (SMD = 0.08; 95% CI [0.05, 0.11]; $p < 0.00001$). Implications for strengthening and expanding cyberbullying prevention programmes in the educational context are discussed. In addition, future research is invited to go beyond the educational setting and consider other variables and factors that extend outside the educational environment and that are equally relevant, as well as to focus new lines of research on the important role of the cyberassistant student as an essential part of this type of situation.

Resumen

El ciberacoso es una nueva y creciente práctica que genera consecuencias más dañinas que incluso el acoso tradicional. En esta situación, el papel de la educación juega un papel decisivo en la lucha contra este tipo de situaciones. De hecho, en los últimos años se ha producido un aumento significativo del número de intervenciones educativas sobre el ciberacoso. Sin embargo, la literatura científica apenas muestra resultados concluyentes sobre la eficacia de estas intervenciones. Por lo tanto, el objetivo de este meta-análisis es analizar los efectos que los programas de prevención del ciberacoso tienen sobre los niveles de perpetración entre los estudiantes escolares. Para ello, se realizó una estrategia de búsqueda según el marco PICOS y los criterios PRISMA en cinco bases de datos diferentes: Web of Science (WoS), SCOPUS, Educational Research Information Centre (ERIC), PubMed, ScienceDirect, SpringerLink y Google Scholar. Tras la búsqueda y la aplicación de los filtros de inclusión/exclusión, se incluyeron 9 estudios en el metaanálisis, que abarcaban un total de 17 intervenciones diferentes realizadas entre 2015 y 2019. Estos estudios describían la aplicación de diferentes programas de intervención a estudiantes de entre 10 y 17 años. Los hallazgos de este meta-análisis mostraron que los programas de prevención educativa podrían disminuir los niveles de perpetración de bullying (DME = 0,08; IC del 95% [0,05, 0,11]; $p < 0,00001$). Se discuten las implicaciones para reforzar y ampliar los programas de prevención del ciberacoso en el contexto educativo. Además, se invita a futuras investigaciones a ir más allá del ámbito educativo y considerar otras variables y factores que se extienden fuera del entorno educativo y que son igualmente relevantes, así como enfocar nuevas líneas de investigación al importante papel del alumnado ciberayudante como parte esencial en este tipo de situaciones.

Palabras clave / Keywords

Adolescence, Bullying, Education programs, Leisure, Meta-analysis, Peer relationships, Social networking, Students, Technology

Acoso, Adolescencia, Estudiantes, Meta-análisis, Ocio, Programas de educación, Redes sociales, Relaciones entre pares, Tecnología

1. Introduction

Thousands of young people around the world suffer some kind of violence (Sastre, 2016). However, within the wide range of violent experiences in which a child can be involved, bullying stands out above all (Garaigordobil & Oñederra, 2010). This consists of conduct (verbal, physical, psychological or social) that one person (or group of them) carries out on another in an intentional and sustained manner over time (Olweus, 1999; Nansel, et al., 2001). In general, bullying can range from direct aggression (verbal and/or physical) to indirect attitudes such as intimidation, extortion or defamation, among other actions (Hinduja and Patchin, 2010). Regardless of the type carried out, they all have a great impact on children, generating enormous problems with high social and psychological costs for both the victims and their environment (González-Cabrera et al., 2019; Rios et al., 2022; Yan et al., 2022).

These traditional bullying practices have always been present in the school context (Aboujaoude, Savage, Starcevic and Salame, 2015). According to a study developed by UNICEF (2018) more than 150 million students have at some point in their lives experienced bullying. Despite this, the prevalence of these behaviours varies from one area to another. In this regard, UNESCO (2019) points to North Africa (42.7%) and Southwest Asia (41.1%) as the areas with the highest prevalence of this type of behaviour.

However, the nature of bullying has changed significantly in recent times (Patchin and Hinduja, 2011). The advent and development of new Information and Communication Technologies (ICT) and the rapid development of digital and Social Media has led to the emergence of a new type of bullying referred to as cyberbullying, cyberharassment, electronic bullying or cybervictimisation (Chaves-Álvarez et al., 2019; Alvites-Huamani, 2019; Chan et al., 2019, Pérez and Palmar, 2021). This new practice has been defined as "intentional and repeated harm inflicted through computers, mobile phones and other electronic devices" (Hinduja & Patchin, 2015, p. 11). In general, cyberbullying can be carried out in multiple different ways such as posting compromising images or videos, sending threatening or derogatory messages, disseminating intimate or relevant information, etc. (Arab and Diaz, 2015; Monks et al., 2016; Hinduja and Patchin, 2013). Furthermore, due to progress and greater social awareness, new research suggests that a gender perspective is essential in the implementation of programs to address cyberbullying (Cebollero et al., 2022a). In this line, these authors propose a study on the validation of instruments related to e-competences as a key factor for the prevention of cyberbullying and that provides significant clues in the training of teachers and students (Cebollero et al., 2022b).

Although a priori it may seem that traditional bullying and cyberbullying are similar practices, in reality they have a series of distinctive characteristics that make the latter a much more harmful practice (Hinduja and Patchin, 2021; Campbell and Xu, 2022). On the one hand, Neyra (2021) defines cyberbullying as an extension of traditional bullying that allows overcoming the boundaries of space. In this sense, cyberbullying is not only generated within the educational centre, but the use of different digital media contributes to it being continuous and permanent regardless of the place (Delgado and Escortell, 2018). Dredge, Gleeson, and Piedad (2014) add that this practice also contributes to overcoming the boundaries of time, making actions permanent and everlasting.

On the other hand, Hinduja and Patchin (2021) highlight two other significant differences that ICTs bring to cyberbullying: anonymity and viralisation. Firstly, the possibility offered by digital media to anonymise identities makes it difficult to identify the aggressors and, therefore, to solve the problem. Moreover, this anonymity provides a certain degree of security to the aggressors that contributes to increasing participation in this type of practice. Secondly, these technologies also help the viralisation of these behaviours by having an impact on two aspects: by increasing the visibility of humiliating, harmful or degrading actions; and by increasing the number of possible victims and witnesses.

All these differences contribute to the fact that cyberbullying generates a series of psychological and social consequences that are much more harmful than those generated by traditional bullying (Slonje et al., 2013; Giménez et al., 2014; Yan et al., 2022). In this sense, numerous studies highlight different effects provoked in victims such as: feelings of fear, anger, frustration or stress (Sticca et al. 2013; Hinduja and Patchins, 2010;

Shpiegel et al., 2015); the presence of anxiety or depression (Buelga et al., 2019; Yan et al., 2022); the decrease in self-concept and self-esteem (Palermi et al., 2017; Delgado et al., 2019); increased social isolation (Ostrov & Kamper, 2015; Pereda & Sicilia, 2017; Ademiluyi et al., 2022) or decreased academic performance (Garaigordobil, 2015; González-Cabrera et al., 2019; Lara-ros et al., 2017); among other aspects. Finally, other studies also point to extreme cases of self-injurious behaviour and suicidal behaviour as possible consequences (Hinduja and Patchin, 2018; Sticca et al. 2013; Holt et al., 2015; Mitchell et al., 2018; Iranzo et al., 2019; Fadhli et al., 2022).

In recent years, this type of bullying practices has increased considerably due to the expansion in the use of new technologies by the younger population (Arnaiz et al., 2016). As reported in a study by the National Institute of Statistics (2020), 94.5 % of young Spaniards aged 10-15 are internet users, and more than 69 % have a mobile device at their disposal. As a result, young people have made the use of ICTs a fundamental part of their lives, sometimes leading to their misuse. It is therefore not surprising that more than 36% of young people surveyed in a study conducted by Patchin and Hinduja (2020) among more than 5000 adolescents admitted to having suffered cyberbullying at some point.

In this context, the role of families and, in particular, of the educational space play a decisive role in the fight against this type of bullying practices among peers (Hinduja and Patchin, 2013; 2021). In fact, although this new bullying practice is a recent phenomenon (Delgado and Escortell, 2018), its rise in recent years has led to the development of numerous educational intervention programmes around the world (Calvete et al., 2021). In this regard, we find some examples such as: prev@Cib (Ortega-Barón et al., 2019), the Asegúrate programme (del Rey et al., 2018), the Cyberprograma 2.0 (Garaigordobil & Martínez- Valderrey, 2015) or the social ViSC (Gradinger et al., 2015), among others. Despite the numerous existing intervention programmes, there are hardly any studies that analyse their effectiveness (Ng, Chua & Shorey, 2020).

For all these reasons, there is a need to develop studies that allow a synthesis of the results of empirical research that analyse the effectiveness of these interventions. To this end, the present research consists of a meta-analysis whose main objective is to analyse the effects that intervention programmes on cyberbullying generate in the levels of perpetration of students at school. This study aims to draw conclusions based on the results of previous research on the effectiveness of educational interventions. Likewise, it also aims to establish biases and future lines of research on which to guide the future of the field under investigation.

2. Methodology

The present research consisted of the development of a meta-analysis. This research strategy has the fundamental objective of determining the overall effect size of quantitative research on a given topic (Piggot and Polanin, 2019). In this case, the meta-analysis focused on the study of the effect of educational intervention programmes on cyberbullying on the perpetration of cyberbullying in adolescents. In order to provide the highest degree of systematisation, scientific rigour and objectivity possible, the principles and premises of the PRISMA and Cochrane protocols were applied. The procedure for the selection and analysis of the studies comprising this research will be described below.

2.1. Search for studies

Multiple searches were conducted through a combination of the following keywords: cyberbullying, cyber aggression, online bullying, electronic bullying; perpetration; intervention, program*; experimental and quasi-experimental. These were selected through a process in which one or more words were derived from each constituent element of the PICO(S) format (Martínez et al., 2016; Schardt, et al., 2007). Different thesauri (ERIC and UNESCO) were used to translate these terms.

The searches were carried out in different databases (WoS, SCOPUS, ERIC, PubMed, ScienceDirect and SpringerLink). In order to complement the search process, an additional search was carried out in Google Scholar to investigate the possible existence of grey literature in this field of research. Finally, a series of inclusion/exclusion criteria were applied, as shown in Table 1.

Table 1
Inclusion/exclusion criteria

Inclusion Criteria	Exclusion Criteria
1) Empirical studies with experimental and quasi-experimental design with control and experimental group.	5) Failure to meet the inclusion criteria.
2) Studies that analyse the perpetration variable.	6) Studies that do not contain mean and standard deviation data.
3) Studies focused on primary, secondary, baccalaureate and university stages.	7) Studies without a control group.
4) Publications from the last six years (2015-2022).	8) Studies without Post-test data.
	9) Duplicate articles.
	10) Reviews or theoretical studies.

After the application of the search equation and of the inclusion/exclusion criteria number 4 in the different databases, a total of 614 documents were obtained. Of these, a total of 263 duplicate documents were eliminated. This process was carried out manually. Subsequently, the remaining 275 studies were screened by applying inclusion/exclusion criteria 1, 2, 3 and 10. As a result, 107 studies were selected and assessed for eligibility by applying inclusion/exclusion criteria 5, 6, 7 and 8. Following this search process and application of the different inclusion/exclusion criteria, a total of 9 studies were selected. Figure 1 shows the search and screening process up to the selection of the final sample.

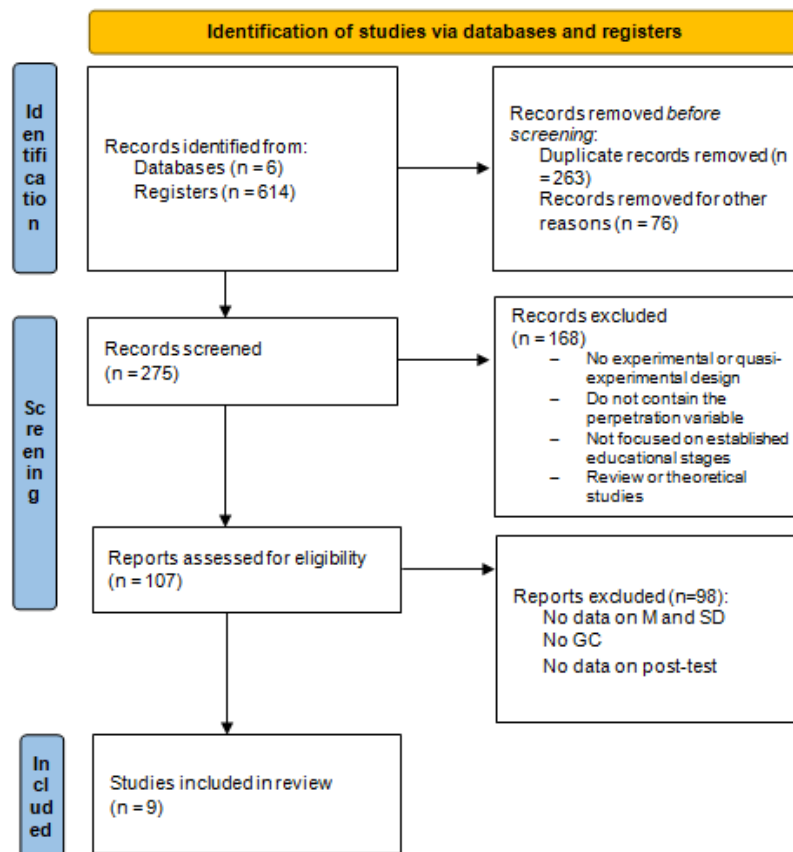


Figure 1. Flow chart.

2.2. Data extraction and coding

Once the studies had been selected, a data extraction and coding phase was carried out. The following characteristics were extracted from each study for both the control group (CG) and the experimental group (EG): (1) sample size; (2) mean (M) and (3) standard deviation (SD). In addition, other data such as sample characteristics, methodological approach and type of intervention were also considered. All this information

was collected in an Excel spreadsheet (Microsoft, Seattle, USA) after detailed reading of each of the studies. This process was carried out by two independent researchers in order to provide maximum reliability to the coding process.

Table 2 shows the information on the sample size of each research, the mean and standard deviation of the dependent variable analysed (perpetration of cyberbullying) in this study.

Table 2

Correlation of each study with the analysed variable

Author (year)	Group	N	Measures Variable Perpetration	
			M	SD
Cross et al (2016a)	GC	1548	0.03	0.14
	GE	1297	0.03	0.26
Cross et al (2016b)	GC	1245	0.03	0.25
	GE	1538	0.03	0.22
Chauz et al. (2016a)	GC	347	0.1	0.48
	GE	135	0.08	0.24
Chauz et al. (2016b)	GC	347	0.1	0.48
	GE	227	0.04	0.11
Ortega-Barón (2019)	GC	236	1.23	0.41
	GE	434	1.14	0.32
Palladino et al. (2016a)	GC	171	0.047	0.11
	GE	451	0.13	0.04
Palladino et al. (2016b)	GC	227	0.045	0.8
	GE	234	0.016	0.3
Schultze-Krumbholz et al. (2016a)	GC	350	0.079	0.217
	GE	136	0.081	0.184
Schultze-Krumbholz et al. (2016b)	GC	350	0.079	0.217
	GE	228	0.101	0.289
Solomontos-kountouri et al. (2016a)	GC	478	0.12	0.46
	GE	286	0.10	0.31
Solomontos-kountouri et al. (2016b)	GC	542	0.13	0.42
	GE	280	0.31	0.66
Solomontos-kountouri et al. (2016c)	GC	478	0.13	0.43
	GE	286	0.09	0.25
Solomontos-kountouri et al. (2016d)	GC	542	0.14	0.42
	GE	280	0.16	0.42
DeSmet et al. (2018a)	GC	96	2.60	1.04
	GE	120	2.70	1.03
DeSmet et al. (2018b)	GC	96	2.70	0.92
	GE	120	2.85	0.92
Gradinger et al. (2015)	GC	665	0.39	0.93
	GE	1377	0.33	0.82
Garaigordobil y Martínez-Valderrey (2015)	GC	83	0.93	1.39
	GE	93	0.70	1.09

2.3. Statistical analysis

For the present meta-analysis, Review Manager (Revman) software version 5.3 was used. The main analysis tools used were the forest plot and funnel plot (Chen et al., 2018; Gillette et al., 2018; Hu et al., 2018). The analyses performed were: effect size, degree of heterogeneity, sensitivity analysis and publication bias.

3. Results

In this section, the 9 studies included in the meta-analysis will be analysed. First, a general description of the studies will be given (time course, research designs and samples). Then, the results extracted from the meta-analysis will be interpreted.

General description of the studies.

Most of the studies selected for this meta-analysis were published in 2016 (n=6). The remaining articles were published in 2015 (n=2), 2018 (n=1) and 2019 (n=1). Regarding the geographical distribution of these research studies, a wide variety of different regions can be observed, such as Spain, Italy, Cyprus, the Netherlands, Belgium, Austria and Germany. However, of all of them, Germany (n=3) and Spain (n=3) stand out as the areas with the highest number of studies.

In terms of the most commonly used methodological designs, the experimental design with QA and EG with a pre-test and a single post-test (33.4%) stands out. Other designs used in the studies were experimental with QA and EG with pre-test and several post-tests (22.2 %); quasi-experimental with QA and EG with pre-test and several post-tests (22.2 %); and quasi-experimental with QA and EG with pre-test and a single post-test (22.2 %). Within these studies we found several investigations with one CG and more than one EG (Solomontos-kountouri et al., 2016; Chaux et al., 2016).

It is important to note that in the present meta-analysis all possible alternatives for comparison between groups and post-test measures have been considered. In this sense, in the study by Solomontos-kountouri et al. (2016) all comparisons between CG and GE and the different post-test results have been considered (represented in the diagram as a, b, c and d); in the research by Chaux et al. (2016) all comparisons between CG and GE have been taken into account (a and b); and in the studies by Palladino, Nocentini and Menesini (2016), Schultze-Krumbholz et al. (2016); Cross et al. (2016), DeSmet et al. (2018) the different measures over time have been taken into account (a, b).

Ultimately, the research focused on comparing the results obtained by groups that did not receive any type of intervention (CG) with those that did (GE). The intervention used in the different studies consisted of the application of different educational intervention programmes on cyberbullying. These programmes, although with different strategies and methods, had as fundamental objectives: conceptualising cyberbullying, raising awareness and sensitisation towards it, fostering commitment to intervention, developing prevention and coping strategies; etc. These programmes employed very different methods and strategies such as the use of ICT (Cross et al., 2016; Palladino et al., 2016), the use of experts (Gradinger et al., 2015; Palladino et al., 2016; Palladino et al., 2016), cooperative work (Gradinger et al., 2015; Solomontos-kountouri et al., 2016) and gamification (Chaux et al., 2016; Schultze-Krumbholz et al., 2016; DeSmet et al., 2018), among others.

With regard to the duration of interventions, there is variation between studies, ranging from one session (Chaux et al., 2016; Schultze-Krumbholz et al., 2016) to a full year (Gradinger et al. 2015; Cross et al., 2016; Palladino et al., 2016; Solomontos-Kountouri et al., 2016; DeSmet et al., 2018). We also found studies with a duration of several sessions (Garaigordobil and Martínez-Valderrey, 2015; Chaux et al., 2016), as well as two (Schultze-Krumbholz et al., 2016) and 9 months (Ortega-Barón et al., 2019).

With regard to the study samples, it is worth highlighting the predominance of studies at the Secondary Education stage (77.8 %), and therefore on subjects aged between 13 and 17 years (Garaigordobil and Martínez-Valderrey; 2015; Chaux et al., 2016; Cross et al. 2016; DeSmet et al., 2018; Palladino et al., 2016; Schultze-Krumbholz et al., 2016; Ortega-Barón et al., 2019). However, there is also a study focusing on the Primary Education stage (11.1 %) with subjects aged 10-12 years (Gradinger et al., 2015); and another (11.1 %) focusing on both stages (Solomontos-Kountouri et al., 2016).

Finally, by way of summary, Table 3 shows the relationship between the different characteristics of each of the studies selected for the meta-analysis.

Table 3.

Main characteristics of the studies analysed.

Study	Territory	Educational Level	N	Methodological Design	Duration
Chaux et al. (2016a)	Germany	High School Education	482	R CG O ₁ – O ₂ EG O ₁ X O ₂	1 session
Chaux et al. (2016a)	Germany	High School Education	574	R CG O ₁ – O ₂	15 sessions

				EG O ₁ X O ₂	
Cross et al. (2016a)	Germany	High School Education	2845	R CG O ₁ - O ₂ - O ₃ EG O ₁ X O ₂ - O ₃	1 year
Cross et al. (2016b)	Germany	High School Education	2783	R CG O ₁ - O ₂ - O ₃ EG O ₁ X O ₂ - O ₃	1 year
DeSmet et al. (2018a)	Belgium	High School Education	216	R CG O ₁ - O ₂ - O ₃ EG O ₁ X O ₂ - O ₃	1 year
DeSmet et al. (2018b)	Belgium	High School Education	216	R CG O ₁ - O ₂ - O ₃ EG O ₁ X O ₂ - O ₃	1 year
Garaigordobil y Martínez-Valderrey (2015)	Spain	High School Education	176	NE CG O ₁ - O ₂ EG O ₁ X O ₂	19 sessions
Gradinger et al. (2015)	Austria	Elementary Education	2042	R CG - O ₂ EG X O ₂	1 year
Ortega-Barón et al. (2019)	Spain	High School Education	670	NE CG O ₁ - O ₂ EG O ₁ X O ₂	9 months
Palladino et al. (2016a)	Italy	High School Education	622	NE CG O ₁ - O ₂ - O ₃ EG O ₁ X O ₂ - O ₃	1 year
Palladino et al. (2016b)	Italy	High School Education	461	NE CG O ₁ - O ₂ - O ₃ EG O ₁ X O ₂ - O ₃	1 year
Schultze-Krumbholz et al. (2016a)	Germany	High School Education	486	R CG - O ₂ EG X O ₂	1 session
Schultze-Krumbholz et al. (2016b)	Germany	High School Education	578	R CG - O ₂ EG X O ₂	2 months
Solomontos-kountouri et al. (2016a)	Cyprus	High school and primary education	764	NE CG O ₁ - O ₂ - O ₃ EG O ₁ X O ₂ - O ₃	1 year
Solomontos-kountouri et al. (2016b)	Cyprus	High school and primary education	822	NE CG O ₁ - O ₂ - O ₃ EG O ₁ X O ₂ - O ₃	1 year
Solomontos-kountouri et al. (2016c)	Cyprus	High school and primary education	764	NE CG O ₁ - O ₂ - O ₃ EG O ₁ X O ₂ - O ₃	1 year
Solomontos-kountouri et al. (2016d)	Cyprus	High school and primary education	822	NE CG O ₁ - O ₂ - O ₃ EG O ₁ X O ₂ - O ₃	1 year

3.1. Meta-analysis results

This section analyses the overall effects of cyberbullying prevention programmes on the perpetration of cyberbullying among students. To this end, Figure X shows the results of the 17 studies (15845 participants) included in the meta-analysis measuring such an effect (Cross et al., 2016a, 2016b; Chauz et al, 2016a, 2016b; Ortega-Barón, 2019; Palladino et al., 2016a, 2016b; Schultze-Krumbholz et al., 2016a, 2016b; Solomontos-Kountouri et al., 2016a, 2016b, 2016c, 2016d; DeSmet et al., 2018a, 2018b; Gradinger et al., 2015; Garaigordobil and Martínez-Valderrey, 2015).

Overall, most studies show a significant effect ($p < 0.05$) in favour of the programme effect, which could mean that the intervention has decreased the target variable, i.e. the perpetuation of cyberbullying situations online. The findings of this meta-analysis show, through the forest plot, that the educational intervention has a significant effect ($P=0.00001$) in reducing bullying behaviour. Thus, the rhombus image to the right of the no effect line confirms that the difference between groups is statistically significant ($P < 0.05$). Therefore, a priori, prevention programmes on cyberbullying exert a positive effect by decreasing the perpetuation of this type of virtual bullying situations. In fact, the estimate of the overall effect of the investigations considered verifies this difference between the EG ($n = 7778$) and the CG ($n = 8067$) ($SMD = 0.08$; $CI\ 95\% [0.05, 0.11]$; $p < 0.00001$), showing an oscillation of the effects between -0.18 and 1.24 . The meta-analysis reported a moderately

heterogeneous pooled result ($p=0.00001$, $I^2= 91\%$) in accordance with the principles of Cohen (1988) and Hattie (2015). This shows that there are moderate inconsistencies between studies due to possible differences in samples, experimental conditions or even in the measures used. However, the heterogeneity could be decreased by applying a sensitivity of analysis ($P=0.16$, $I^2= 26\%$), with the exclusion of 2 studies (Palladino et al., 2016a; Solomontos-Kountouri et al. 2016b), after which the overall effect estimate would still show a statistically significant difference ($SMD=0.03$; 95% CI [-0.01, 0.06]; $P= 0.16$). Therefore, this analysis determines that the studies by Palladino et al., (2016a) and Solomontos-Kountouri et al. (2016b) resulted in moderate heterogeneity among the studies analysed in the meta-analysis.

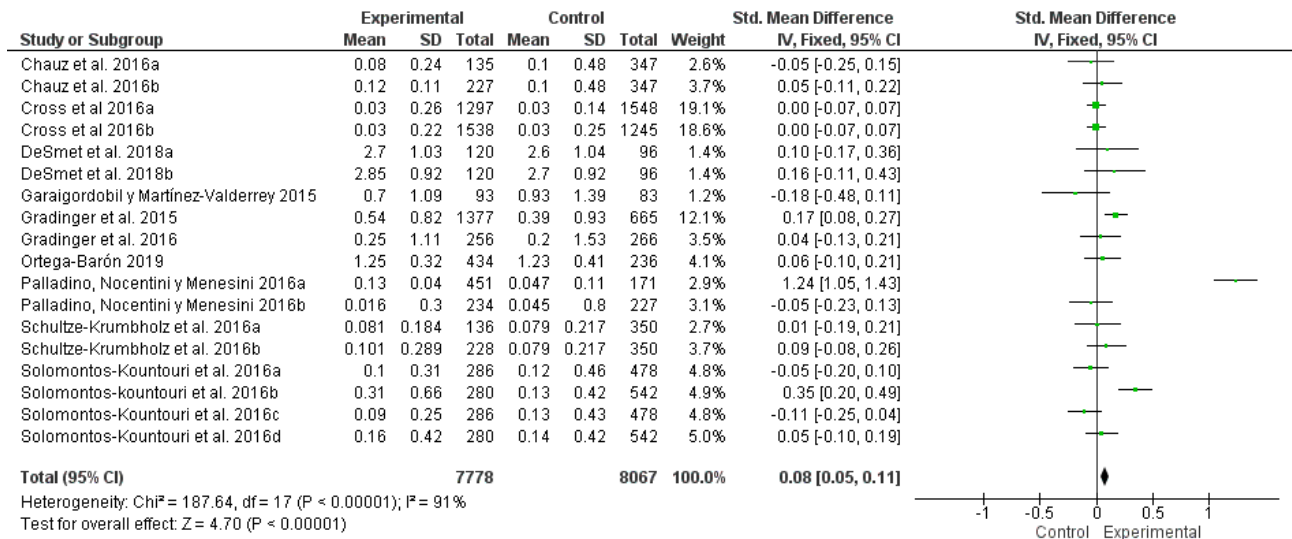


Figure 2. Forest plot with all results

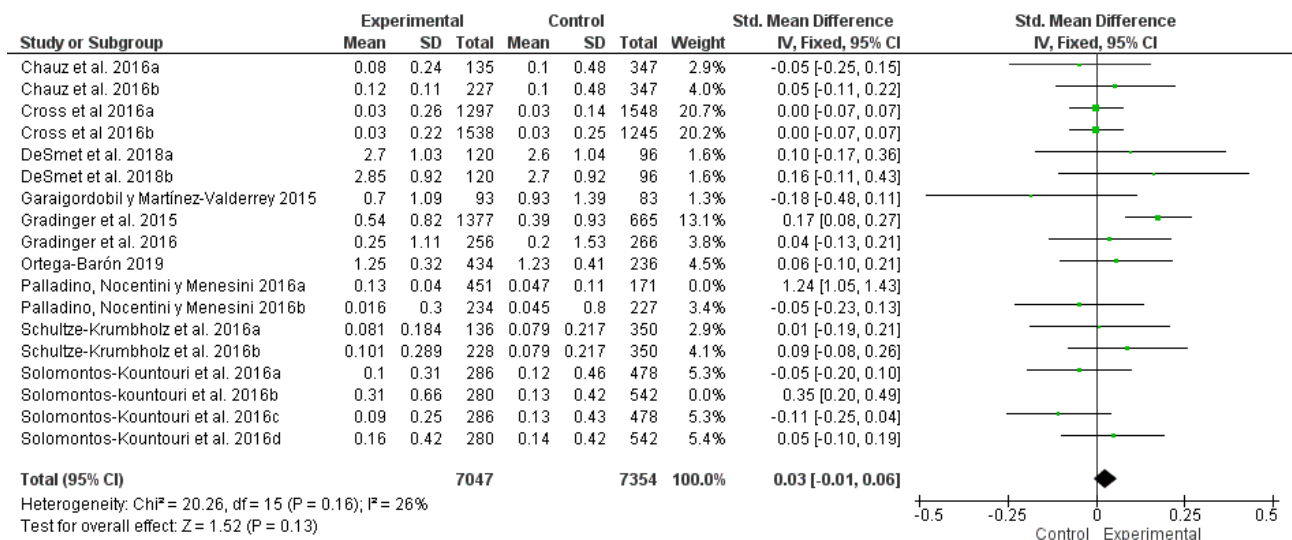


Figure 3. Forest plot after sensitivity analysis

Regarding publication bias, Figure 3 shows the distribution of interventions according to the significance of the effect and the precision of the studies on the perpetuation of cyberbullying situations in pupils. The graph shows an asymmetric distribution of studies, of which one of them falls outside the 95% CI parameters. This could be due to the presence of high heterogeneity ($I^2: 91\%$). Furthermore, the distribution of studies in terms of effect size reflects heterogeneity with respect to the Y-axis, with one study falling outside the parameters of the research cluster.

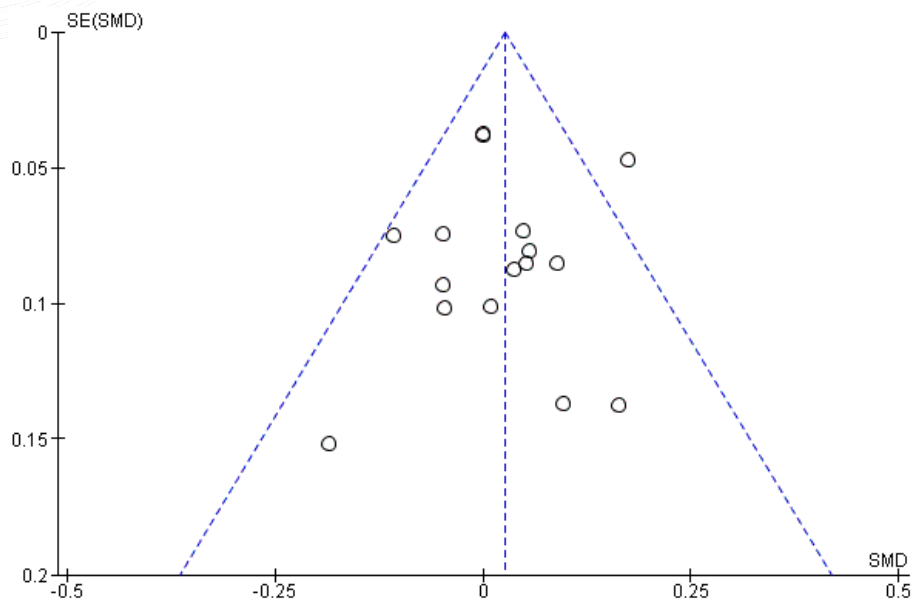


Figure 4. Funnel Plot on the distribution of studies of cyberbullying prevention programmes and their effect on the perpetuation of cyberbullying

4. Discussion y conclusions

The aim of this meta-analysis was to analyse the effects of cyberbullying intervention programmes on the levels of perpetration among students at school. After searching and applying the inclusion/exclusion filters, 9 studies were included in the meta-analysis, including a total of 17 different interventions carried out between 2016 and 2019; 2016 being the year with the highest productivity in this area with a total of 6 investigations (37.5% of the total). The samples of the studies are characterised by coming from different geographical locations but the most predominant were Germany ($n=3$) and Spain ($n=3$).

On the other hand, it should be noted that the most predominant research designs were characterised by experimental designs with QA and EG and a pre-test and post-test (33.4%). Furthermore, we consider it very opportune to highlight that in our review study we have included and assessed all the existing alternatives of comparison between groups and post-test measures.

With regard to the purposes of the selected studies, it is important to point out that, despite pursuing a common objective, namely to assess the effectiveness of a cyberbullying prevention programme in the sample/participants, they also had other relevant objectives. These included making these situations of bullying visible in the educational centre, providing a conceptualisation of the term, raising awareness and encouraging greater commitment to eradicating this phenomenon, among others. The use of ICTs and collaborative and active didactic and methodological strategies were key points in the interventions analysed. In terms of the duration of the programmes, the time usually ranged from one session to a full year. It should be noted that the target population was concentrated in the Secondary Education stage, specifically in the 13-17 age group. Our results show that cyberbullying prevention programmes can affect the decrease in the perpetration of this type of situations in the educational context, mainly in the secondary school stage. So far, no up-to-date and conclusive meta-analysis has been conducted on cyberbullying prevention programmes on the perpetration of online bullying. However, Tanrikulu (2018) conducted a systematic review of 16 empirical studies published up to 2016. His findings revealed that in all interventions there were positive effects of this type of educational programmes in terms of variables of victimisation and perpetration of bullying situations in students. Other studies such as that of Lee et al. (2013) concur in this aspect, reporting that the implementation of a cyberbullying prevention programme in seventh grade secondary school students immediately and effectively improved knowledge about cyberbullying, reduced intentions and retained after-learning effects. In fact, studies such as that of Williford et al., (2010) with a large sample of participants/school children showed that after the implementation of Kiva (a cyberbullying prevention programme) students decreased levels of victimisation and perpetration of bullying situations. Therefore, it was concluded that Kiva could be an effective programme to address cyber forms of bullying and victimisation.

In line with this, a large body of research has echoed the need for education on the prevention of this type of bullying (Aboujaoude et al. 2015; de la Caba and Atxurra, 2013; Field, 2018). These studies not only warn of the significant consequences of its effects, but also highlight its new characteristics, which raise new questions about the role of the agents involved. Cyberbullying among students and more specifically, school-aged adolescents has received increased attention in recent literature (Chisholm, 2014). Moreover, Walker, Craven and Tokunaga (2013) noted that there is currently a pressing need for meta-analyses that evaluate the effectiveness of intervention and prevention programmes on cyberbullying outcomes.

However, there is currently insufficient empirical evidence on whether existing school-based anti-bullying programmes are effective in addressing the unpublished aspects of cyberbullying. To address this important gap, this meta-analysis was proposed and provides findings that are consistent with other major international research. Saarento, Boulton and Salmivalli (2015) in their longitudinal study indicated that, after implementing an anti-bullying prevention programme, students improved their knowledge about psychosocial developmental processes contributing to bullying and victimisation. Furthermore, this study shed light on those key mechanisms by which bullying can be successfully counteracted.

This study focused on studying the effects of cyberbullying prevention programs on the variable of perpetration over time. Some similar studies found significant findings in this particular area of study. For example, in the United States (Espelage et al., 2018), Canada (Riddell et al., 2018) or the United Kingdom (Gaffney and Farrington, 2018) positive effects of prevention programmes on this study variable were reported. Even in the Spanish context, systematic reviews of the literature have been developed that have clarified the potential of this type of programme (Zych et al., 2016). This research also pointed to the influence of factors such as gender, family, age or ethnicity on the prevalence of variables such as victimisation and perpetration of cyberbullying. Despite this, research suggests that cyberbullying is a prevalent form of interpersonal aggression in today's modern society and is therefore an important topic for intervention and prevention.

4.1. Research limitations and strengths

This meta-analysis shows as main weakness the inaccuracy of some cyberbullying prevention programmes. Applications of educational prevention programmes can be very diverse. Some research does not describe in depth the type of programme used, the duration and the internal organisation. Also, some studies do not take into account contextual and situational factors and other variables performed by students during their daily habits, which may bias the results. These moderating factors could be important in explaining the conceptual heterogeneity of cyberbullying prevention programmes. In this sense, it would be interesting to include contextual, situational and methodological moderators in future proposals. These limitations make it difficult to know the true effectiveness of cyberbullying prevention programmes. Despite the above, this is the first time that a meta-analysis classifies and analyses solely and in details the effects of cyberbullying perpetration, making it one of the most specialised reviews in this particular line. The scope of this work has been limited to educational prevention programmes and we have provided educational implications of this type of interventions in the educational context for students which are developed below.

4.2. Findings and educational implications of cyberbullying prevention programmes in the educational context

This meta-analysis has shown that cyberbullying prevention programmes have a potential that had not been recognised until now. Incorporating active and collaborative methodologies in this type of programmes was an added value that reinforced the desired study variable: to decrease the perpetration of bullying on the web over time. Therefore, we consider that one of the main educational implications of this study should be to increase the use of cyberbullying prevention programmes in schools. In this sense, it would be necessary to promote the introduction of these programmes in the classroom in educational legislation. Cyberbullying prevention programmes could be used as a point to be included in teaching planning and teaching units. In fact, it would be interesting to train teachers in this type of programmes, in order to incorporate the whole mechanism and the correct structure in their professional teaching performance. One recommendation is to use technology and active learning. In line with this, it is necessary to highlight that at the public policy level, Spain is making efforts to eradicate this type of violence and this has been reflected in the new educational law LOMLOE (2020). This organic law aims to deal with bullying and other highly relevant issues, such as sexual identity or ecological awareness, developing critical skills and attitudes in students towards situations in which respect for peers and life in general are basic and indisputable.

Within the school context, other alternatives that are proving interesting are peer group structures, where young people socialize and group with each other to conform to peer expectations and learn how social organizations work from an ethical and committed perspective (Romera et al., 2016). Even educational centers are betting on a new figure, the cyber helper. This figure promotes student participation by freely assuming a commitment to identify and denounce these situations of harassment, and as a mediator in the resolution of such conflicts arising from the use of the Internet (Wachs, 2012).

In addition, these initiatives should be supported by training actions and comprehensive bullying prevention programs for the entire educational community. The development of this training should move towards the learning of e-skills. In this way, different interventions and activities could be directed to promote communication skills, empathy and peaceful conflict resolution among peers (Bautista et al., 2022; Montoro and Ballesteros, 2016).

There is a need for more scientific production aimed at analysing the duration, frequency and type of stimuli suitable for structuring bullying prevention programmes in the school context. In addition, future research is invited to go beyond the educational setting and consider other variables and factors that extend outside the educational environment and that are equally relevant, as well as to focus new lines of research on the important role of the cyberassistant student as an essential part of this type of situation. Furthermore, little is known about possible age and gender differences in their effects, so these results should be considered with caution. It would also be necessary to clarify the possible impact of unanalysed confounding factors, such as socio-economic and cultural background. Finally, It is suggested that the possible effects of cyberbullying prevention programmes on other potential variables such as educational values, emotional intelligence, psychosocial aspects, among others, should be explored further.

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