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Psychological well-being as a predictor of cyberbullying victimization in university students: a Bayesian approach

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Introduction: The present study examined the relationship between psychological well-being among university students and cyberbullying exposure.

Methods: The study included 262 students from Kuban State University as its sample. The Cyberbullying Scale (CBS) and the Depression, Anxiety, and Stress Scale (DASS-21) were used as data collection tools. We preferred Bayesian statistical methods for data analysis.

Results: The results of the study revealed that exposure to cyberbullying did not differ according to gender, age, and daily internet usage time. Researchers found that depression was the strongest predictor of exposure to cyberbullying, accounting for approximately 9% of the variance. Anxiety and stress variables did not significantly contribute to the explained variance in the model.

Discussion: The findings of the study emphasize the importance of developing protective interventions, especially for students with depressive symptoms. These results underline the significance of developing campaigns against cyberbullying and strengthening university psychological support systems. The findings also highlight the necessity for computer literacy programs and social support systems.

KEYWORDS

cyberbullying, psychological well-being, depression, anxiety, stress, Bayesian statistics

Introduction

Cyberbullying is a form of aggression that intentionally aims to harm individuals through digital platforms (Olweus and Limber, 2018; Watts et al., 2017). Particularly widespread among university students, this issue compromises the psychological and social well-being of individuals. Cyberbullies could cause major emotional difficulties, including humiliation, guilt, loneliness, anxiety, and depression (Agus et al., 2021; Pyżalski et al., 2022).

These days, many college students experience cyberbullying. According to Madbouly Elmahdy et al. (2024), 90.9% of first-year students at Ain Shams University said they had been cyberbullied. A similar finding was made by Bakheet et al. (2024), who found that 54% of Sohag University students had been bullied online. The fact that these numbers are so high shows how bad the problem is.

Investigating the link between harassment and mental health has been done applying several approaches. In sixteen of the twenty studies (Arif et al., 2024), depression and cyber victimizing clearly revealed a correlation. According to Savani et al. (2023), 3.19% of cyberbullying victims had good results in anxiety screening, and the degree of cyberbullying was directly associated with the anxiety intensity.

Literary research on the impact of cyberbullying on psychological well-being abounds. Studies on whether psychological well-being influences the impression of being subjected to cyberbullying are lacking, nevertheless. In addition, studies examining the relationship between cyberbullying and depression, anxiety and stress levels, especially in university students, with Bayesian statistical methods are quite limited. In addition, there is a need for current studies that comprehensively address the relationships between these variables in the Russian sample.

The aim of this study is to examine the relationship between cyberbullying and psychological well-being in university students. In line with this purpose, answers to the following research questions were sought:

1 Do university students' levels of exposure to cyberbullying differ according to demographic variables (gender, age, daily internet use)?
2 Is there a significant relationship between exposure to cyberbullying and depression, anxiety, and stress levels in university students?
3 To what extent do depression, anxiety, and stress variables predict exposure to cyberbullying?

The results of this study are expected to contribute to the development of intervention programs to prevent cyberbullying in university students.

Literature review

Cyberbullying

Cyberbullying is defined as a form of aggression that seeks to intentionally harm individuals through digital platforms (Olweus and Limber, 2018; Sheinov, 2020; Watts et al., 2017). This type of bullying is facilitated by technologies such as social media, instant messaging applications, and online gaming platforms. In particular, the anonymity feature allows perpetrators to act more boldly and makes it difficult for victims to defend themselves (McHugh et al., 2019; Mesch, 2009). Not only among teenagers but also among adults, cyberbullying is a common issue with major consequences for people's psychological and social well-being.

Many things can lead to cyberbullying. Studies on cyberbullying imply that persons who participate in it could be hiding their own shortcomings, getting retribution, improving their social position, or bringing attention to themselves (König et al., 2010; Li et al., 2023). For instance, some people may behave out of a need to feel strong or to release personal grievances, while others may participate in these actions in an attempt to dominate online debates. Moreover, anonymity lets offenders act more aggressively, free from concern about reprisals. This situation points to a complex dynamic that combines both the individual's inner motives and the conveniences provided by online environments. Cyberbullying also involves a complex psychological dynamic that reflects the perpetrators' need to exert power and their desire to feel superior (Deyneka et al., 2020; Ye et al., 2024). There is a close connection between traditional bullying and cyberbullying; it has been emphasized that individuals who bully in one type are likely to be active in the other type (Thomas et al., 2015; Watts et al., 2017). However, the constant access and anonymity provided by the digital environment suggest that cyberbullying has a more permanent and challenging effect.

The psychological effects of cyberbullying are wide-ranging. Victims often experience deep emotional difficulties such as shame, embarrassment, isolation, anxiety, and depression. These diseases can lead to lower self-worth and major effects like self-harm or suicidal thoughts (Agus et al., 2021; Pyżalski et al., 2022). A study (Khadka et al., 2024) based on Nepal found that female teenagers who claimed cyberbullying were more likely to develop anxiety (OR: 2.49) and sadness (OR: 1.64). Psychosomatic symptoms, which are bodily expressions of psychological worry, are also related to cyberbullying. In research on teenagers, cybervictims claimed psychosomatic problems 2.39 times more often than others (Peprah et al., 2024). Particularly among cyberbullying victims, the risk of suicidal thoughts and self-harm is rather substantial. One year later, a longitudinal UK study revealed that cyberbullying raised a self-harm risk (Winstone et al., 2024). Moreover, cyberbullying makes one lonelier and more isolated socially. Cyberbullying victims were reported in Malaysian research to be more likely to experience loneliness (Samsudin et al., 2024).

Family relationships and emotional intelligence help to shape how cyberbullying affects people. While high-conflict circumstances may raise the probability of victimization (Rahmaputri et al., 2022), supportive family settings may help to reduce the psychological impacts of cyberbullying. In addition, effective coping mechanisms may facilitate individuals to cope with the negative effects of bullying. Emotional intelligence has been identified as an important factor that reduces the negative effects of cyberbullying (Extremera et al., 2018). It is stated that individuals with high emotional intelligence cope better with stress and develop resilience in the face of bullying.

Reducing the consequences of cyberbullying depends much on preventive actions and interventions. Among the effective measures are family and community involvement, policy and intervention program implementation, digital literacy training, empathy and emotional intelligence training, Digital literacy motivates people to act more responsibly and with knowledge when online (Aprilia and Rachma, 2022). Empathy-building educational initiatives help to lower bullying practices and raise social awareness. Parents and teachers also have great responsibility in terms of open communication, victim assistance, and internet safety raising awareness (Van Ouytsel et al., 2015). Supportive environments should be created at the school and community level to provide resources for victims and constructively guide the behavior of perpetrators. People as well as communities should be informed about proper application of technical instruments. The fast advancement of technology calls for ongoing modification of treatments against cyberbullying. Particularly changes in social media algorithms and new technologies like augmented reality and virtual reality might raise the risk of online harassment while also giving chances to create creative solutions to find and stop cyberbullying. For instance, algorithms and content control systems driven by artificial intelligence could be faster at identifying cyberbullying texts. Still, one should also take privacy infringement and false detection risk of these techniques under consideration. The always changing character of technology calls for the creation of more efficient answers in this field and rigorous evaluation of the ethical issues raised by these answers.

A complicated phenomena, cyberbullying compromises people's psychological and social well-being. Thus, comprehensive strategies for addressing cyberbullying on personal and social spheres are significantly required. These strategies include public campaigns

against cyberbullying, empathy and emotional intelligence programs, digital literacy education, and loving family and classroom environments. In addition, given the continuous development of technology, the effective use of AI-supported content moderation systems and the resolution of ethical issues are also an integral part of this process. When all these approaches are brought together, it may be possible to create a safer and more supportive online environment. This reality of the digital era can only be under control with effective intervention and preventive regulations; so, every person can live in a safer online environment. Policy initiatives promoting education and resilience-building will assist to mitigate the long-term effects of cyberbullying. Nonetheless, the solution of this issue depends much on the cooperative efforts of every sphere of life.

Cyberbullying among university students: prevalence and influencing factors

Research from all around shows that cyberbullying is rather common among university students, which raises major issues. Defined as deliberate hostility via technology, cyberbullying claims a sizable share of the school body. Negative psychological effects including tension, anxiety, and sadness thus follow from this. The frequency rates, consequences and influencing elements of cyberbullying are investigated in this book.

Studies show that the frequency rates of cyberbullying depend on the setting and the used techniques. For example, 90.9% of first-year Ain Shams University students said they have experienced cyberbullying (Madbouly Elmahdy et al., 2024). 54% of Sohag University students claimed they experienced cyberbullying; this somewhat higher incidence of men than women (Bakheet et al., 2024). 54% of university students in Jeddah, Saudi Arabia, reported victimisation (Alghamdi et al., 2024). Said to be 31% of Jordanian university students, cyberbullying disproportionately affected younger students (Tayeh, 2023). Of the South African participants, 36% reported to be cyberbullies (Cilliers, 2021). According to reports, cyberbullying is relatively common in Bangladesh and creates emotional reactions among victims include anger, tension and self-blame including self-blame (Sheikh et al., 2023).

Cyberbullying influences people in psychological as well as intellectual spheres. Among the psychological consequences, depression, anxiety, and stress clearly showed a correlation (Alghamdi et al., 2024; Arif et al., 2024). Notable among the victims are also emotional responses including self-blame, dread, and wrath (Sheikh et al., 2023). Academically, victims claimed trouble focusing and a performance drop (Khine et al., 2020). Academically, victims claimed problems focusing and a performance reduction (Khine et al., 2020). Regarding society effects, female students frequently mentioned greater victimizing rates while men were more typically among the offenders (Arafa and Senosy, 2017). Conversely, males have been observed to engage in cyberbullying behaviors more frequently, suggesting a gender disparity in both victimization and perpetration (Alsawalqa, 2021).

Cyberbullying is influenced in many ways, including activity on social media and real connections and behavior. Platform like Facebook and long-term social media use increase the victimizing risk (Bakheet et al., 2024; Madbouly Elmahdy et al., 2024). Young age and strong internet use raise the danger of cyberbullying (Tayeh, 2023). Reducing cyberbullying depends much on a helpful virtual community and good interactions (Sayed et al., 2023).

Different approaches have to be devised to stop cyberbullying and assist victims. University-level awareness programs should explain to students the consequences of cyberbullying and strategies of prevention. Academic institutions should build easily available victim assistance systems. Encouragement of digital literacy will help pupils to use the internet safely and responsibly. Furthermore, fostering positive student-teacher relationships and creating a supportive environment in virtual classroom communities can reduce the effects of cyberbullying.

In conclusion, it is clear that cyberbullying is a significant problem among university students. In order to deal with this problem, it is necessary to increase awareness programs in universities, expand digital literacy education, and develop support mechanisms for victims. Moreover, next studies should concentrate on the long-term consequences of cyberbullying and successful intervention techniques in many cultural settings. Dealing with this issue effectively calls for a multimodal strategy including awareness-raising campaigns, education, and creation of encouraging communities.

Psychological well-being

Psychological well-being (PWB) is a multifarious notion defined by a person's sense of well-being and effective functioning (Boylan and Ryff, 2015; Edmondson and Macleod, 2015). Considered as a fundamental component of general health and longevity, it improves both mental and physical condition. PWB is defined not only by the absence of negative psychological states but also by certain elements that help a person to feel generally good. Hedonic and eudaimonic well-being are the two main divisions into which these elements fit.

Hedonic well-being is the emphasis of a person on feeling happiness and positive feelings. This category mostly consists of two components: Positive Emotion and Happiness consists in frequent positive feelings and a general sensation of happiness. Life Satisfaction is a general evaluation of an individual's life and is defined in relation to feelings of satisfaction and fulfillment (Boylan and Ryff, 2015).

Eudaimonic well-being is about realizing one's potential and leading a meaningful life. The following components are important elements of eudaimonic well-being: Life Purpose, having a sense of direction and meaning in life contributes to both mental and physical health (Boylan and Ryff, 2015). One of the fundamental components of psychological well-being is self-acceptance—that which brings one at peace with herself (Edmondson and Macleod, 2015). Personal growth is the belief of the person in ongoing education and development initiatives (Rodríguez-Carvajal et al., 2010). Rodríguez-Carvajal et al. (2010) define autonomy as a person's capacity for making independent decisions and actions. Environmental mastery is the ability of a person to appropriately run his or her life and environment (Edmondson and Macleod, 2015).

Resilience and self-compassion can increase someone's optimism and life satisfaction even as they reduce depressed symptoms (Bag et al., 2022). It has been noted that the components of psychological well-being could produce varied results in different societies and settings. According to a study on Thai seniors, well-being revolves mostly on intrapersonal and interpersonal elements (Ingersoll-Dayton et al., 2004). This emphasizes the need of applying measuring techniques appropriate for many civilizations.

Resilience, social support, self-regulation, physical exercise and academic stress are key components of psychological well-being. Resilience—that is, a person's ability to control stress—has been favorably linked with components including environmental mastery and personal development (Anjum, 2022). Social support, support from family and peers, plays a critical role in increasing an individual's psychological adjustment and general well-being (Aw et al., 2023). Skills such as self-regulation, planning and monitoring positively affect psychological well-being by supporting the individual's goal-oriented behaviors (Salleh et al., 2021). Physical activity, moderate physical exercises reduce stress and improve mood (Molina-García et al., 2011). Academic stress, especially among university students, increased academic pressure can lead to psychological distress (Clabaugh et al., 2021).

Consequently, understanding the many dynamic and interconnected components of psychological well-being is critical for developing strategies to enhance individuals' overall well-being. Targeted development of factors such as resilience, social support and physical activity can significantly improve individuals' psychological well-being.

Studies on mental health, psychological distress and psychological well-being of university students show that various demographic factors play an important role. In studies using the DASS-21 scale, significant differences in terms of gender stand out. Research consistently reveals that female students experience higher levels of depression, anxiety and stress compared to male students. This finding has been supported by studies conducted in different countries such as the UAE, Russia and Mexico (Alalalmeh et al., 2024; Al-Hadi Hasan and Waggas, 2022; Vuelvas-Olmos et al., 2023; Zolotareva et al., 2023). Nonetheless, other studies—like the one by Sanmartín et al. (2022)—showing no appreciable gender-related variations in DASS-21 ratings—showcased here.

Examining the age factor shows that young students—especially those between the ages of 18 and 20—are more sensitive to psychological issues. Students in this age group are about five times more likely to experience depression than older students (Alalalmeh et al., 2024; Eid et al., 2021). Kulsoom and Afsar (2015) study emphasized that younger students report higher levels of stress due to the difficulties they experience during the transition to university. Conversely, Pang et al. (2021) noted that older pupils might create more efficient coping strategies and so recorded reduced stress and anxiety levels.

Students' psychological well-being also much depends on grade level and academic department. Those in demanding disciplines like dentistry and medicine report higher worry and stress than students in other areas. According to Stormon et al. (2019) dental student study, different stress profiles among these students result from the demanding nature of their courses. Students in demanding majors also report increased mental stress (Rahman et al., 2022). The highest DASS ratings among fourth-year students also point to academic expectations rising in the upper years (Alalalmeh et al., 2024).

Students' psychological well-being also influences cultural setting and socioeconomic background. Low income and low parental education raise students' depression risk (Bezhan Ayubi and Raju, 2020). Factors including international student status, handicap status and migration history significantly influence mental health outcomes, as De Groot et al. (2024) pointed out; these groups reported higher degrees of internalizing and externalizing difficulties. Research conducted during the COVID-19 epidemic found that the epidemic badly affected the psychological well-being of students in all demographic groups and raised depression, anxiety, and stress levels (Kiray Vural and Yiğitoğlu, 2022; Shaigerova et al., 2022).

Ultimately, the cross-cultural validity study by Lu et al. (2018) in China showed that the DASS-21 scale functioned equally across sexes, although cultural elements could operate as a mediator in the manifestation of mental health issues. Female students exhibited greater Generalized Anxiety Disorder (GAD-7) and DASS-21 scores, Jiang et al. (2021) also noted. These results highlight the need of include demographic and cultural aspects into the planning of mental health treatments for university students.

Relation between psychological well-being and cyberbullying

Research applying the DASS-21 scale have closely investigated the relationship between psychological well-being of university students and cyberbullying. Studies show that cyberbullying gravely affects students' mental health. Arif et al. (2024) conducted a thorough analysis with prevalence rates ranging from 15 to 73% and found that in sixteen of the twenty studies investigated depression had a clear association with cyber victimizing. With regard to anxiety, Savani et al. (2023) study found that 3.19% of cyberbullying victims screened positive; the intensity of anxiety increased in line with the degree of cyberbullying. Jenaro et al. (2021) also confirmed that victims of cyberbullying scored significantly higher on anxiety symptoms. Martínez-Monteagudo et al. (2020) stated that high stress levels increase the likelihood of being a victim of cyberbullying and that stress is a significant predictor of cyberbullying victimization.

Alrajeh et al. (2021) underlined the reciprocal link between cyberbullying and depression, showing that cyber victimizing can cause depressed symptoms, which in turn raises the possibility of more victimizing. Particularly among sexual minority college students, Lee et al. (2023) observed that victimization of cyberbullying was linked to reduced academic satisfaction. This finding is consistent with Przybylski and Bowes (2017) study showing that both traditional bullying and cyberbullying are linked to lower mental well-being.

The protective role of social support is also prominent in research. Hellfeldt et al. (2020) stated that social support from family, friends and teachers may be a protective factor against the negative psychological effects of cyberbullying. Wu et al. (2024) underlined that apparent social support could act as a mediator between cyberbullying victimizing and loneliness. Whether as a victim or offender, Samsudin et al. (2024) and Zhang et al. (2020) revealed that participation in cyberbullying predicted higher degrees of psychological suffering.

Given these results, it is quite crucial to create cyberbullying prevention and intervention strategies in the university surroundings. Particularly, elements like resilience and adaptation to the academic environment should be considered since they could either minimize or aggravate the consequences of cyberbullying. Moreover, treating cyberbullying and advancing psychological well-being also depend on the larger social surroundings and the part played by onlookers.

Methodology

This quantitative research investigates university students' psychological well-being in relation to cyberbullying. The study

focuses on whether psychological well-being and its sub-dimensions influence cyberbullying behaviors, which have grown very popular in the digital era of today. In this context, the links between the types of bullying that university students are exposed to and their psychological well-being levels were analyzed in detail. A quantitative method approach was adopted because this approach enables the objective evaluation of the data obtained from a large sample group and the statistical measurement of the relationships between cyberbullying and psychological well-being. The study was designed in accordance with the relational survey model. Bayesian approach was preferred in the statistical analysis techniques of the data obtained.

Data collection tools

Psychological well being

Designed for assessing negative emotional states including depression, anxiety and stress, the Depression, Anxiety and Stress Scale-21 (DASS-21) designed Lovibond and Lovibond (1995), the DASS-21 asks participants to score their experiences over the last week on a scale from 0 ("no sure") to 10 ("absolutely sure"). It comprises three subscales of seven items each. The DASS-21 scale was used to measure "psychological well-being" in studies (Al-Hadi Hasan and Waggas, 2022; Holton et al., 2023).

The DASS-21 has been validated as a reliable scale in various populations. Cronbach's alpha coefficient for the depression subscale was found to be between 0.85 and 0.88, for the anxiety subscale between 0.81 and 0.82, and for the stress subscale 0.90 (Henry and Crawford, 2005; Osman et al., 2012). These values show that the subscales measure their own constructs consistently. The validity of the DASS-21 was proven by different analyses. Factor analyses supported a three-factor structure of depression, anxiety and stress. For example, in a large sample, this model provided a good fit to the data (Crawford and Henry, 2003). It has also been validated by comparison with clinical observations. Translated into numerous languages, the DASS-21 has also been validated in several cultures including Russian, Korean, and Italian (Bottesi et al., 2015; Lee et al., 2019; Zolotareva, 2021). Its concise and consistent framework makes it rather popular in both clinical and research domains.

Cyberbullying

As cyberbullying has become widespread, the measurement and assessment of this phenomenon has gained importance. The Cyberbullying Scale (CBS) developed by Stewart et al. (2014) is a comprehensive measurement tool designed to assess cyber victimization experiences. The scale consists of 14 items and uses a 5-point Likert-type rating (0 = Never, 4 = Always).

Data were collected from 736 students (6th-12th grade) to examine the psychometric properties of the scale. The age range of the sample was 11–18 years and 50.8% of them were male. When ethnic distribution was analyzed, 89.7% of the sample was White, 6.2% was African American, 2.2% was multi-ethnic, and 1.93% was from other ethnic groups (Stewart et al., 2014).

Both Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were used for the construct validity of the scale. Both analyses showed that the scale had a single-factor structure. CFA results revealed that the model showed good fit (CFI = 0.98, TLI = 0.98, RMSEA = 0.06). Concurrent validity analyses revealed that CBS scores were significantly correlated with anxiety ($r = 0.57$), depression ($r = 0.51$) and loneliness ($r = 0.40$). As a result of the reliability analysis, the Cronbach's alpha internal consistency coefficient of the scale was calculated as 0.94. Similarly high reliability coefficients were obtained for subgroups: $\alpha = 0.94$ for middle school students, $\alpha = 0.94$ for high school students, $\alpha = 0.94$ for boys and $\alpha = 0.93$ for girls (Stewart et al., 2014). In conclusion, the analyses show that the CBS is a valid and reliable instrument that can be used to assess cyberbullying. The one-factor structure of the scale indicates that cyberbullying is a unidimensional construct and this finding is consistent with other studies in the literature (Menesini et al., 2011; Tynes et al., 2010; Ybarra et al., 2012). The scale has been used in many countries such as Pakistani, Spain, US and Russia (Garaigordobil, 2017; Saleem et al., 2021; Selkie et al., 2016; Semenova, 2023).

Sample

The study group consists of students studying at Kuban State University. Participation in the study was voluntary. The purpose of the study was explained to the students before filling in the scales. It was explicitly declared that the collected data would not be used outside the academic study. They were informed that they could withdraw from the survey at any stage of the study. No data were collected by revealing the identities of the participants. 380 students participated in the study. 83.2% of the participants were female. The study data were analyzed and 6 students who did not fill in the data sufficiently were excluded from the study. In addition, 112 students who stated that they were not exposed to cyberbullying were also excluded from the study.

The deliberate focus on students who reported cyberbullying victimization ($n = 262$) rather than the entire initial sample ($n = 380$) was methodologically appropriate given the study's primary aim to investigate the relationship between psychological well-being variables and cyberbullying experience patterns. This approach aligns with similar research designs in the field that specifically examine victim experiences (Brandau and Evanson, 2018; Yarbrough et al., 2023). By concentrating exclusively on victims, we were able to conduct a more nuanced analysis of the psychological factors that might influence different patterns and intensities of cyberbullying victimization.

Furthermore, this methodological decision follows established practices in cyberbullying research where the focus is on understanding the psychological characteristics of victims rather than establishing prevalence rates (Barlett and Coyne, 2014; Zych et al., 2019). Such focused sampling yields more specific and actionable insights for targeted intervention development for those most affected. While we acknowledge this approach may limit generalizability to the broader student population and does not permit prevalence estimation, it provides deeper insights into the psychological profile of cyberbullying victims, which was the central research question of this study. Future research could benefit from complementary designs that include both victims and non-victims to establish comparative patterns and overall prevalence rates.

There were 262 data included in the analysis. 82.2% of the participants were female. The proportion of female participants in our study is seen to be high. However, this proportion reflects the general student population of the university where the study was conducted. Therefore, our sample is consistent with the demographic structure of the institution where the study was conducted. However, the effects of this imbalance in gender comparisons were considered in statistical

analyses and this limitation was considered when interpreting the findings. Age groups were 18–19 (27.5%), 20–21 (44.3%), 22–23 (16.4%) and 24 and over (11.8%).

Data analysis

As a result of the analyzes, it is seen that the variables examined do not have a normal distribution. The most important indicator supporting this situation is that the *p* values of the Shapiro–Wilk test for all variables are less than 0.001. When the Z values for skewness ($Z_{skewness}$) are analyzed, it is seen that while the Stress variable (0.900) is within acceptable limits (±1.96), the variables Depression (4.253), Anxiety (2.073) and especially Cyberbullying (12.907) deviate significantly from the normal distribution. In terms of kurtosis Z values ($Z_{kurtosis}$), Cyberbullying variable (16.797) is significantly different from the other variables. While Depression (−1.707) is within the normal distribution, Anxiety (−2.863), Stress (−3.377) and Cyberbullying variables deviate from the normal distribution. In particular, the fact that the Cyberbullying variable has the highest deviation values in terms of both skewness and kurtosis shows that the distribution of this variable deviates significantly from normal. In the light of these findings, it is recommended to use nonparametric tests or to apply normalization procedures to the data (see Table 1).

Since the data do not have a normal distribution, Bayesian approach was preferred. Bayesian Mann–Whitney U Test was used to determine the extent to which the data supported differentiation by gender, while Bayesian ANOVA was used for age and daily internet use. Bayesian linear regression was used to determine predictive power. The criteria presented in Table 2 were used for Bayesian factor interpretation.

Results

Descriptive statistics

Figure 1 shows the level of university students' exposure to cyberbullying. The data reveal various dimensions of exposure. When the jitter plot in the graph is analyzed, it is seen that the majority of the students are in the range of 15–20 points. This suggests that students either seldom or hardly experience cyberbullying at all. The points assigned in the 25–45 range, however, show that certain children are highly exposed to cyberbullying and maybe via several channels. According to the box plot, the median value is about 18 and the interquartile range (15–22) is somewhat limited. This implies that, in the sample, most of the pupils went through cyberbullying at comparable degrees. The outliers in the upper section of the graph—range of 30–45 points—show, nevertheless, that certain kids are highly exposed to cyberbullying across several channels. The correct right-skewed structure of the distribution is amply shown in the density map. This arrangement underlines the existence of pupils in the high-risk group even although low and medium exposure is more typical.

Cyberbullying change according to demographic variables

Table 3 provides a gender-based comparison of cyberbullying exposure. Whereas the mean score of male participants ($N = 46$) was 20.326 (SD = 6.659), the mean score of female participants ($N = 216$) was 19.25 (SD = 4.659). Results of the Bayes Factor ($BF_{10} = 0.188$) and Bayesian Mann–Whitney U Test (4684) show that gender does not significantly affect cyberbullying exposure. The effect size (Rhat = 1.056) also supports this finding. It is noteworthy that the standard deviation of male participants is higher than that of female participants, indicating that the levels of exposure to cyberbullying in the male group are distributed in a wider range.

Table 4 shows university students' exposure to cyberbullying according to age groups. When we look at the distribution of age groups, students between the ages of 20–21 ($N = 116$) constitute the largest group. This is followed by the 18–19 age group ($N = 72$), the 22–23 age group ($N = 43$) and the 24 and over age group ($N = 31$). When the mean scores are analyzed, it is seen that the 18–19 age group has the lowest mean of being exposed to cyberbullying ($M = 18.653$, SD = 4.774). The averages of the other age groups are quite close to each other, and the 22–23 age group has the highest average ($M = 19.907$, SD = 4.401). The 20–21 age group ($M = 19.716$, SD = 5.402) and the 24 and over age group ($M = 19.581$, SD = 5.309) have similar mean values. When the standard deviation values are analyzed, it is seen that the highest variability is in the 20–21 age group (SD = 5.402) and the lowest variability is in the 22–23 age group (SD = 4.401). This shows that students in the 20–21 age group have a wider range of exposure to cyberbullying.

Table 5 presents the Bayesian evaluation of the variations in cyberbullying exposure among age groups. For both models, the P(M) value was set as 0.5, therefore assigning the models equal *a priori* probability. The P(M|data) value for the null model was 0.941; the BF_m value was 16.086. For the age model, the P(M|data) value is 0.059 and the BF_m value is 0.062. The BF_{10} value of 0.062 and the very low error value of 0.004% provide strong evidence that the results are reliable and that there is no significant difference between age groups in terms of exposure to cyberbullying. These results also statistically support the finding that the mean values of the age groups previously examined are close to each other.

TABLE 1 Skewness, kurtosis and normality test.

	N	Skewness	Std. error of skewness	$Z_{skewness}$	Kurtosis	Std. error of kurtosis	$Z_{kurtosis}$	Shapiro–Wilk	*p*-value of Shapiro–Wilk
Depression	262	0.638	0.15	4.253	−0.512	0.3	−1.707	0.933	< 0.001
Anxiety	262	0.311	0.15	2.073	−0.859	0.3	−2.863	0.957	< 0.001
Stress	262	0.135	0.15	0.900	−1.013	0.3	−3.377	0.955	< 0.001
Cyberbullying	262	1.936	0.15	12.907	5.039	0.3	16.797	0.800	< 0.001

TABLE 2 BF10 assessment criteria.

BF_{10}	Comments
> 100	Extraordinary evidence for H1
30–100	Very strong evidence for H1
10–30	Strong evidence for H1
3–10	Moderate evidence for H1
1–3	Anecdotal evidence for H1
1	No evidence
1/3–1	Anecdotal evidence for H0
1/3–1/10	Moderate evidence for H0
1/10–1/30	Strong evidence for H0
1/30–1/100	Very strong evidence for H0
< 1/100	Extraordinary evidence for H0

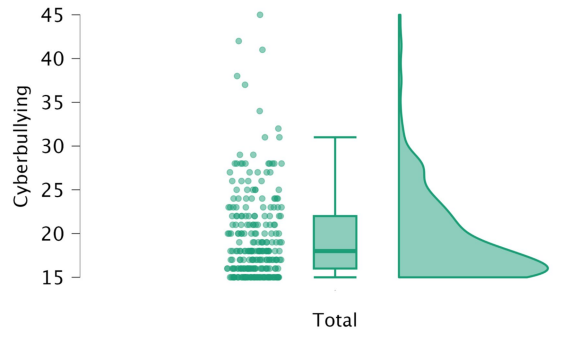

FIGURE 1
Cyberbullying's raincloud plot.

TABLE 3 Mean, standard deviation, and Bayes factor related to gender.

Group	N	Mean	SD	BF_{10}	Bayesian Mann–Whitney U Test	Rhat
Female	216	19.25	4.659			
Male	46	20.326	6.643	0.188	4,684	1.056

TABLE 4 Mean, standard deviation, related to age group.

Age group	N	Mean	SD
18–19	72	18.653	4.774
20–21	116	19.716	5.402
22–23	43	19.907	4.401
24 and over	31	19.581	5.309

TABLE 5 Bayes factor related to age group.

Models	P(M)	P(M|data)	BF_M	BF_{10}	error %
Null model	0.5	0.941	16.086	1	
Age	0.5	0.059	0.062	0.062	0.004

Table 6 shows students' exposure to cyberbullying according to their daily internet usage time. The majority of the students in the sample ($N = 122$) use the internet 4–6 h a day and the mean exposure to cyberbullying of this group is 19.262 (SD = 4.986). The second largest group, those who use the internet for 7–9 h ($N = 73$), had a similar mean of 19.342 (SD = 4.448). The group that uses the Internet for 1–3 h ($N = 39$) and the group that uses the Internet for 10 h or more ($N = 28$) are relatively smaller groups, with mean scores of 19.821 (SD = 5.331) and 19.929 (SD = 6.577), respectively. The standard deviation (SD = 6.577) of the group using the Internet for 10 h or more is considerably higher than the other groups, indicating that the students in this group have a wider range of exposure to cyberbullying. Interestingly, the mean scores of all groups were quite close to each other (in the range of 19.262–19.929), suggesting that the duration of daily internet use does not have a significant effect on the level of exposure to cyberbullying.

Table 7 presents Bayesian analysis of the association between daily internet use time and exposure to cyberbullying. For both models, the P(M) value is set as 0.5, therefore giving these models identical a priori probability. For the null model, P(M|data) value was 0.971 and BF_m value was 33.671. For the daily internet use model, the P(M|data) value is 0.029 and the BF_m value is 0.03. The BF_{10} value of 0.03 and the very low error value of 0.01% provide strong evidence that the results are highly reliable and that there is no significant difference between the duration of daily internet use in terms of exposure to cyberbullying. These results also statistically support the finding that the average values of the daily internet usage groups are close to each other.

The results of the Bayesian correlation analysis reveal that there are significant relationships between exposure to cyberbullying and psychological well-being subdimensions. When Kendall's tau B coefficients were examined, a significant positive relationship ($\tau B = 0.221$) was found between exposure to cyberbullying and depression, and very strong evidence ($BF_{10} = 109038.742$) was obtained for the existence of this relationship. Strong evidence ($BF_{10} = 26254.888$) was established for the existence of a noteworthy positive connection ($\tau B = 0.209$) between exposure to cyberbullying and stress as well. Furthermore supported by the Bayes Factor ($BF_{10} = 195.43$) is the favorable link between anxiety and exposure to cyberbullying ($\tau B = 0.164$). These findings show that the degree of cyberbullying exposure usually rises when stress, anxiety and depression rise (see Table 8).

Depression—cyberbullying

The graph in Figure 2 graphically illustrates the link between depression and cyberbullying exposure. Every point on the graph stands for one participant; the y-axis shows cyberbullying exposure ratings (between 15 and 45) and the x-axis shows depression scores (between 0 and 50). The blue line is the regression line showing the positive relationship between the variables. The gray density plots on the right and top of the graph show the distribution structure of each variable. The distribution of points and the upward slope of the regression line visually support the positive correlation found earlier ($\tau B = 0.221$). In particular, it is observed that when depression scores increase above 30, cyberbullying scores also tend to increase. However, there are some outliers in the graph - in particular, there are a few

TABLE 6 Mean, standard deviation, related to daily internet usage.

Daily internet usage	N	Mean	SD
1–3 h	39	19.821	5.331
4–6 h	122	19.262	4.986
7–9 h	73	19.342	4.448
10 h or more	28	19.929	6.577

TABLE 7 Bayes factor related to daily internet usage.

Models	P(M)	P(M|data)	BF_M	BF_{10}	Error %
Null model	0.5	0.971	33.671	1	
Daily internet usage	0.5	0.029	0.03	0.03	0.01

TABLE 8 Correlation between psychological well-being and cyberbullying.

Correlations	Kendall's tau B	BF_{10}
Depression-Cyberbullying	0.221	109038.742
Anxiety-Cyberbullying	0.164	195.43
Stress-Cyberbullying	0.209	26254.888

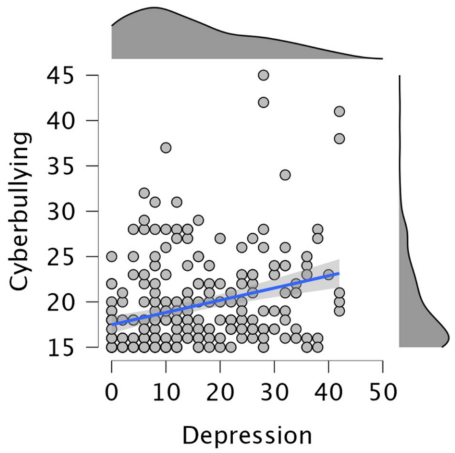

FIGURE 2
Scatter plot between depression and cyberbullying.

participants with cyberbullying scores above 35. When the density distributions are analyzed, it is seen that both variables show a right-skewed distribution. This indicates that most of the participants in the sample scored relatively low, but there was a group of participants who scored high.

Anxiety—cyberbullying

Figure 3 scatter plot graph clearly depicts how anxiety and cyberbullying exposure interact. Every point on the graph stands for

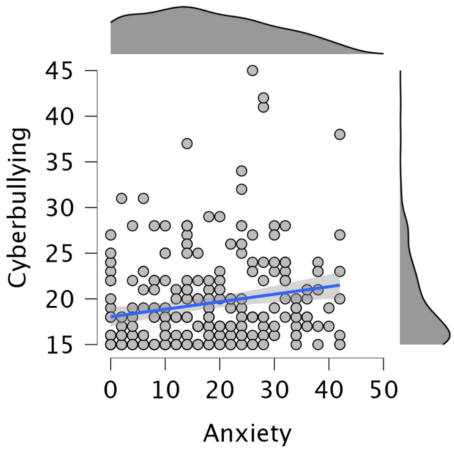

FIGURE 3
Scatter plot between anxiety and cyberbullying.

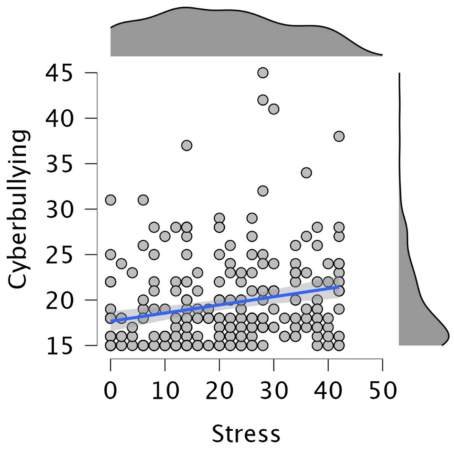

FIGURE 4
Scatter plot between anxiety and cyberbullying.

one participant; the y-axis shows cyberbullying exposure ratings (from 15 to 45) and the x-axis shows anxiety scores (from 0 to 50). The slight upward slope of the blue regression line visually confirms the positive relationship between the variables ($\tau B = 0.164$). When the distribution of the dots is analyzed, a slight upward trend is observed in the exposure to cyberbullying scores as anxiety scores increase. The correlation, meanwhile, seems to be less strong than the depression-cyberbullying one. The graph shows several unusual trends, particularly in the anxiety score region of 20–30; a few participants have a cyberbullying score exceeding 35. The gray density distributions above and to the right of the graph expose that both variables exhibit a right-skewed distribution. Although most of the participants had low to moderate scores, there was also a group of those with high marks.

Stress—cyberbullying

The graph in Figure 4 graphically depicts the association between stress and cyberbullying exposure. Every point on the graph shows

one participant; the y-axis shows cyberbullying exposure ratings (from 15 to 45) and the x-axis shows stress scores (from 0 to 50). The upward slope of the blue regression line visually confirms the positive relationship between the variables (τB = 0.209). When the distribution of the points is analyzed, it is observed that as stress scores increase, there is an increasing trend in the exposure to cyberbullying scores. This relationship seems to be stronger than the anxiety-cyberbullying relationship, but slightly weaker than the depression-cyberbullying relationship. There are noteworthy outliers in the graph, especially in the 25–35 stress score range, a few participants with a cyberbullying score above 35 stand out. The gray density distribution reveals that the stress variable is spread over a wider range and shows a relatively more normal distribution. The density distribution on the right shows that the exposure to cyberbullying variable shows a right-skewed distribution, meaning that the majority of the participants have low to medium scores, but there is also a group of participants with high scores.

The results presented in Table 9 examine the impact of various psychological variables on exposure to cyberbullying. The results reveal quite interesting findings. The strongest model is the one including only depression (P(M|data) = 0.683, BF_m = 23.694, BF_{10} = 15556.118, R^2 = 0.089). This model was the most supported by the data and explained approximately 9% of the variance in cyberbullying exposure. It is noteworthy that depression alone has such a strong effect. Models in which anxiety or stress was added with depression (Depression + Anxiety: BF_{10} = 2715.113, R^2 = 0.09; Depression + Stress: BF_{10} = 2545.423, R^2 = 0.089) also have strong evidence, but do not contribute significantly to the variance explained. This suggests that depression is the main predictor. The explanatory power of the anxiety (BF_{10} = 13.405, R^2 = 0.036) or stress (BF_{10} = 78.34, R^2 = 0.05) models alone is relatively lower. Although the model with all variables combined (BF_{10} = 617.491, R^2 = 0.09) is more complex, it does not provide additional explanatory power. These results suggest that depression plays a central role in the relationship between exposure to cyberbullying and mental health variables. This finding suggests that interventions for cyberbullying victims should focus specifically on depressive symptoms.

Table 10 shows a detailed analysis of the coefficients obtained from the Bayesian Linear Regression analysis. The coefficient for the depression variable was estimated at 0.13 (SD = 0.032) and its inclusion in the model is very strongly supported (BF_inclusion = 207.881, P(incl|data) = 0.995). The confidence interval was entirely positive (0.075–0.192), indicating that depression has a consistent positive effect on exposure to cyberbullying. The coefficient for the anxiety variable was estimated at-0.004 (SD = 0.019), with weak evidence for its inclusion in the model (BF_inclusion = 0.253, P(incl|data) = 0.202). The confidence interval included zero (−0.061–0.022), indicating that anxiety has no significant effect on exposure to cyberbullying. The coefficient for the stress variable was estimated at 0.002 (SD = 0.019), again with weak evidence for its inclusion in the model (BF_inclusion = 0.246, P(incl|data) = 0.197). The confidence interval included zero (−0.03–0.055), indicating that stress also had no significant effect on exposure to cyberbullying. These results support previous analyses and show that depression has a significant and positive effect on exposure to cyberbullying, but anxiety and stress alone do not have a significant effect.

Discussion

In recent years, cyberbullying has emerged as a significant problem among students. Various academic studies have examined the prevalence and effects of this issue in detail. For example, in Russia, cyberbullying is common, especially based on research conducted in schools in the Sverdlovsk region (Nazarov et al., 2022). Another study conducted by Gönültaş (2022) on university students in Turkey revealed that 57% of students had committed cyberbullying at least once in the last 6 months, and 68% had been exposed to cyberbullying. In addition, another study conducted in 2023 reported that 21.9% of cyberbullying victims among university students were

TABLE 9 Bayesian linear regression.

Models	P(M)	P(M|data)	BF_M	BF_{10}	R^2
Null model	0.25	1.317×10^{-4}	3.952×10^{-4}	1	0
Depression	0.083	0.683	23.694	15556.118	0.089
Depression + Anxiety	0.083	0.119	1.489	2715.113	0.09
Depression + Stress	0.083	0.112	1.384	2545.423	0.089
Depression + Anxiety + Stress	0.25	0.081	0.266	617.491	0.09
Stress	0.083	0.003	0.038	78.34	0.05
Anxiety + Stress	0.083	6.279×10^{-4}	0.007	14.303	0.05
Anxiety	0.083	5.885×10^{-4}	0.006	13.405	0.036

TABLE 10 Bayesian linear regression coefficient values.

Coefficient	P(incl)	P(excl)	P(incl|data)	P(excl|data)	$BF_{inclusion}$	Mean	SD	Lower	Upper
Intercept	1	0	1	0	1	19.439	0.299	18.894	20.014
Depression	0.5	0.5	0.995	0.005	207.881	0.13	0.032	0.075	0.192
Anxiety	0.5	0.5	0.202	0.798	0.253	−0.004	0.019	−0.061	0.022
Stress	0.5	0.5	0.197	0.803	0.246	0.002	0.019	−0.03	0.055

subjected to cyberbullying, while 8.6% of them were perpetrators of cyberbullying (Aparisi et al., 2023). These studies show that cyberbullying is a significant problem among university students and can have serious effects on students' mental health (such as depression and anxiety). Programs that include various strategies to prevent cyberbullying have been proposed in different countries. A review study by Siddiqui and Schultze-Krumbholz (2023) examined seventeen different cyberbullying intervention programs implemented worldwide. These programs include strategies such as individualized instruction, teacher professional development, and a whole-school approach. The study suggests a strong integration of theoretical frameworks, combining proactive and reactive strategies, and reducing digital device use. According to Vikhman et al. (2021), the KiVa program also provides effective results in preventing cyberbullying and can be used effectively among Russian students. Another study conducted in Canada by Hendry et al. (2023) identified strategies to prevent and intervene in cyberbullying by obtaining the opinions of key stakeholders such as educators, counselors, and police officers. These strategies include increasing cyberbullying awareness, digital citizenship education, and increasing parental involvement in their children's technology use. These studies emphasize the need to develop comprehensive and multifaceted programs to prevent cyberbullying among university students. The collaboration of educators, students, and parents is critical to the success of such programs.

This study examined the relationship between psychological well-being and cyberbullying among university students. The results of the study revealed rather strong positive relation between stress, anxiety, and depression with respect to cyberbullying exposure.

According to the research results, exposure to cyberbullying does not vary by gender. Several of the studies that have been published would fit this result. For example, Sanmartín et al. (2022) likewise reported no considerable gender variance. This outcome, meantime, contradicts certain earlier studies (Arafa and Senosy, 2017), which show that female students more often victimize others.

The cyberbullying exposure of age groups showed not much variation. Research showing younger students are more at risk recorded in the literature contradict this result (Alalalmeh et al., 2024; Eid et al., 2021). Likewise identified lacking a significant link were daily internet use time and cyberbullying exposure.

The results of Bayesian linear regression analysis clearly revealed the effects of psychological variables on exposure to cyberbullying. The strongest model, the model including only depression, explained approximately 9% of exposure to cyberbullying. This finding suggests that depression has a central role in cyberbullying victimization. This outcome conforms to the systematic review results of Arif et al. (2024). Of the twenty papers searched for this systematic review, sixteen amply illustrated a link between depression and cyber victimizing. Although our study found a significant relationship between depression and cyberbullying victimization, the cross-sectional nature of the research prevents establishing causal relationships between these variables. While students with higher depression scores were observed to experience more cyberbullying victimization, this relationship could potentially be bidirectional. As indicated by Alrajeh et al. (2021), there might be a reciprocal relationship between cyberbullying victimization and depression; experiencing cyberbullying victimization can lead to depressive symptoms, but depressive symptoms might also cause individuals to perceive behaviors more negatively and thus identify themselves as victims of cyberbullying more frequently. To better understand this complex relationship, longitudinal studies are necessary. Future research should focus on clarifying the causal relationships between these variables and examine how the interaction between depression and cyberbullying evolves over time.

Adding anxiety and stress variables to the model did not contribute significantly to the explained variance. A lot of studies have found different results to this surprising one. For example, (Jenaro et al., 2021) found that people who were cyberbullied said they felt a lot more anxious. Another study by (Savani et al., 2023) discovered that 3.19 percent of cyberbullying victims had anxiety, and the level of anxiety was related to the severity of the cyberbullying.

When the regression coefficients were analyzed, the coefficient of the depression variable and the confidence interval being completely positive indicate that depression has a consistent positive effect on exposure to cyberbullying. This result can be tangentially connected to the discovery of Lee et al. (2023) that victimizing cyberbullies lowers academic performance. This result is also in line with Przybylski and Bowes (2017)'s study, which showed that both traditional bullying and cyberbullying are linked to worse mental health.

Anxiety and stress variables have coefficients that are very close to zero, and their confidence intervals also contain zero. This means that these factors do not seem to have any effect on cyberbullying exposure. These findings contradict the findings of Martínez-Monteagudo et al. (2020) that high stress levels are a significant predictor of cyberbullying victimization.

When these results are evaluated together with the findings of Wu et al. (2024) that perceived social support may play a mediating role between cyberbullying victimization and loneliness, it emphasizes the importance of social support in the design of intervention programs. In addition, as stated in the studies of Samsudin et al. (2024) and Zhang et al. (2020), given that participation in cyberbullying as a victim or perpetrator predicts higher levels of psychological distress, it is important to design intervention programs to include both victims and perpetrators.

Considering these findings, students with depressive symptoms may be at risk for cyberbullying and the importance of developing protective interventions for these students emerges. As Hellfeldt et al. (2020) stated, it is important to consider social support from family, friends and teachers as a protective factor and include it in intervention programs.

Conclusion

This study examined the relationship between cyberbullying and psychological well-being in university students. The results of the study showed that psychological variables have a significant effect on exposure to cyberbullying. In particular, depression was found to be a significant predictor of being exposed to cyberbullying. According to the results of the study, exposure to cyberbullying does not differ according to gender. Similarly, no significant difference was found in terms of age groups and daily internet usage time. These findings suggest that cyberbullying may occur independently of demographic characteristics. The results of Bayesian regression analysis clearly revealed the effects of psychological variables on exposure to cyberbullying. The model including only the depression variable

explained approximately 9% of the exposure to cyberbullying. This finding suggests that depression has a central role in cyberbullying victimization. The addition of anxiety and stress variables to the model did not make a significant contribution to the variance explained.

Recommendations

In line with the results of this study, some important recommendations can be made. First of all, cyberbullying prevention programs should be developed in universities. It is important that these programs focus especially on students with depressive symptoms. Psychological counseling centers of universities should create special support programs for cyberbullying victims and develop intervention strategies for these students. Improving students' digital literacy skills and raising awareness about safe internet use are also of great importance. In addition, university staff should be trained to recognize the signs of cyberbullying and intervene. Developing programs to strengthen social support from family, friends and teachers can also be effective in combating bullying. Establishing anonymous reporting systems for victims of cyberbullying will enable students to seek help without hesitation. In addition, the fact that preventive intervention programs cover both victims and bullies will ensure that both dimensions of the problem are effectively addressed.

Future research should examine both victimization and perpetration aspects of cyberbullying to provide a more comprehensive understanding of this phenomenon among university students. Investigating the bidirectional nature of cyberbullying and the potential overlap between victim and perpetrator roles would contribute to developing more effective and targeted intervention strategies that address the complete dynamics of online aggressive behavior.

Limitations

This study has some important limitations. The fact that the study was conducted in a single university limits the generalizability of the results. The self-report-based nature of the data collection instruments is another limitation that may increase the likelihood of respondents responding under the influence of social desirability.

One of the significant limitations of our study is the use of a cross-sectional research design. Although this design is useful for identifying relationships between variables, it does not allow for causal inferences. In particular, the relationship between psychological well-being and cyberbullying may have a complex structure in which both can mutually influence each other over time.

Another limitation of the study is related to the multi-faceted nature of the concept of psychological well-being. In this study, DASS-21 scale was used to measure psychological well-being. It is recommended that future studies compare the results by measuring with different tools.

The study's focus on a Russian university sample presents a cultural limitation to its generalizability. Cyberbullying patterns and psychological responses may vary significantly across different cultural contexts due to varying digital behavior norms, social interaction patterns, and mental health attitudes. Furthermore, cultural factors might influence how psychological variables such as depression and anxiety manifest and relate to cyberbullying experiences. Future research should prioritize cross-cultural comparative studies to determine which findings from this research are universal and which are culturally specific, thereby enhancing the global applicability of cyberbullying interventions.

The fact that the majority of the participants were female (82.2%) caused gender differences to be insufficiently analyzed. The fact that students who stated that they were not exposed to cyberbullying were excluded from the analysis makes it difficult to obtain information about the general prevalence of cyberbullying. Finally, the fact that only the victimization dimension was examined in the study and the bullying behavior was not addressed is also an important limitation.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical authorization for the study was secured from Kuban State University. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

OS: Writing – original draft, Writing – review & editing. MZ: Writing – original draft, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Publisher's note

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