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Cyberbullying: An Emerging Psychological Cybersecurity Issue?

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ABSTRACT

Cyberbullying is becoming a prevalent issue in the digital world today. The pressure on adolescents to endure online harassment which often occurs from masked bullies is stringently oppressing. There is also a lack of research regarding this topic and a gruesome debate as to considering it among relevant cybersecurity issues. This paper, via a qualitative approach based on a critical literature review and secondary data, assessed whether cyberbullying is an emerging psychological cybersecurity issue. The end goal is the proposal of innovative cybersecurity solutions that can help in mediating cyberbullying. Findings revealed that digital device prevalence is a major propeller of a pressing health challenge among youngsters globally regardless of their educational level. Moreover, it was deduced that cyberbullying is strongly linked with the psychological aspect of cybersecurity, an evolving area of the human aspects of cybersecurity. Cyberbullying includes threatening, embarrassing, harassing or demeaning an individual via an online platform. In extreme situations, statistics have revealed that the majority of cyberbullied victims are at high risk of committing suicide. Thus, cybersecurity strategists need to include policies that combat cyberbullying as well as add it to the list of major cyberthreats. One of the best solutions to mediate cyberbullying is to develop a system that blocks cyberbullying perpetrators and ensures a safe system especially for younger online users to report such issues to higher authorities. Also, training on cyberbullying is essential to create awareness of this menace among online users. Conclusively, if the issue of cyberbullying is handled in a judiciously technological manner, the internet could be a bit safer for all categories of users.

1. Introduction

In recent times, cyberbullying has escalated into an issue of social harassment in many educational institutions globally. Novel communication technologies have tried to proffer support to deal with such rare means of harassment which usually occurs amongst youngsters, from the cradle up till their adulthood. This is in concordance with its probable association with expansive economic

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and social circumstances. In contemporary technologically advanced times, communication amongst individuals via digital devices is integrated into daily collaborative dynamics. Thus, the present technological revolution has changed the manner of relationships and communication. For youngsters, this indicates that school is not the only place where they can meet, interact and socialize, but now there is an option of socializing *via* cyberspace [1].

Therefore, community life alongside interpersonal relations generated in space has become an element of importance, leading to the development of personal social competence. Concerning adolescents, the majority of such interactions occur at school [2]. This is obvious as school is among the major places where students and young people consume a reasonable amount of their time. It is also a place where socialization occurs via daily coexistence. Thence, this environment is essential in the enhancement of criminal or antisocial behaviours at a young age as well as could also serve as a crucial part of their prevention [3,4].

Technology has negatively influenced school violence by introducing novel violent dynamics, one of which includes cyberbullying. Thus, technology has changed the manner of communication, work processes and training respectively [1,5]. This issue is therefore of much concern due to its scope, as the majority of victims are youngsters. This is a challenge of major concern in society, as it could even be more serious than expressed in a context where it leads to several kinds of abuse, such as child maltreatment, of which the breeding of suicidal ideas and even suicide itself is not exempted [6,7].

Thus, cyberbullying can be indirectly likened to an aspect of traditional harassment that intrinsically characterizes bullying, with the inclusion of intentionality, continuous repetition by the consistent aggressors and aggressive acts, amongst other characteristics such as social media advertisement, difficulty in cutting off from the cyberspace and anonymity [3,5]. As a result of this approach, cyberbullying is considered to be a major contributor to a wider web of crime based on three sources of risk, namely the environment, individuals (victims) and society at large. This is based on the Triple Criminal Risk model [8].

Cyberbullying has a differentiating element *via* technological usage, a reason why it is defined as intentional and repeated damage caused electronically, via the Internet or mobile and is propagated by a person or group of persons against which it is almost impossible for the victim to defend themselves [1]. This is a critical issue of consideration as it affects not just the security of the victim but their psychological and mental health.

From a conceptual definition perspective, cyberbullying consists of hostile and cruel conduct against an individual or a rival *via* sending or publicizing harmful materials or engaging in other socially aggressive forms via digital technologies or the internet. Moreover, it is socially inappropriate online behaviour that comprises intimidation, harassment, insults, threatening messages, humiliation, taunts and usage of inappropriate language, amongst others.

Regarding the fact as to if cyberbullying is part of cybersecurity, is an issue not yet addressed by mainstream literature in this field. Cyberbullying as explained earlier uses the digital environment *via* technology to harass victims, thereby leaving them in a vulnerable state which is a key aspect of cybersecurity. Vulnerability can be devastating and is common in many cyberthreats, of which cyberbullying does not seem different. Therefore, this paper considers cyberbullying critically and tries to conceptually derive the link with cybersecurity and its effect on the victims. Moreover, solutions that can help eradicate cyberbullying a psychological aspect of cybersecurity is also presented.

Educational policies alongside pedagogical and didactic trends are in increased advocacy of technology usage both in and out of the classroom to serve as a supportive medium for learning and teaching [9,10]. Contemporary youngsters, as compared to their parents, are digital natives; this means they possess a greater knowledge of technology than the digital immigrants (older persons,

such as their parents). Thus, youngsters find a haven of privacy online that enable them to interact with peers which poses as a form of refuge for the youngsters to remain a devastating vulnerable state when assaulted. Consequently, for the harassers, the digital environment is an effective and perfect avenue to attack their victims as the technologies is of eases to them and doesn't pose any of defence, they attach in a masked confrontation and the scope of damage achieved is proportionally considerable to the executed action. It is therefore important to note that in the 21st century, the human life is now digitalised, thereby requiring that the populace is well trained to manage the novelties and challenges in course.

With regards to psychological effects probably sufferable by the victims of cyberbullying, it has been observed that symptoms such as high levelled anxiety, helplessness, self-concept degradation, diverse psychosocial maladjustments, low self-esteem and depression-like mood disorders [4,11], occur by victims of cyberbullying during their youthful age all through to adulthood. This is a sign that cyberbullying is indeed a major aspect of cybersecurity and could be included in the psychological aspect of cybersecurity a major constituent of the human aspects of cybersecurity. This is still an understudied area in literature and needs to be explored critically. Furthermore, it has been observed that many victims when suffering from bullying, face low performance in academics, truancy, difficulty concentrating, as well as some desiring to become cyberbullies themselves [9,12]. This could lead to vulnerability to stress, further leading to negative emotions, such as suicidal thoughts and fear of the unknown.

Therefore, this study is of utmost significance to the entire community and cybersecurity stakeholders at various institutions, governments and society at large. This study can foster the enablement of appropriate comprehensibility of actual patterns of cyberbullying coping mechanisms. Moreover, findings from this study suggest that cybersecurity stakeholders collaborate with cybersecurity strategists to ensure the inclusion of policies that can combat cyberbullying as well as publish it in the category of major cyberthreats and not just view it as a mere social menace. Among the best solutions for cyberbullying mediation is the development of systems that can block the perpetrators of cyberbullying as well as ensure a safer system that can be used by online users, especially younger users in reporting cyberbullying related issues to higher authorities that can take drastic actions to mitigate it. For institutions and the government, this study promotes training on cyberbullying and exposure of its hidden critical negative effects to create awareness among online users and to protect the cyberspace of institutions and government. These research implications can inform strategic programming efforts that can comprise cyberbullying awareness lessons/training, knowledge regarding the state of the law towards cyberbullying as a cybersecurity issue, as well as training on social skills. Moreover, there is substantial information provided *via* this research that can assist parents of youngsters with access to technology and how they can guide their wards against cyberbullying victimization.

The remainder part of this paper discusses the methodology used in this review, results and discussions focusing on cyberbullying as an emerging psychological cybersecurity issue as well as finding the target victims of cyberbullying and proposing innovative cybersecurity solutions to mediate cyberbullying and a brief conclusion on the topic. This paper aims to contribute to exposing the psychological effects of cyberbullying and how this affects the potential victims, most of which are youngsters and adolescents.

2. Methodology

This paper, *via* a qualitative approach based on a critical literature review and secondary data, assessed whether cyberbullying is an emerging psychological cybersecurity issue. The research

approach is tailored to conceptual and narrative research, which involves a critical review of case studies and empirical studies to gather verified information regarding cyberbullying and its emergence as a cybersecurity issue. Moreover, the articles examined were retrieved from high-impact journals, as well as research databases comprising Science Direct, Google Scholar, IEEE and Springer, amongst others. A criterion was set for reviewing each article, which included the recency and relevance of the article to this subject. Also, articles that were above 10 years old as of the time of this paper's publication were exempt from the review. Though, in rare cases, a few articles older than 10 years were included as they are foundational articles. Moreover, studies that had limited contribution to the subject were also exempted. Regarding the data analysis, the author judiciously ensured that the most essential information was transcribed and extracted carefully to ensure the objective of the paper was fully achieved.

2.1 Study Design

In this study, a scoping review was carried out based on Arksey *et al.,* [13] framework. Scoping reviews are used for proper synthesis of obtainable information dwelling in existing literature, thereby acting as a preliminary indication and probable literature body size with emphasis on an emerging subject of interest [13,14].

2.2 Scoping Review Strategy

A scoping review strategy was adopted in this study as recommended by the literature. To ensure that the reviewed articles were up to date, the screening of publications was limited to papers published between the last 10 years, 2014 to 2024. The review underwent a dual search approach, which comprised controlled and uncontrolled search mechanisms. The controlled search which was adapted from a systematic literature review helped in mitigating biases or incomplete evidence from a study [14]. This search approach produced optimal literature mapping alongside standardized findings. Furthermore, the control search was done through the IEEE, Scopus and Springer databases. Consequently, the uncontrolled search was carried out *via* generic databases such as Google Scholar, Science Direct and Web of Science, to explore the field of study extensively which eventually led to an extraction of a larger range of articles within the defined cyberbullying scope. As a result of this systematic process, publications of interest were identified based on occurring terms such as title, abstract and the main text. All articles were screened carefully. Table 1 presents a sample list of searched terms used in this review.

2.3 Inclusion and Exclusion Criteria

The procedure used in searching was carried out iteratively, thus enabling the researcher to capture essential articles regardless of the methods, quality and research designs employed [14,15]. Only articles written in the English language as well as had explicit reference to the domain of cyberbullying, online safety and cybersecurity were accepted. To justify the reliability of the screening process of articles, crucial steps were taken in assessing the databases as well as extracting final records for the qualitative synthesis. Moreover, a Preferred Reporting Item for Systematic Revives and Meta-Analysis (PRISMA) protocol was utilized [16,17] which helped in strengthening the review to be of more advanced value. Also, only articles within the last 10 years were included, although there were a few exceptions where the articles were foundational and theoretical backgrounds.

Table 1
A sample list of search terms used in this review (Wildcards and Boolean operators were used for the searches)

Searching Terms	Search Explore Databases
Search terms	• cyberbullying* • "cyberbully*" • cybersecurity • cyberbully victims • "cyberbully victim psychological impact" • "cyberbully victimization" • "cyberbully perpetrators" • cyberbully teenager • youngsters* • teenager* • online safety

2.4 Article Screening and Selection

A three-phase search process included article collection, scanning of the title and abstract as well as reading the full text. At least two reviewers (FF and ZA) inspected each article and ensured that they adhered to the inclusion criteria as well as the extracted data accuracy. Overall, about 1328 articles were retrieved in the first phase of data search, with about 600 duplicates detected. Furthermore, all articles underwent critical examination via carefully analysing and reading the abstracts and titles to ensure the papers are eligible for review. At this phase, the articles were assessed based on the availability of abstract and full text, whether the language was in the English language and the level of data sufficiency or importance. Thus, after these screenings, about 660 articles were excluded from the review. The next phase involved the screening and reading of the entire text and another 38 articles were removed as a result of issues comprising: a lack of focus on cyberbullying, not related to cybersecurity issues and no focus on youth or teenagers. Thus, the articles that eventually met the study inclusion and exclusion criteria were a total of n=30. The PRISMA diagram for this review is depicted in Figure 1.

2.5 Data Analysis Method

All selected full-text articles were added to Endnote referencing software. Also, an Excel spreadsheet was used in summarizing the findings, synthetization of essential themes, as well as to make conclusions on inferences. In this study, qualitative synthesis alongside content analysis and thematic analysis were employed to identify the relevant features that aided the classification of findings into several themes. These themes were derived inductively, in which each theme comprised of information specific to the subject topic of cyberbullying as a cybersecurity issue.

3. Results and Discussion

The findings presented in this section constitute the major extractions from the review. This paper presented a general discussion about cyberbullying as a psychological cybersecurity issue as well as its effect on the victims. In terms of sequence, the findings are split into three major parts which answer the three research questions addressed in this paper. First, it discussed the target victims of cyberbullying, followed by the psychological effect of cyberbullying and how this links to cybersecurity. Finally, it provides innovative cybersecurity solutions to mediate cyberbullying.

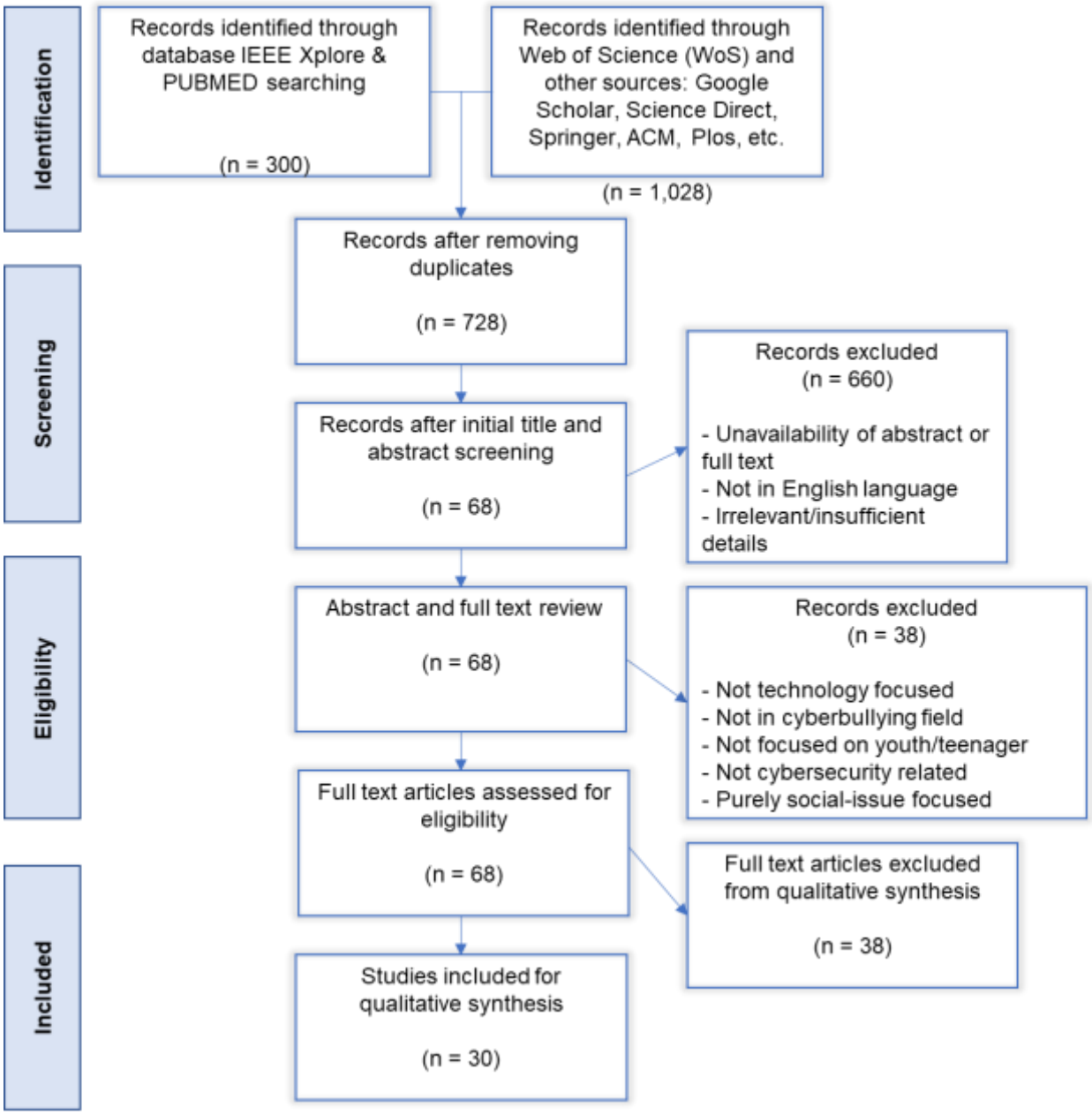

Fig. 1. PRISMA flow diagram for cyberbullying literature search

3.1 Target Victims of Cyberbullying

Recent research which conducted a bibliometric analysis on the factors of cyberbullying found that among the top 20 keywords associated with cyberbullying, the terms “adolescent”, “child”, “adolescence’, “school”, “education”, “mental health”, “depression”, “psychology”, were interrelated [18]. This indicates that one of the major victims of cyberbullying is children and adolescents (secondary school students). However, further research has indicated that the trend is moving from just adolescents and children to university students and younger adults, as the issue of cyberbullying is progressive.

In many situations, cyberbullying is intertwined with bullying in school [19,20]. Nevertheless, there is a need for proper recognition of distinctive characteristics of the individual forms of aggression. In cyberbullying, the offender can be a total stranger or an acquaintance from afar, whereby dangerous materials can be copied and spread easily thus increasing the chance of causing

harm even far after the main aggressor has stopped. Unfortunately, the victim is on the receiving end as they cannot avoid the attack, as they continue making use of the internet to avoid being socially isolated yet remaining socially damaged. Conversely, cyberbully victims are mostly physically far from the bully during the period of attacks [6], thereby probably influencing the attack's perceived severity.

Consequently, victims of cyberbullying have applied a couple of coping strategies as done by victims of online harassment, however, there are some evident differences regarding the choice of strategies. For example, literature informs that cyberbullying victims are usually more active in search of online advice, confronting their bullies online, as well in changing their contact details. Moreover, cyberbullying victims tend to make use of more avoidance strategies yet rely less on cognitive responses involving deliberating putting in efforts to regard a cyberbullying event as less serious or keep themselves far away from the incident by encouraging themselves of the fact that it only occurred in a virtual space and not in reality.

A corpus of studies has conducted assessment on cyberbullying in adolescence, yet certain studies suggested the prevailing occurrence of cyberbullying in higher learning institutions [11,21]. Surprisingly, data from the literature seems to be quite alarming, as it suggests that about twenty to fifty percent of youngsters have experienced cyber victimization in the environments of a university. In fact, Martínez-Monteagudo *et al.,* [11] confirmed that about 22.5% of students in higher learning institutions were intimidators of other students at least under one scenario while 55.3% were victims of cyberbullying at one point or their lives. This secondary data therefore infers that cyberbullying is not just an issue among adolescents and children, but a progressive issue that affects even older cyber-users.

Furthermore, from a survey among 2052 primary and secondary school children, it was revealed that the issue of cyberbullying among youngsters is not marginal [22]. Nevertheless, discrepancies exist between prevailing figures consequent to direct measurement versus indirect cyberbullying measurement. Therefore, youngsters who have engaged in the act of bullying online or *via* a digital device were younger and often victims of cyberbullying themselves as well as sometimes perpetrators of traditional bullying. This is a serious issue as it shows the progressions of victimization of cyberbullying, thus making it even more difficult to mediate. With such knowledge in circulation, it is important that cybersecurity training on cyberbullying should be available to diverse categories of the populace, especially youngsters, but also include young adults and even middle-aged people. Any active user of the Internet can be a victim of cyberbullying and could also indulge in the act of cyberbullying other Internet users as well.

3.2 Psychological Effect of Cyberbullying

Recently, there has been a dramatic rise in the bullying cases of youngsters attending school via the use of technological communicative devices. The vast spread of emerging technology as well as social media platforms has brought about several advantages, however, it also has some negative implications such as exposing youngsters to novel cyberthreat risks, one of which is cyberbullying. A definition of cyberbullying has been presented in the previous sections. Typical cyberbullying behaviours consist of offensive or threatening calls or messages, publicizing confidential or private information, humiliation and insults, photograph manipulation, recording of subsequently disseminated assaults, exclusion and identity theft, amongst others [1,22].

Cyberbullying has a couple of well-recognized consequences, which affect both the victims as well as the offenders, especially during the stage of adolescence (youthful age). Nevertheless, a couple of studies have also analysed these effects among university students. Gathered from several studies,

it is shown that cyberbullying victims suffer from depression and low self-esteem. Stress, helplessness, sleep disorders, somatization, irritability, anger, lack of concentration in academics and anxiety, amongst others [18,23]. More extreme cases of cyberbullying could lead to suicidal thoughts or behaviours [11]. There are instances in literature where cyber-victimization has been widely linked with suicide [9,11]. A systematic review by John *et al.,* [24], revealed that cyberbullying victims face higher risks than non-victims as regards suicidal behaviours and self-harm tendencies. More recent studies have also revealed that there is a significant association between suicidal thinking and cyberbullying. The reason for the former may be due to the detrimental characteristics of cyberbullying as the information is permanently accessible globally, thus resulting in inevitable and continuous bullying, as materials published on the internet can be accessible to the public for a longer period. This thereby facilitates the offender's anonymity, thus extending victimization beyond necessary [1].

Literature has established that there are serious effects of traditional bullying on victims. Some of these effects include increased depression levels, psychosomatic symptoms, severe physical harm, anxiety and even suicide. Moreover, there is a sense of social ineffectiveness being felt by bullied students amongst other greater interpersonal difficulties, lower competence in academics, alongside higher absenteeism from school [11,25]. Corroboratively, several scholars from the emerging cyberbullying field have hypothesized a greater impact and more severe effects for victims as this medium of bullying is continuous and has the possibility of reaching a wider audience, hence exerting more bullying forces on the victim. Nevertheless, to date, there is scarce empirical evidence that backs this claim, thus a research area for future studies to consider. Among the few studies that tried to find the effect of cyberbullying among victims, findings indicated that traditionally victimized bullied students reported to have felt a crueller and harsher impact on their lives as compared to those who were victims of cyberbullying. However, striking evidence revealed that the mental health of cyber-victims who underwent cyberbullying suffered a highly significant measure of social difficulties as well as higher levels of depression and anxiety than traditional bullied victims. These findings thereby infer that the effect of cyberbullying is indeed grievous and cannot be considered as less a problem than traditional bullying. Therefore, measures need to be put in place to eradicate the occurrences of cyberbullying among youngsters, which has become an evolutionary issue.

3.3 Recommendations and Innovative Cybersecurity Solutions to Mediate Cyberbullying

Having ascertained that cyberbullying can be classified as a psychological cybersecurity issue, how then can cybersecurity solutions help in mitigating the effect of cyberbullying. It is seemingly evident that it is not effective enough to simply ignore severe incidents of cyberbullying, even if the victims who are mainly youngsters might want to, yet it is not certain to be an adaptive solution. As informed by Xiao *et al.,* [9], the strategy of ignoring is of less value to the victim based on the severity of the harm and the cumulative period of the cyberbullying event. Therefore, cybersecurity professionals in the field of intervention and prevention need to acknowledge the difference in operation for the effectiveness of cyberbullying victims from those of online harassment. Consequently, stressing the effect of purposeful ignoring (referring to a choice to ignore without reframing as less serious) is very essential. A recent study evaluated this strategy as emotionally helpful in stopping cyberbullying. As established by literature, coping strategies for cyberbullying might discourage the offender from progressing with the act of cyberbullying. However, it is essential to pay more attention to a broader context that can enable an adequate understanding of the actual patterns of cyberbullying coping mechanisms.

Furthermore, there is a prevalence of technological coping strategies, which are mostly popular and are considered effective measures of mediating cyberbullying [26,27]. From recent research, it was noted that via the application of technological coping, more than half of cyberbullying victims deleted the aggressor/offender from their contact lists and changed their settings to block the offender. However, changing or deleting their username/phone activities was used rarely. This reluctance shows how important youngsters place their daily digital lives and how hooked they are to the internet. Technological solutions have been considered an effective measure and are often cited as effective in evicting the bully from the scene. Regarding other technological measures, searching for online advice on cyberbullying has been reported as a not popular way to mitigate cyberbullying as the majority of cyberbullying victims do not consider this option. This is a question for future research as to the kind of advice available online regarding cyberbullying. Overall, from past scholarly works, technological strategies are recommended as a reliable solution to tackle the issue of cyberbullying.

Another recommended strategy from related investigations is to seek support from others. It has been discovered that informing a third party about bullying helps in stopping about half of cases and contributes significantly to the emotional coping of the victims of cyberbullying. This infers that though others may not be able to solve the situation, they could serve as a qualitative source of emotional support. Therefore, anti-cyberbullying platforms must be set up, especially in the learning environment which could comprise primary school, secondary school and even university level. Consequently, online parental supervision is considered a defence against cyber-victimization, however, there is a likelihood that this relationship be mediated by the practices of children in social networks. As registered by the literature, parental supervision is identified as an important factor for protection [28,29]. Nevertheless, certain systematic reviews [3,7,26] have argued that there are inconsistencies in the results among the analyses of parental factors as a defensive measure against cybervictimization of which cyberbullying is core. Thus, these inconsistencies in findings are suggestive to state that there is a complexity in the relationship between cyberbullying and parental supervision, thus indicating the need for further research.

Another solution could be to organize cybersecurity training sessions with a focus on cyberbullying and its effect on the psychological aspects of the victim. Moreover, gamification in cybersecurity has been known to be of much effect in educating and informing targeted audiences about the danger of cyberthreats and the need to be cybersecurity-conscious [30]. Consequently, cyberbullying awareness and coping strategies in a gamified cybersecurity instrument can serve as an icebreaker in mediating cyberbullying among youngsters. Among the prospective avenues for enhancing the effectiveness of cyberbullying intervention programs is the active involvement of bystanders or supporters to support the victim as well as assist in eradicating the bullying. Certainly, a couple of researchers focusing on traditional bullying have revealed that defenders or bystanders play an important role in mitigating bullying [4,5,23]. However, there is less research that focuses on cyberspace defenders in this case. Thus, cybersecurity units of education centres of all levels of study should incorporate this medium into the cybersecurity assurance program for their respective audiences.

3.4 Advancement in Technology and Engineering: Recommendations to Mitigate Cyberbullying

Significant potential can be offered by technology and engineering to curb cyberbullying. This can be done via the provision of tools and systems that enhance detection, response and prevention. Artificial intelligence (AI) and machine learning (ML), for example, can be utilized for the development of advanced algorithms that can detect patterns in real-time cyberbullying occurrences on social

media and messaging platforms [31,32]. These systems can analyse emojis, textual content and multimedia to flag behaviours that are abusive or threatening, thereby enabling a swift intervention. In a recent study, it was highlighted that content-moderated tools engineered by AI were able to successfully mitigate the spread of harmful messages, thus emphasizing their role in promoting a safer online space [33]. Moreover, the integration of natural language processing (NLP) technologies allows these systems to have a clear understanding of the context, thereby reducing false positives and improving accuracy. AI algorithms can also alert moderators or take automated actions to protect digital users from falling victim to cyberbullying, such as hiding posts that are harmful or warning users to avoid such behaviours. Recently, another study demonstrated how the prevalence of cyberbullying on student-centric social platforms was drastically reduced via AI-based sentiment analysis tools [34], thereby showcasing their efficacy in pre-emptively reducing harmful interactions.

Engineering innovations have also contributed to creating a safer online space via enhanced user privacy and accountability measures. For instance, biometric systems and multi-factor authentication can help in reducing the potential for identity theft, which is often exploited by cyberbullies to target or impersonate their victims. Moreover, emerging technologies such as blockchain technology are powerful tools that can mitigate anonymity by enabling traceable and secure digital identities and at the same time maintaining the privacy of users. A recent study illustrated how decentralized identity systems can help limit online aggressors' anonymity without compromising the victim or whistleblower's safety [35]. Consequently, engineering platforms that have integrated education features can raise awareness about cyberbullying's psychological impacts. Studies have shown that gamified learning modules that simulate real-life scenarios and teach empathy have proven to effectively mitigate adolescent bullying behaviour [36,37]. Through the integration of these solutions, engineers and technologists can contribute to a strategy that is comprehensive in addressing cyberbullying from prevention to resolution.

The interaction between technology and human-centric engineering ensures that the solutions proposed are not only effective but also take scalability and inclusiveness into consideration. Thus, collaborations need to occur between educators, policymakers and technology developers, to create adaptive systems that can evolve with the current digital trends. Thus, the incorporation of engineering principles and machine learning into educational curricula and public cybersecurity awareness campaigns can aid in the empowerment of individuals in cyberbullying recognition and counteracting. Such a holistic approach will not only ensure a safer online experience but also promote a digitally responsible culture. Therefore, if ethical engineering practices and innovation are well-prioritized, the global community can make significant progress in eradicating cyberbullying in the digital age.

4. Conclusion

This paper has exploratively addressed cyberbullying as a psychological cybersecurity issue. It has further been found that victims of cyberbullying could vary as compared to the notion that it is mostly common among adolescents. From the findings of this study, it was discovered that youngsters in general are targeted victims of cyberbullying. University students and other young adults have been proven to be victims of cyberbullying as well. This infers that cyberbullying is a progressive cybersecurity issue that evolves with the development of the victims. Unfortunately, some victims of cyberbullying also upgrade to become bullies themselves to satisfy their grievances. Among the effective strategies to mitigate cyberbullying included technical solutions of which suggestions are for the formation of anti-cyberbullying online platforms, as well as including cyberbullying as a topic in novel cybersecurity gamification innovations. Regarding the psychological

effects of cyberbullying, it has been discovered that there is a probable link between cyberbullying and suicidal thoughts or even behaviours, amongst other socioeconomic and psychological effects such as mental disability, low self-esteem, etc. It is therefore essential that the findings of this research should be implemented and put into practice by various cybersecurity units of educational institutions, thus helping to mediate cyberbullying as well as maintain cybersecurity assurance among online users.

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References

[1] Agus, Mirian, Maria Lidia Mascia, Maria Assunta Zanetti, Simona Perrone, Dolores Rollo and Maria Pietronilla Penna. "Who Are the Victims of Cyberbullying? Preliminary Data Towards Validation of." *Contemporary Educational Technology* 13, no. 3 (2021): ep310. https://doi.org/10.30935/cedtech/10888

[2] Williford, Anne, L. Christian Elledge, Aaron J. Boulton, Kathryn J. DePaolis, Todd D. Little and Christina Salmivalli. "Effects of the KiVa antibullying program on cyberbullying and cybervictimization frequency among Finnish youth." *Journal of Clinical Child & Adolescent Psychology* 42, no. 6 (2013): 820-833. https://doi.org/10.1080/15374416.2013.787623

[3] Notar, C. E., S. Padgett and J. Roden. *Cyberbullying: a review of the literature. Univer J Educ Res. 2013; 1: 1–9*. 2013. https://doi.org/10.13189/ujer.2013.010101

[4] Campbell, Marilyn, Barbara Spears, Phillip Slee, Des Butler and Sally Kift. "Victims' perceptions of traditional and cyberbullying and the psychosocial correlates of their victimisation." In *Emotional and behavioural difficulties associated with bullying and cyberbullying*, pp. 161-173. Routledge, 2013.

[5] Barlett, Christopher Paul. *Predicting cyberbullying: Research, theory and intervention*. Academic Press, 2019.

[6] Bussey, Kay, Aileen Luo, Sally Fitzpatrick and Kimberley Allison. "Defending victims of cyberbullying: The role of self-efficacy and moral disengagement." *Journal of school psychology* 78 (2020): 1-12. https://doi.org/10.1016/j.jsp.2019.11.006

[7] Hinduja, Sameer and Justin W. Patchin. "Bullying, cyberbullying and suicide." *Archives of suicide research* 14, no. 3 (2010): 206-221. https://doi.org/10.1080/13811118.2010.494133

[8] DeBlasio, Shannon and Dara Mojtahedi. "Exploring the relationship between psychopathy and criminal thinking: utilising the Tri-PM within a forensic sample." *Journal of criminological research, policy and practice* 9, no. 1 (2023): 14-30. https://doi.org/10.1108/JCRPP-05-2022-0021

[9] Xiao, Bowen, Wanfen Chen, Xiaolong Xie, Hong Zheng, Danielle Law, Hezron Onditi, Junsheng Liu and Jennifer Shapka. "Exploring the Risk Factors of Cyberbullying Among Chinese Adolescents: The Important Role of Cybervictimization." *International Journal of Bullying Prevention* (2023): 1-12. https://doi.org/10.1007/s42380-023-00195-5

[10] Machackova, Hana, Alena Cerna, Anna Sevcikova, Lenka Dedkova and Kristian Daneback. "Effectiveness of coping strategies for victims of cyberbullying." *Cyberpsychology: Journal of Psychosocial Research on Cyberspace* 7, no. 3 (2013). https://doi.org/10.5817/CP2013-3-5

[11] Martínez-Monteagudo, María Carmen, Beatriz Delgado, Ángela Díaz-Herrero and José Manuel García-Fernández. "Relationship between suicidal thinking, anxiety, depression and stress in university students who are victims of cyberbullying." *Psychiatry Research* 286 (2020): 112856. https://doi.org/10.1016/j.psychres.2020.112856

[12] Hsieh, Ming-Li, Shun-Yung Kevin Wang and Yusheng Lin. "Perceptions of punishment risks among youth: Can cyberbullying be deterred?." *Journal of School Violence* 22, no. 3 (2023): 307-321. https://doi.org/10.1080/15388220.2023.2183865

[13] Arksey, Hilary and Lisa O'malley. "Scoping studies: towards a methodological framework." *International journal of social research methodology* 8, no. 1 (2005): 19-32. https://doi.org/10.1080/1364557032000119616

[14] Munn, Zachary, Micah DJ Peters, Cindy Stern, Catalin Tufanaru, Alexa McArthur and Edoardo Aromataris. "Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach." *BMC medical research methodology* 18 (2018): 1-7. https://doi.org/10.1186/s12874-018-0611-x

[15] Peters, Micah DJ, Christina M. Godfrey, Hanan Khalil, Patricia McInerney, Deborah Parker and Cassia Baldini Soares. "Guidance for conducting systematic scoping reviews." *JBI Evidence Implementation* 13, no. 3 (2015): 141-146. https://doi.org/10.1097/XEB.0000000000000050

[16] Tricco andrea C., Erin Lillie, Wasifa Zarin, Kelly O'brien, Heather Colquhoun, Monika Kastner, Danielle Levac *et al.,* "A scoping review on the conduct and reporting of scoping reviews." *BMC medical research methodology* 16 (2016): 1-10. https://doi.org/10.1186/s12874-016-0116-4

[17] Behl, Abhishek, Nirma Jayawardena, Vijay Pereira, Nazrul Islam, Manlio Del Giudice and Jyoti Choudrie. "Gamification and e-learning for young learners: A systematic literature review, bibliometric analysis and future research agenda." *Technological Forecasting and Social Change* 176 (2022): 121445. https://doi.org/10.1016/j.techfore.2021.121445

[18] López-Meneses, Eloy, Esteban Vázquez-Cano, Mariana-Daniela González-Zamar and Emilio Abad-Segura. "Socioeconomic effects in cyberbullying: Global research trends in the educational context." *International journal of environmental research and public health* 17, no. 12 (2020): 4369. https://doi.org/10.3390/ijerph17124369

[19] Menesini, Ersilia, Annalaura Nocentini, Benedetta Emanuela Palladino, Ann Frisén, Sofia Berne, Rosario Ortega-Ruiz, Juan Calmaestra *et al.,* "Cyberbullying definition among adolescents: A comparison across six European countries." *Cyberpsychology, behavior and social networking* 15, no. 9 (2012): 455-463. https://doi.org/10.1089/cyber.2012.0040

[20] Morin, Hillary K., Catherine P. Bradshaw and Joseph M. Kush. "Adjustment outcomes of victims of cyberbullying: The role of personal and contextual factors." *Journal of school psychology* 70 (2018): 74-88. https://doi.org/10.1016/j.jsp.2018.07.002

[21] Lowry, Paul Benjamin, Jun Zhang, Chuang Wang and Mikko Siponen. "Why do adults engage in cyberbullying on social media? An integration of online disinhibition and deindividuation effects with the social structure and social learning model." *Information Systems Research* 27, no. 4 (2016): 962-986. https://doi.org/10.1287/isre.2016.0671

[22] Vandebosch, Heidi and Katrien Van Cleemput. "Cyberbullying among youngsters: Profiles of bullies and victims." *New media & society* 11, no. 8 (2009): 1349-1371. https://doi.org/10.1177/1461444809341263

[23] Baroncelli andrea and Enrica Ciucci. "Unique effects of different components of trait emotional intelligence in traditional bullying and cyberbullying." *Journal of adolescence* 37, no. 6 (2014): 807-815. https://doi.org/10.1016/j.adolescence.2014.05.009

[24] John, Ann, Alexander Charles Glendenning, Amanda Marchant, Paul Montgomery, Anne Stewart, Sophie Wood, Keith Lloyd and Keith Hawton. "Self-harm, suicidal behaviours and cyberbullying in children and young people: Systematic review." *Journal of medical internet research* 20, no. 4 (2018): e9044. https://doi.org/10.2196/jmir.9044

[25] Hamm, Michele P., Amanda S. Newton, Annabritt Chisholm, Jocelyn Shulhan andrea Milne, Purnima Sundar, Heather Ennis, Shannon D. Scott and Lisa Hartling. "Prevalence and effect of cyberbullying on children and young people: A scoping review of social media studies." *JAMA pediatrics* 169, no. 8 (2015): 770-777. https://doi.org/10.1001/jamapediatrics.2015.0944

[26] Rajbhandari, Jyotshna and Karna Rana. "Cyberbullying on social media: An analysis of teachers' unheard voices and coping strategies in Nepal." *International journal of bullying prevention* 5, no. 2 (2023): 95-107. https://doi.org/10.1007/s42380-022-00121-1

[27] Erbiçer, Eyüp Sabır, Emre Toprak and Ahmet Metin. "Cyberbullying among adolescents in Turkey: the relationship between coping strategies and cyberbullying perpetration." *Child and Adolescent Mental Health* 28, no. 1 (2023): 67-75. https://doi.org/10.1111/camh.12622

[28] Martín-Criado, José-María, José-Antonio Casas, Rosario Ortega-Ruiz and Rosario Del Rey. "Parental supervision and victims of cyberbullying: Influence of the use of social networks and online extimacy." *Revista de Psicodidáctica (English ed.)* 26, no. 2 (2021): 160-167. https://doi.org/10.1016/j.psicoe.2021.04.002

[29] Kim, Soyeon, Scott R. Colwell, Anna Kata, Michael H. Boyle and Katholiki Georgiades. "Cyberbullying victimization and adolescent mental health: Evidence of differential effects by sex and mental health problem type." *Journal of youth and adolescence* 47 (2018): 661-672. https://doi.org/10.1007/s10964-017-0678-4

[30] Fatokun, Faith B., Zalizah Awang Long, Suraya Hamid, Johnson O. Fatokun, Christopher Ifeanyi Eke and Azah Norman. "Gamifying cybersecurity knowledge to promote good cybersecurity behaviour." *Journal of Computing Technologies and Creative Content (JTec)* 7, no. 2 (2022): 25-34.

[31] Ghani, Miharaini Md, Mustafa, Wan Azani, Shaiful Bakhtiar, Durratul Laquesha and Khairudin, Moh. "A Comprehensive Study: AI Literacy as a Component of Media Literacy," *Journal of Advanced Research in Applied Sciences and Engineering Technology, vol. 53*, no. 2, (2025): 112-121. https://doi.org/10.37934/araset.53.2.112121

[32] Danousis, Michail and Christos Goumopoulos. "A machine-learning-based motor and cognitive assessment tool using in-game data from the game2awe platform." In *Informatics*, vol. 10, no. 3, p. 59. MDPI, 2023. https://doi.org/10.3390/informatics10030059

[33] Intelligence, An Artificial, Sheetal Sharma and Ridhika Chatterjee. "3 Combating Cyberbullying." *Combatting Cyberbullying in Digital Media with Artificial Intelligence* (2023): 35. https://doi.org/10.1201/9781003393061-4
[34] Weerasinghe, Kasuni. "Making the Internet a safe space for children by leveraging the power of AI." (2024).
[35] Islam, Md Shohidul, Md Arafatur Rahman, Mohamed Ariff Bin Ameedeen, Husnul Ajra, Zahian Binti Ismail and Jasni Mohamad Zain. "Blockchain-Enabled Cybersecurity Provision for Scalable Heterogeneous Network: A Comprehensive Survey." *CMES-Computer Modeling in Engineering & Sciences* 138, no. 1 (2024). https://doi.org/10.32604/cmes.2023.028687
[36] Fatokun, Faith, Zalizah Awang, Suraya Hamid, Johnson O. Fatokun and Azah Norman. "Cybersecurity knowledge deterioration and the role of gamification intervention." *Journal of Advanced Research in Applied Sciences and Engineering Technology* 43, no. 1 (2024): 66-94. https://doi.org/10.37934/araset.43.1.6694
[37] Faith, B. Fatokun, Zalizah Awang Long and Suraya Hamid. "Promoting cybersecurity knowledge via gamification: an innovative intervention design." In *2024 Third International Conference on Distributed Computing and High Performance Computing (DCHPC)*, pp. 1-8. IEEE, 2024. https://doi.org/10.1109/DCHPC60845.2024.10454080