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The digital defence against cyberbullying: A systematic review of tech-based approaches

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Abstract: Cyberbullying, which has been exacerbated by the widespread use of smartphones and the increasing stress associated with the pandemic, needs the promotion of positive online behaviour, cyberbullying awareness, and victim support. The PRISMA technique is used in this review to identify effective preventative tools and intervention options. Eleven studies met our inclusion criteria and were selected for review. A quality assessment was conducted. Upon thorough evaluation of the included studies, the intervention data was compiled in a narrative format. Using thematic analysis, we explored the effectiveness of technological interventions for preventing cyberbullying comprehensively. Technology-driven strategies for identifying and combating cyberbullying in educational settings, such as language-specific cyberbullying detection tools, IRCB programmes for empowering teenagers, and technologies such as CREEP Semantic Technology and CREEP Virtual Coach, have showed potential. TIPIP and the #WIIWY movement have also assisted to raise awareness and educate people about cyberbullying. However, more research is required to design targeted interventions that address varied demographics and circumstances, while including parents and taking the target audience's age into account remains critical for effective technology-driven educational interventions and digital advocacy.

Subjects: Information & Communication Technology (ICT); Technology; Health & Society

Keywords: cyberbullying; social media; technological intervention; mental health

1. Introduction

The smartphone, an innovative product of evolution, has the potential to be dangerous if overused, making its increasing prevalence a pressing issue that requires immediate action. This outbreak has seen widespread use of smartphone technology (David & Roberts, 2021). In important areas such as business, health, social life, education, and more, it has both positive and negative effects.

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Additionally, the effects of such an addiction are shown across all age groups and are not just limited to children (Mokhtarina et al., 2022). Schools were obligatory to offer online education because of stay-at-home parents, and kids have been forced to use digital platforms and applications (Zheng et al., 2022). Children have also communicated with peers more frequently via text messaging and social media because they were unable to meet in person. Children who use educational platforms that require interaction through postings and comments and who are more likely to link with their peers online, would have a higher risk of engaging in cyberbullying and other types of online violence (Chipangura & Dtendjo-Ndjindja, 2022). The relationship between interactive educational platforms and cyberbullying, or online violence, is multifaceted (Abaido, 2020). This relationship is affected by anonymity, peer pressure, a lack of adult supervision, and poor online behaviour. These dangers may result from children's peer influence, poor dispute resolution, and exposure to hazardous information. Parental counsel, school regulations, and platform measures also affect risk (Doty et al., 2022). When parents monitor their children's internet activity and educational platforms encourage good behaviour and discourage cyberbullying, the risk can be reduced.

Cyberbullying is defined as the act of intentionally, aggressively, and repeatedly harassing an individual or group who are unable to defend themselves easily in a psychological context through the use of electronic information and communication tools such as social media sites, blogs, e-mails, and so on (Smith et al., 2012; Zhan et al., 2022). Although it is challenging to make an accurate and consistent definition due to factors such as anonymity, uncertainty about the persistence of data, and bystanders, cyberbullying is defined as the act of harassing an individual or group who are unable to defend themselves (Barlett et al., 2021; Eden & Roberto, 2021). When the relevant research is examined, it becomes abundantly evident that the phrase "cyberbullying" is used to refer to a wide range of detrimental behaviours and practises (Hinduja & Patchin, 2022; Yurdakul & Butun Ayhan, 2022). The use of put-downs, flaming, cyberstalking, harassment, masquerade, dishonesty, exclusion, impersonation, and sexting are all instances of behaviours that are considered to be undesirable (Barlett et al., 2021). In contrast, it has been determined that the concept of cyberbullying involves harmful behaviours that are repeated and have a power imbalance between the bully and the victim that is skewed in favour of the bully (Wu et al., 2022). Cyberbullying can take many different forms and have many different aspects. It is a concept that required further attention by the contemporary researchers.

The Coronavirus disease (COVID-19), has triggered a worldwide pandemic that has affected every facet of society, including how people interact to one another. The paradigm of human interaction had shifted towards online communication has resulted in a significant increase in the prevalence of cyberbullying. Before the pandemic, cyberbullying mainly took place through social media platforms like Facebook, Instagram, and Twitter, and was mainly focused on teasing, spreading rumours, and exclusion (Shin & Choi, 2021). On the other hand, cyberbullying has become worse and more harmful since the pandemic. There is more focus on cyberstalking, hacking, fraud, and spreading false information about the pandemic (Kee et al., 2022; Shin & Choi, 2021). One of the main reasons for this shift is the increased amount of time that people are spending online due to lockdowns and social distancing measures. As more individuals spend more time online, cyberbullies have more opportunities to target their victims (Doty et al., 2022). In addition, the tension and uncertainty brought on by the pandemic have made individuals more susceptible to bullying, as they may be less equipped to deal with its negative effects (Armitage, 2021; Wiguna et al., 2021). Due to diminished face-to-face interaction and increased online communication, the pandemic has led to a rise in cyberbullying (Haddad et al., 2021). Personal interactions fostered empathy and deterred aggression prior to the pandemic. Even though online communication is deemed interpersonal, the absence of nonverbal cues leads to misunderstandings and conflicts (Eden & Roberto, 2021). Moreover, the anonymity of online platforms can encourage abusers. The absence of immediate consequences in virtual interactions can contribute to the escalation of cyberbullying, making it an issue of concern (Kee et al., 2022). The pandemic has substantially altered the nature and scope of cyberbullying. The increase in online

communication, coupled with the stress and unpredictability brought on by the pandemic, has resulted in a more severe and malevolent form of cyberbullying (Achuthan et al., 2023). It is crucial that individuals, educators, and policymakers take steps to address this issue and provide support to those who are affected by cyberbullying. This includes promoting positive digital behavior, raising awareness about the dangers of cyberbullying, and providing resources for those who have been affected (Barlett et al., 2021).

Cyberbullying has become an alarming concern in the digital age, in which technology permeates every aspect of our existence (Chillemi et al., 2020). Innovative and technologically-based approaches have emerged as essential tools for ensuring cyber security against cyberbullying in order to combat this modern threat. Before delving into the specifics of these approaches, it is essential to comprehend the dynamic nature of cyberbullying and the pivotal role that technology plays in perpetuating and mitigating this problem. It is frequently asserted that more recent research is necessary before the development of these programmes or software, even though good intervention and prevention programmes designed for this purpose have been discovered in several countries. This paper addresses this gap by showing how technical solutions might defend against this digital threat. By investigating the research questions, we expect to contribute to the expanding body of knowledge in the field of cyberbullying prevention by providing direction for the development of more effective and targeted technology-based interventions. Ultimately, the study seeks to foster safer online environments for individuals of all ages and backgrounds, mitigating the harmful effects of cyberbullying in today's interconnected world.

2. Methods and materials

PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) is a widely used reporting tool for systematic reviews. Using PRISMA, the following is an explanation of the methodology for the systematic review on cyberbullying prevention. Utilizing electronic databases including Google Scholar, PubMed, Scopus, and Web of Science, a comprehensive search of the literature was conducted. Before the screening started, these are the keywords that been used in databases searching: “cyberbullying; cyber bullying; cyber victim; cyber victimization; cyber harassment; online bullying; internet bullying;” AND “prevention; intervention; program; effective*; tech*; model; prototype”. Following are the steps taken in choosing the articles. Figure 1 depicts the steps taken to choose the reviews to be included in the analysis.

After conducting the search, the next step is to screen the articles based on the inclusion and exclusion criteria. The inclusion criteria for this study would be peer-reviewed articles that discuss technological-based prevention methods used to combat cyberbullying. The articles should be a research article, written in English, and published between the years 2018 and 2022. The exclusion criteria could be articles that do not focus on technological-based prevention methods. The screening process involves reading the article title, abstract, and full text to determine whether it meets the inclusion and exclusion criteria. To understand why an article was considered ineligible for inclusion when it did not meet the preset inclusion criteria, please refer to Figure 1 of the PRISMA flow chart.

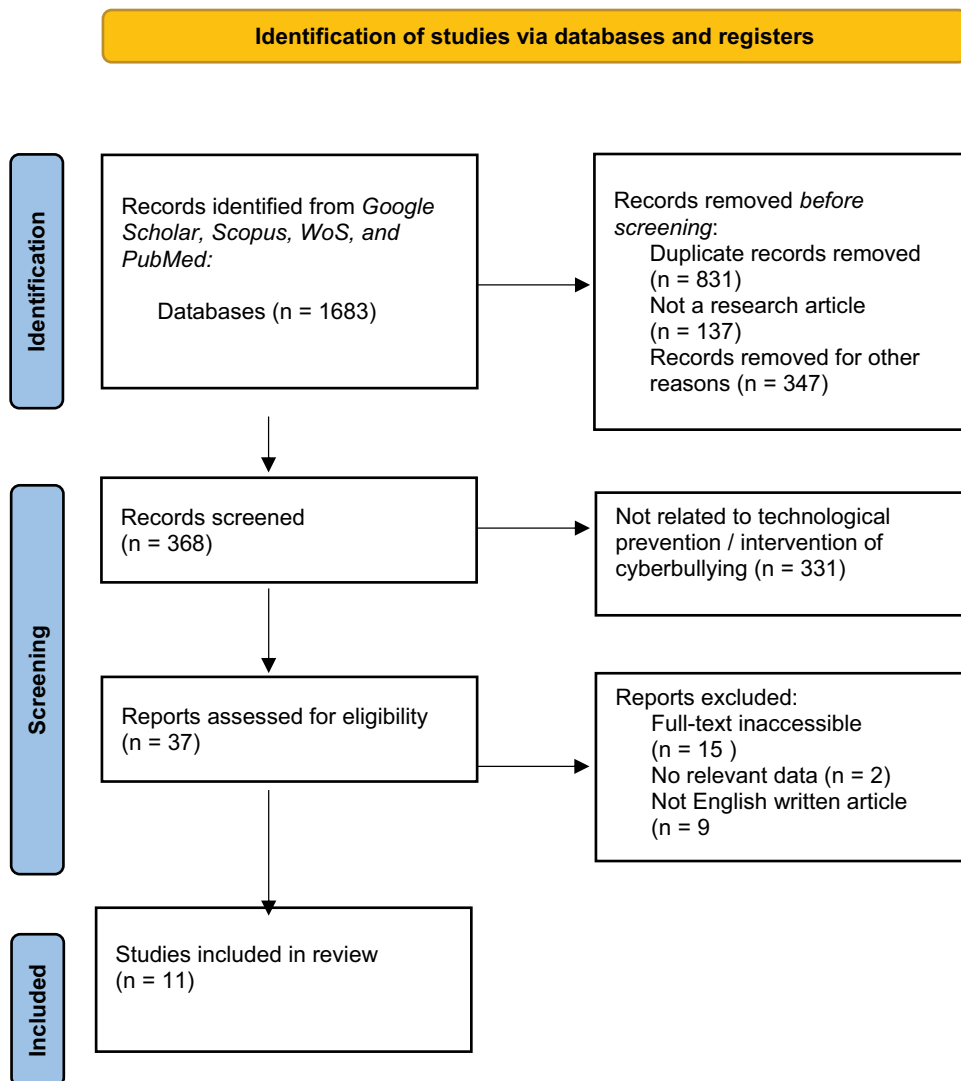
Data is also extracted from chosen articles. The author(s), year of publication, article title, study design, study population, intervention methods, outcomes, and limitations can be extracted using a standardised form. Data extraction ensures that all important data is captured consistently. The PRISMA methodology's quality evaluation step helps reveal bias and limits in selected papers. This data can be used to influence future cyberbullying prevention research and offer suggestions. Synthesis is the final stage. This involves summarising significant findings, identifying similar themes, and flagging study limitations.

We used a quality assessment tool that was adapted from Lorenc et al. (2014). The assessment involves nine domains: abstract and title; introduction and aims; methodology and data collecting; sampling and data collection; data analysis; ethical issues and bias; results; transferability/

generalizability; and practical implications. Each domain was rated on a scale of 1 (very poor) to 4 (excellent), obtaining an overall score ranging from 9 to 36. Following that, overall quality ratings were assigned as follows: high quality (A) for scores of 30–36 points, medium quality (B) for scores of 24–29 points, and low quality (C) for scores of 9–24 points. It's worth noting that the synthesis did not exclude, or downgrade research based on its quality evaluation scores.

We used thematic analysis (Lorenc et al., 2014) to analyse and interpret the qualitative data gathered in our systematic review on cyberbullying prevention using technology. This methodological approach played a critical role in identifying, analysing, and reporting recurring patterns and themes in the data. We were able to delve deeply into the various perspectives and conceptual understandings prevalent in the field by using thematic analysis. This method allowed for a thorough examination of how various technological strategies and interventions are perceived and implemented in the context of cyberbullying prevention. The analysis was meticulously carried out, ensuring that emerging themes accurately represented the data, resulting in insightful and nuanced understandings of the effectiveness and challenges associated with technological solutions in cyberbullying prevention.

Figure 1. Identification of studies via databases and registers.



3. Results

Eleven articles were meticulously selected to provide a comprehensive overview of the various interventions and strategies used to deal with cyberbullying. These articles provide valuable insight into the strategies and methods employed to combat this pervasive issue. By reviewing these studies, readers can gain a deeper comprehension of the efforts made to prevent and mitigate the effects of cyberbullying, paving the way for the future development of more effective interventions and approaches. The studies have been conducted in different countries, using various theoretical frameworks and targeting different populations. The data presented in the Table 1 show the author(s), year of publication, country, theoretical framework, targeted subject, and type of intervention used in each study. There are six countries represented in the selected articles: India, Australia, United States, Italy, Lebanon, and Indonesia. The selected articles in the table cover the years 2018 to 2022. The number of publications per year is as follows: 1 article in 2018, 1 article in 2020, 4 articles in 2021, and 5 articles in 2022. Overall, the majority of the articles were published in the last two years, suggesting a growing interest in research related to cyberbullying interventions. (Please refer to the [Appendix](#) for the quality of study scoring)

This study implemented a systematic review approach following the PRISMA procedures to thoroughly examine cyberbullying intervention papers published from 2018 to 2022. Through thematic analysis, we have identified recurring patterns that consistently emerge within this corpus of research. Significantly, the utilisation of technology interventions, as demonstrated by the research conducted by Raj et al. (2022) and Paul et al. (2022), has effectively employed machine learning and deep learning algorithms to automatically identify and mitigate instances of cyberbullying. Simultaneously, a prominent thematic thread arises concerning efforts to enhance resilience, prominently exemplified by the Increasing Resilience to Cyberbullying (IRCB) programme developed by Chillemi et al. (2020). The programme, which has been adopted in secondary schools in Australia, has a strong emphasis on training students with vital coping skills and creating resilient social support networks. The primary goal is to empower students to effectively respond to instances of cyberbullying.

The iPACT project, which Ranney et al. (2021) proposed, is a notable example of an additional significant topic: text message-based interventions. This intervention employs agile methodologies to increase teenagers' knowledge of cyberbullying, aiming to improve their ability to identify, address, and avoid such occurrences. Furthermore, the cyberbullying intervention landscape has been enhanced by the inclusion of semantic technology frameworks, as exemplified by the research conducted by Gabrielli et al. (2021), and psychological frameworks, as illustrated by Sorrentino et al. (2018). These frameworks contribute unique methodologies for the identification and mitigation of online abuse.

The COVID-19 pandemic has had a significant global impact, leading to a focus on evaluations specifically relevant to the pandemic. In their study, Haddad et al. (2021) have introduced the COVID-19 Bullying Scale (CBS-11) as a tool to measure the occurrence of pandemic-related bullying among adults in Lebanon. The utilisation of this instrument plays a pivotal role in quantifying the pervasiveness and comprehending the intricacies of this distinctive manifestation of cyberbullying, hence potentially influencing the creation of focused remedies. Moreover, a prominent thematic emphasis is placed on ads aimed at promoting empathy, as exemplified by the "What If It Was You" (#WIIWY) campaign conducted by Fatimatzahro and Achmad (2022). By utilising social media platforms, this effort effectively utilises human tales as a means to enhance public consciousness regarding the issue of cyberbullying. Furthermore, it aims to cultivate empathy among individuals and promote bystander action, thereby fostering a collective feeling of accountability in combating the prevalence of online harassment.

Mindfulness-based interventions, exemplified by the work of Maria Michael and Reyes (2022), social-emotional learning initiatives such as Kutok et al. (2021) Intervention Media to Prevent Teenage Cyber-Conflict Through Technology, and online educational programmemes like Choi and

Table 1. Summary of studies included in the systematic review

Author(s)	Year	Country	Theory/Framework	Targeted subject	Type of Intervention	Effectiveness of the intervention	Quality of study
Raji et al.	2022	India	Deep learning framework	Social media Main: Twitter	Machine learning and deep learning techniques	Positive	High
Paul et al.	2022	India	Deep ensemble model	Social media Main: Twitter	Machine learning and deep learning techniques	Positive	High
Chillemi et al.	2020	Australia	N/A	Australian secondary schools	Increasing resilience to cyberbullying (IRCB) program	Positive	Medium
Ranney et al.	2021	United State	Agile methods	Adolescents (past-year cybervictimization)	Intervention to prevent adolescent cybervictimization with text message (IPACT)	Positive	High
Gabrielli et al.	2021	Italy	The CREEP project/framework	School; Social media Main: Instagram and Twitter	CREEP semantic technology CREEP virtual coach	Positive	High
Sorrentino et al.	2018	Italy	The ecological system theory and the threat assessment approach	Students	Tabby improved prevention and intervention program (TIPiP)	Positive/Negative	High
Haddad et al.	2021	Lebanon	N/A	Lebanese adults	COVID-19 bullying scale (CBS-11)	Positive	High
Fatimatuzzahro et al.	2022	Indonesia	N/A	Social media Main: Tiktok	What If It Was You (#WIIWY)	Positive	Medium
Maria Michael & Reyes	2022	India	Conklin's program development model	Cyberbullied adolescents	Online Mindfulness-based Logotherapy Program (OnlineMLP)	Positive	High
Kutok et al.	2021	United State	N/A	Social media Main: Instagram	Intervention Media to Prevent Adolescent Cyber-Conflict Through Technology	Positive	High
Choi & Park	2021	South Korea	Successive Approximation Model (SAM) approach	Students	Online cyberbullying education program	Positive	High

Park's (2021) creation of an online cyberbullying education programme for students in South Korea, collectively contribute to a holistic approach that seeks to address cyberbullying incidents and empower individuals with the requisite knowledge, abilities, and emotional fortitude to navigate the digital realm proficiently.

This systematic analysis highlights the presence of repeating patterns in cyberbullying intervention efforts, indicating a constantly changing environment characterised by advancements in technology, psychological understanding, and pedagogical approaches. The recognition and comprehension of these thematic groupings provide significant knowledge for policymakers, educators, and researchers, underscoring the significance of implementing varied and customised intervention approaches to establish online environments that are safer and more empathetic for individuals from various populations and contexts.

4. Discussion

During the pandemic, people spent more time on the screen, specifically on social media. People spent more time at home for a few months because they were not allowed to leave their homes except for essential workers, until the governments of each country issued movement control orders allowing people to resume their normal routines by following the Standard Operating Procedure (SOP). The research on cyberbullying is still considered in the early exploratory stage, despite the exponentially rising number of studies in recent years. Even though this study made use of a number of intervention and prevention programmes and pieces of software, more studies which incorporating cyberbullying elements required to provide a more complete picture of the problem. A rise in cyberbullying practises and cyberbullying victims could result from the fact that technology has accelerated in all domains. Because of this, this study provides significant information about cyberbullying intervention and prevention by methodically assessing tools and software for combating cyberbullying and cyber victimization to the contemporary academics, policy-makers, and educators working in this area.

In this extensive analysis of cyberbullying, we delve into several key themes that collectively contribute to a better comprehension of this pervasive problem in the digital age. Cyberbullying, characterised by multiple forms of online harassment and victimisation, has risen to prominence with the rapid expansion of digital communication platforms. To address this complex problem, we have identified and organised our discussion around four central themes, each shedding light on various aspects of the cyberbullying phenomenon. These themes include technological solutions for cyberbullying detection, digital interventions aimed at prevention, educational initiatives to promote awareness and resilience, and the impact of contextual factors and distinctive challenges in the cyberbullying landscape. Together, these themes provide a multifaceted perspective on the issue, shedding light on the tools and strategies available to combat cyberbullying as well as the larger societal context in which it occurs.

4.1. Technological solutions for detecting cyberbullying

Several studies looked into the advancement of new technology for detecting and combating cyberbullying. Deep learning systems were used by Raj et al. (2022) to detect cyberbullying in multilingual social media posts, while machine learning, and deep learning algorithms were used by Paul et al. (2022) to detect cyberbullying in code-switched writings. These technical developments demonstrate the power of artificial intelligence in combating cyberbullying.

4.2. Cyberbullying prevention through digital interventions

In the fight against cyberbullying, the advent of digital solutions has been a major trend. Ranney et al. (2021) established iPACT, a digital intervention for cyber victimized adolescents that engages them through SMS text messaging. CREEP Semantic Technology and CREEP Virtual Coach, tools developed to assist school officials and teens in detecting and responding to cyberbullying, were presented by Gabrielli et al. (2021). Sorrentino et al. (2018) contributed the Tabby Toolkit, a comprehensive set of digital materials for increasing cyberbullying awareness and

understanding. These studies emphasise the significance of utilising digital tools to empower both teenagers and educators in the avoidance of cyberbullying.

4.3. Educational initiatives

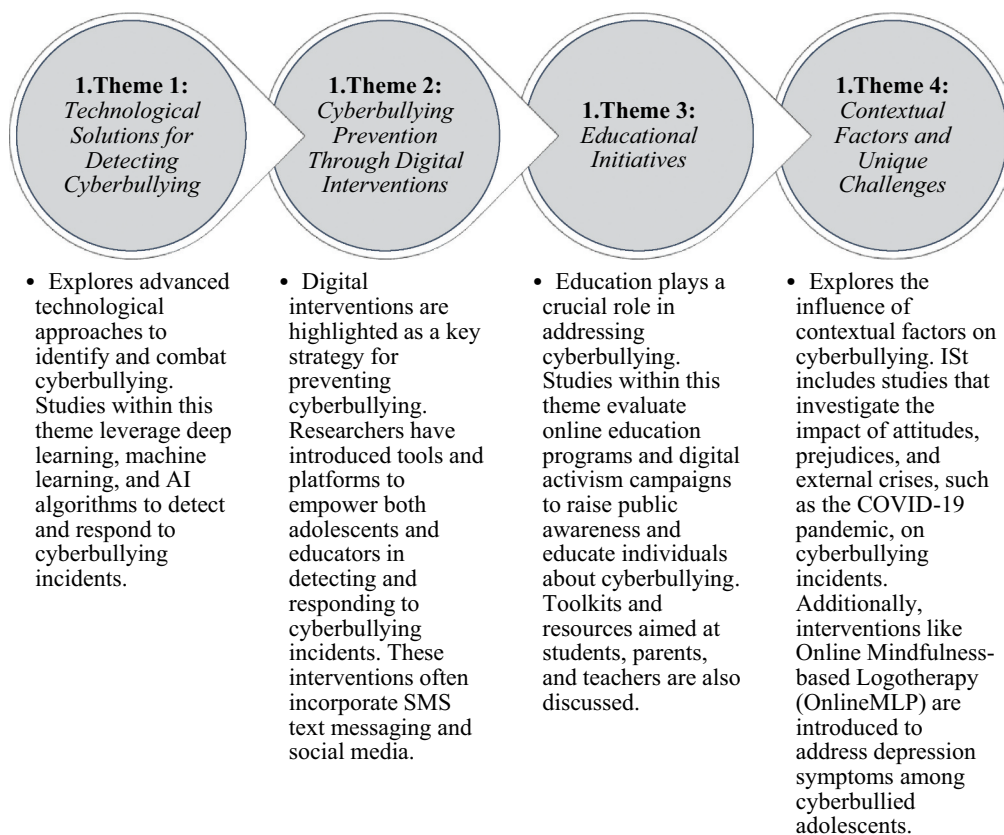
Several studies emphasise the importance of education in combatting cyberbullying. Choi and Park (2021) examined the influence of an online education programme on reducing cyberbullying victimisation and perpetration among students, emphasising the efficacy of educational interventions. Fatimatu Zahra and Achmad (2022) started the #WIIWY TikTok digital activism campaign to raise public awareness and educate people about cyberbullying. Sorrentino et al. (2018) introduce the TIPIP programme, which emphasises the role of education through a toolbox aimed at students, parents, and teachers.

4.4. Contextual factors and unique challenges

Some research investigated the impact of contextual factors on cyberbullying. Haddad et al. (2021) discovered that prejudiced views played a role in bullying behaviours, notably during the COVID-19 epidemic. During the pandemic, Kutok et al. (2021) established an online programme, Online Mindfulness-based Logotherapy (OnlineMLP), to address depression symptoms among cyberbullied adolescents. The findings of Maria Michael and Reyes's (2022) research offered evidence for the need for intervention programmes such as OnlineMLP to comprehensively treat the depression symptoms experienced by cyberbullied youths.

Finally, these researches contribute to the ongoing efforts to combat cyberbullying. In addressing this complicated issue, they emphasise the necessity of technical breakthroughs, digital interventions, education, and a knowledge of contextual elements. While each study provides useful insights on its own, when taken together, they provide a full picture of the complex approach required to effectively combat cyberbullying, especially in the digital age and during

Figure 2. Summary of key themes.



difficult times like as the COVID-19 pandemic. Figure 2 shows a high-level summary of the key issues that arose from our research. To help you understand the subject of our review, each theme is accompanied by a brief description.

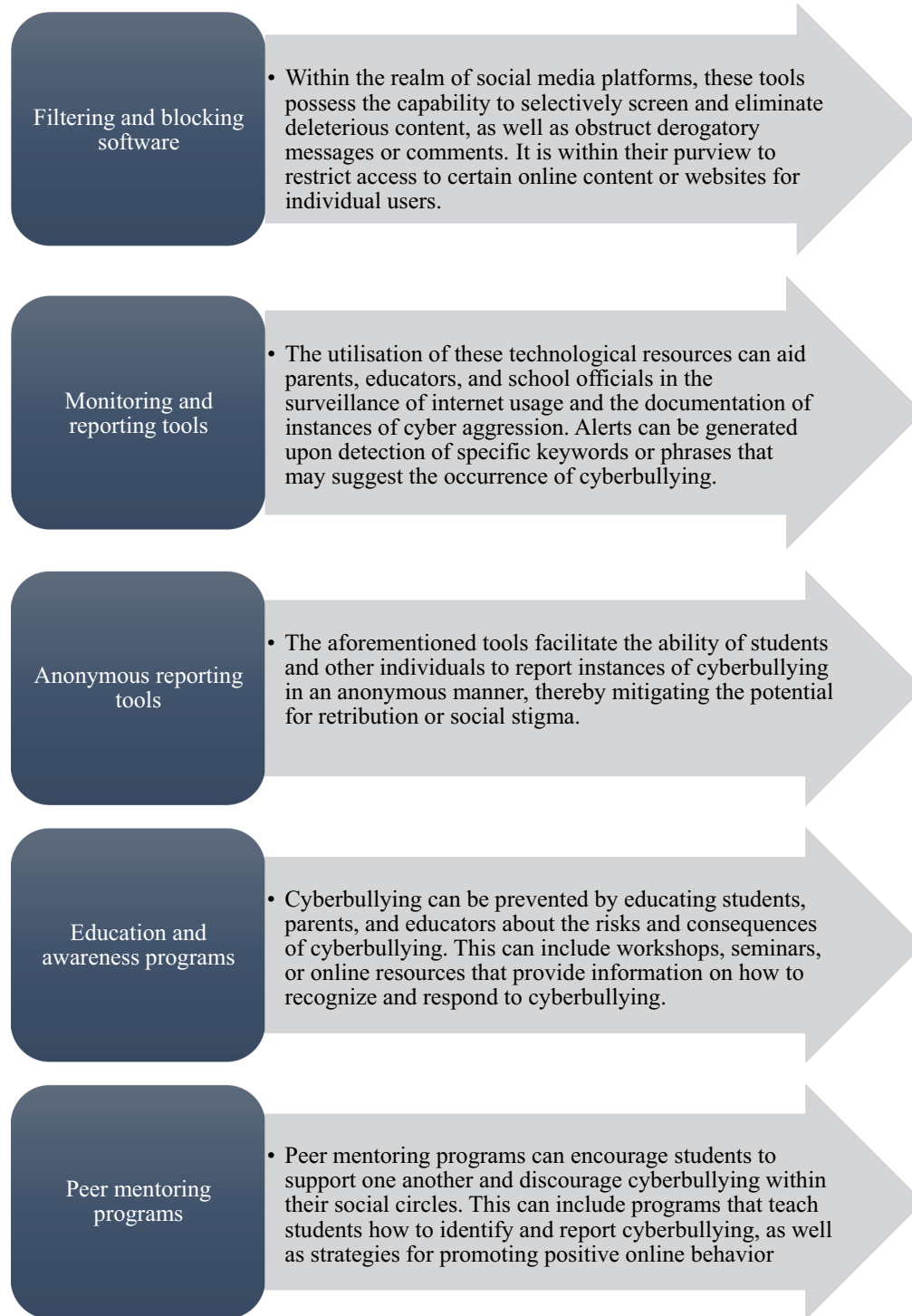
The reviewed articles discussed various technological interventions to detect and combat cyberbullying in different languages and through different approaches. The use of deep learning algorithms was highlighted as a promising method for cyberbullying detection, and the implementation of virtual coaching and online education programs were identified as helpful tools in combating cyberbullying. Moreover, the review found that adolescents from all socio-economic and racial or ethnic backgrounds almost universally use SMS text messaging, thus it was used as a method of combating cyberbullying. The reviewed articles also stressed the importance of interventions in schools and provided evidence that technology-based interventions were well received by participants. The use of public engagement through digital activism as a means to increase public awareness of cyberbullying was also highlighted. Last but not least, the impact of the COVID-19 pandemic on cyberbullying was discussed, with evidence indicating that individuals with prejudiced attitudes were more likely to engage in harassing actions against COVID-19 patients. As people were spending more time on their smartphones, the majority of articles were published at that time. Overall, the reviewed articles suggest that technology-based interventions and public engagement can be effective in addressing cyberbullying, but additional research is required to better understand its impact and efficacy.

There are several technological interventions that can help prevent cyberbullying which already been suggested in previous studies (Abaido, 2020; Smith, 2015; Tozzo et al., 2022). Some of the most effective technological interventions for preventing cyberbullying include (see Figure 3)

Simultaneously, a combination of these technological interventions, along with a strong commitment to education and awareness, can help prevent cyberbullying and promote a safer and more positive online environment. The most important thing that can be done to combat the effects of cyberbullying is to make an attempt, both literally and metaphorically, to find a solution to the problem. The primary responsibility of legislators, school administrators, educators, and parents in this context is to implement a programme or software to intervene and prevent cyberbullying (Zhu et al., 2021). This should be done while keeping cyberbullying in mind. Each of the cyberbullying intervention and prevention methods and software investigated for this study has its own distinct theoretical underpinnings (Ansary, 2020). According to the findings of this study, it has been discovered that in years where there are fewer technological facilities and where technology is used relatively less, in most cases, the programmes that are incorporated into the school curriculum and carried out with activities in the classroom are utilised throughout the academic year to either stop or interfere with instances of cyberbullying. However, as we get closer to the present, it is clear that more technologically oriented solutions (such as social networking sites, films, instructional games, presentations, and so on) are an attempt to solve the problem with expanding technological capabilities (Calvo-Morata et al., 2020). The increased use of technology during this pandemic, in which all needs, particularly learning and teaching, are to be met through technology, is expected to lead to instances of cyberbullying and other forms of cyber victimisation.

The fact that the COVID-19 is currently circulating lends credence to this theory. In this light, we need more than ever strategies that combine the right technologies with the right educational principles and the collaboration of various academic fields to put an end to cyberbullying and other forms of online harassment that can be traced back to the improper use of various technological tools (Pyżalski et al., 2022). Another finding from the study was that a wide range of measurement tools are used to identify instances of cyberbullying. The problem with these tools is that they approach cyberbullying from various perspectives and evaluate the results in various ways, resulting in a problem with external validity. As a result, it is self-evident that a globally recognised, valid, and reliable instrument is required to generalise the findings in the context of cyberbullying intervention and/or prevention. Despite the fact that programmes based in schools and supported

Figure 3. Technological interventions for preventing cyberbullying.



by parents have been proven to be effective in the context of cyberbullying intervention and prevention, it is undeniable that we require solutions that are innovative, creative, and functional while remaining free (Martín-Criado et al., 2021). Because of the pandemic, this is especially true in the online environment.

Nevertheless, Hinduja and Patchin (2015) has written about the importance of social media companies and technology providers taking an active role in preventing cyberbullying. They

suggested that social media companies could use their existing technology to identify and remove cyberbullying content, as well as provide tools for reporting and blocking cyberbullies. Similarly, Smith (2019) has emphasised the importance of technology providers taking responsibility for cyberbullying prevention. He proposed that technology providers can make online environments safer by developing and implementing effective content moderation and reporting systems. He also proposed that social media companies collaborate with schools and other community organisations to educate users about cyberbullying and encourage positive online behaviour. Overall, Hinduja Patchin and Smith have all suggested that technology can help prevent cyberbullying. While technology alone cannot solve the problem of cyberbullying, it can be used as part of a comprehensive, multi-disciplinary prevention strategy. We can create safer and more supportive online environments for all individuals by collaborating with technology providers, educators, parents, law enforcement, and legal professionals.

5. Conclusion

All research has its flaws, and this one is no exception. The studies can only look at the databases that were chosen for the inspection. This is the study's first limitation. The study also has the second limitation of only including full-text, English-language articles. In the context of presenting an ever-increasing number of articles to researchers, this type of study gives them a jumping-off point for discovering the main consensus on the issue researched. But there are typically some restrictions in the presentation of non-inferential descriptive data in a review study. More comprehensive research written in languages other than English are needed to help comprehend the impact of the problem in the context of many causes and various geographical, social, and cultural situations, which are currently underrepresented.

Based on the articles chosen for this systematic review, it can be concluded that there are various approaches to addressing cyberbullying, including technological interventions, educational programs, digital activism, and intervention programs. The use of deep learning systems and machine learning algorithms in detecting cyberbullying has been shown to be effective, and technology-based interventions in schools have also been effective in detecting and preventing cyberbullying. In addition, educational programs and intervention programs have shown positive results in reducing the number of cyberbullying cases and victimization experiences among students. The employment of digital activism has also been leveraged to enhance public consciousness and education regarding the issue of cyberbullying.

It is imperative to underscore that cyberbullying is a multifaceted issue that warrants a varied approach. The efficacy of technical interventions and educational initiatives notwithstanding, it is imperative to also attend to the underlying biases and discriminatory attitudes that engender instances of cyberbullying. Additionally, it is imperative to acknowledge the impact of cyberbullying on the psychological welfare and overall health of individuals. It is crucial to implement measures aimed at mitigating depressive symptoms in adolescents who have been subjected to cyberbullying.

Utilising the potential of technology, this research reviews the most effective tools and strategies for combating cyberbullying. These valuable insights can be used by policymakers, practitioners, and social media platforms to create a kinder and safer online environment, empower individuals, and nurture positive digital interactions. Together, we can make a significant contribution to the struggle against cyberbullying and ensure a brighter, more inclusive digital future for all.

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Author contributions

Conceptualization: CNN and NS; data curation: NS; formal analysis: NS; CNN; HMC; HS; funding acquisition: CNN; methodology: NS; supervision: CNN; validation: NS; CNN; HMC; MIBMR; OPB; HS; writing—original draft: NS; writing—review and editing: NS; CNN; HMC; MIBMR; OPB; AMBM; and HS. All authors have read and agreed to the published version of the manuscript.

Data availability statement

Data will be made available on request.

Supplementary material

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Appendix. Results of the quality assessment for the selected studies

Author(s)	Abstract/ title	Introduction/ aims	Data collection	Sampling	Analysis	Ethics/bias	Results	Generability	Implications	Total	Grade
Roj et al.	3	4	4	4	4	2	4	4	4	33	A
Paul et al.	3	4	4	4	4	3	4	4	4	34	A
Chillemi et al.	3	4	4	4	3	2	3	3	3	29	B
Ranney et al.	4	4	4	4	4	4	4	4	4	36	A
Gabrielli et al.	4	4	4	4	4	4	4	4	4	36	A
Sorrentino et al.	4	4	4	4	4	4	4	4	4	36	A
Haddad et al.	4	4	4	4	4	4	4	4	4	36	A
Fatimatuzzahro et al.	3	3	3	4	4	2	3	3	3	28	B
Michael & Reyes	3	4	4	4	4	4	3	4	3	33	A
Kutok et al.	4	4	4	4	4	3	3	3	3	32	A
Choi & Park	3	4	4	4	4	4	4	4	4	35	A