EVALUATING THE EFFECTIVENESS OF AN INTERNET-BASED TOOL FOR EMOTIONAL ASSESSMENT OF STUDENTS AT A PUBLIC UNIVERSITY IN BRAZIL

AVALIAÇÃO DA EFETIVIDADE DE UMA FERRAMENTA BASEADA NA INTERNET PARA AVALIAÇÃO EMOCIONAL DE ESTUDANTES EM UMA UNIVERSIDADE PÚBLICA NO BRASIL

EVALUACIÓN DE LA EFICACIA DE UNA HERRAMIENTA BASADA EN INTERNET PARA LA EVALUACIÓN EMOCIONAL DE ESTUDIANTES DE UNA UNIVERSIDAD PÚBLICA EN BRASIL

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ABSTRACT

University students have a higher prevalence of illnesses that affect their mental health. This leads to a higher risk of dropping out, poor academic performance, drug abuse, difficulties in finding a job after graduation, and suicidal thoughts. Internet-based tools for screening students with symptoms of these illnesses are necessary, then it allows to perform an early diagnosis and treatment. Therefore, this study aimed to develop an Internet-based tool for the emotional assessment of students at a state public university. The SAVE (emotional assessment software) was developed in a standardized language already used by the university's systems. Initially, the Beck Inventory (BDI-II) was used to screen for students with depressive symptoms. Students who scored more than 9 were referred to a multiprofessional care (psychology, nursing, physiotherapy, and social work) for diagnosis and treatment. The analysis of 671 questionnaires answered by students in the first 12 months of the tool's operation showed a prevalence of 83.5% with depressive symptoms, where 20.4% with mild symptoms, 39.1% with moderate symptoms, and 24.0% with severe symptoms. This study demonstrated the importance of using Internet-based tools to detect symptoms that affect the mental health of university students.

Keywords: Mental health; Depression; Screening; Students; University.

RESUMO

Os estudantes universitários apresentam maior prevalência de doenças que afetam a saúde mental. Isto leva a um maior risco de abandono escolar, mau desempenho acadêmico, abuso de drogas, dificuldades em encontrar um emprego após a formatura e pensamentos suicidas. São necessárias ferramentas baseadas na Internet para triagem de alunos com sintomas dessas doenças, pois permitem realizar diagnóstico e tratamento precoces. Portanto, este estudo teve como objetivo desenvolver uma ferramenta baseada na Internet para avaliação emocional de estudantes de uma universidade pública estadual. O SAVE (software de avaliação emocional) foi desenvolvido em linguagem padronizada já utilizada pelos sistemas da universidade. Inicialmente, foi utilizado o Inventário de Beck (BDI-II) para triagem de estudantes com sintomas depressivos. Os alunos que obtiveram pontuação superior a 9 foram encaminhados para atendimento multiprofissional (psicologia, enfermagem, fisioterapia e serviço social) para diagnóstico e tratamento. A análise dos 671 questionários respondidos pelos estudantes nos primeiros 12 meses de funcionamento da ferramenta mostrou uma prevalência de 83,5% com sintomas depressivos, sendo 20,4% com sintomas leves, 39,1% com sintomas moderados e 24,0% com sintomas graves. Este estudo demonstrou a importância do uso de ferramentas baseadas na Internet para detectar sintomas que afetam a saúde mental de estudantes universitários.

Palavras-chave: Saúde mental; Depressão; Triagem; Estudantes; Universidade.

RESUMEN

Los estudiantes universitarios tienen una mayor prevalencia de enfermedades que afectan su salud mental. Esto conduce a un mayor riesgo de abandono escolar, bajo rendimiento académico, abuso de drogas, dificultades para encontrar trabajo después de graduarse y pensamientos suicidas. Son necesarias herramientas basadas en Internet para detectar a los estudiantes con síntomas de estas enfermedades, lo que permite realizar un diagnóstico y tratamiento temprano. Por lo tanto, este estudio tuvo como objetivo desarrollar una herramienta basada en Internet para la evaluación emocional de estudiantes de una universidad pública estatal. El SAVE (software de evaluación emocional) fue desarrollado en un lenguaje estandarizado ya utilizado por los sistemas de la universidad. Inicialmente, se utilizó el Inventario de Beck (BDI-II) para detectar

estudiantes con síntomas depresivos. Los estudiantes que obtuvieron una puntuación superior a 9 fueron remitidos a un centro multiprofesional de atención (psicología, enfermería, fisioterapia y trabajo social) para diagnóstico y tratamiento. El análisis de 671 cuestionarios respondidos por estudiantes en los primeros 12 meses de funcionamiento de la herramienta arrojó una prevalencia del 83,5% con síntomas depresivos, donde el 20,4% con síntomas leves, el 39,1% con síntomas moderados y el 24,0% con síntomas graves. Este estudio demostró la importancia del uso de herramientas basadas en Internet para detectar síntomas que afectan la salud mental de los estudiantes universitarios.

Palabras clave: Salud mental; Depresión; Triaje; Estudiantes; Universidad.

INTRODUCTION

Diseases that affect mental health, such as depression, promote disability and the global health-related burden (ALHENAKI et al., 2023; MORALES et al., 2023; REHM; SHIELD, 2019; RUFINO et al., 2024). University students (undergraduate and postgraduated) face challenges that can worsen their mental health problems, with many experiencing symptoms of anxiety and depression (AUERBACH et al., 2018; PEIXOTO; SOARES; BEZERRA, 2022). Studies have shown that university students experience higher levels of stress, anxiety and depression than the general population (AUERBACH et al., 2018; MOFATTEH, 2021; SHELDON et al., 2021). Academic pressure, financial strain, as separation from family and the transition towards independence are some of the factors that contribute to students' increased vulnerability (OKASHA et al., 2022; PEIXOTO; SOARES; BEZERRA, 2022; SAYEED et al., 2023).

Sheldon et al. (2021) carried out a systematic review where they adapted the factors associated with mental health problems and distress, created by Furber et al. (2017) to encompass university students. They classified the factors into 2 levels of categories (primary and secondary) (table 1).

Table 1 – Categories of factors associated with mental health problems and distress.

Categories (primary level)	**Categories (secondary level)**
- Physiological and health	- Physical illness and disability - Sleep disturbance
-Psychological	- Stress - Self-perceived health - Self-esteem and self-beliefs - Personality - Cognitive functioning and response styles - Emotion regulation - Trait resilience - Current mental illness - Psychiatric history
- Predictors of response to trauma	- Negative life events - Childhood adversity - Additional life stress
- Relational	- Parental depression - Attachment to parents - Parenting - Social isolation - Social relationships - Social support - Perceived discrimination/Racism - Community violence
- Sociodemographic	- Debt and/or worsening SES - Poor living arrangements - Gender - Sexual minorities - Age
- Factors related to Higher Education	- Academic environment - Sexual harassment

- Lifestyle	- Physical activity - Alcohol consumption - Drug use - Smoking - Diet quality - Mobile phone use

Source: adapted from Sheldon et al., (2021)

Addressing mental health concerns of university students is an urgent and complex task that requires a comprehensive approach. This involves organizing awareness campaigns, guaranteeing access to mental health resources and implementing institutional policies that create a better learning environment (CHOW et al., 2021). Poor mental health is strongly linked to academic underperformance, high dropout rates and difficulties in obtaining employment after graduation (BOYD, 2022; SAYEED et al., 2023). Untreated mental health issues can also result in substance abuse, relationship instability, and suicidal thoughts (CHOW et al., 2021; MOFATTEH, 2021; PAVANI et al., 2021; PONZO et al., 2020).

Several factors contributing to depression among university students have been identified, such as gender (where females are more susceptible), academic year (with a higher prevalence in later years), dissatisfaction with courses, lack of social engagement, inadequate access to psychological support, and migration for educational purposes (DEMENECH et al., 2021). Depression has been evaluated using diverse methods, with the Beck Depression Inventory (BDI) being the most widely utilized (GOMES-OLIVEIRA et al., 2012; JACKSON-KOKU, 2016). The BDI consists of a self-report questionnaire that includes 21 items, with scores reflecting the severity of depression (BRESOLIN et al., 2020; LIMA; ASSUNÇÃO; BARRETO, 2015; SAYEED et al., 2023; WANG; GORENSTEIN, 2013). The refined version of the BDI- II has been translated into several languages and is widely used (WANG; GORENSTEIN, 2013).

Care should be taken when utilizing BDI-II as a unique diagnostic tool because of the possibility of false positives (SHEAN; BALDWIN, 2008). Nevertheless, self-assessment scales such as the BDI-II and PHQ-9 provide an easy, reliable, and validated method for evaluating depression in diverse settings, including universities (ADAMS et al., 2021; BRESOLIN et al., 2020).

Despite the provision of counseling services on campus, students' reluctance to seek assistance because of stigma continues to be a significant challenge (MOFATTEH, 2021; SUM et al., 2024). Implementing educational campaigns to promote the use of accessible screening tools may help increase help-seeking behaviors (CHOW et al., 2021). Digital interventions, such as Internet-based resources and mobile applications, have

emerged as effective and economical alternatives, particularly because of their anonymity (LEE; JUNG, 2018; PONZO et al., 2020). Widespread access to smartphones and the Internet makes these resources useful for promoting mental health support and interventions (OKASHA et al., 2022).

Dietel et al. (2024) have demonstrated the positive influence of smartphone-based approaches on enhancing emotion regulation during periods of high stress (DIETEL et al., 2024). This shows the significance of implementing strategies for managing mental disorders in universities, suggesting that online mental health screening constitutes an effective intervention approach, as evidenced in previous studies (FAUZI et al., 2021). Early detection and intervention for mental health issues among students is necessary to prevent negative consequences on academic performance and their future careers (ISHIMARU et al., 2023; SAYEED et al., 2023). The university should play a role in the early detection and prevention of mental health issues despite the challenges in establishing criteria for identifying at-risk students (ISHIMARU et al., 2023). Recognizing depression's symptoms, such as persistent sadness, anhedonia, sleep disturbances, and feelings of worthlessness, is important for timely intervention (LOCH et al., 2024). Prioritizing mental health support within educational institution can promote a healthier and more supportive environmental for students, thereby improving their overall well-being and academic success. With this in mind, the objective of this study was evaluate the effectiveness of an internet-based tool for the emotional assessment of academics at the State University of Ponta Grossa.

MATERIAL AND METHODS

DEVELOPMENT OF THE EMOTIONAL ASSESSMENT SOFTWARE (SAVE)

The SAVE (Emotional Assessment Software) developed in this study integrates various technologies. The server infrastructure and database utilized in its development are housed within the University premises, necessitating the adoption of its standard technologies, including:

- The Laravel software framework, implemented using the PHP programming language;
- PostgreSQL for robust data storage capabilities;
- HTML, CSS, and JavaScript for the web design and interactivity.
- Database Modeling

In designing the database architecture, a primary concern was the separation of response data from respondent identification information. Identification details are saved for

subsequent integration, if required, through data cross-referencing with University services. All completed questionnaires are securely saved within the University's database infrastructure, facilitating subsequent analysis of key sociodemographic factors that may influence student mental health.

SOFTWARE INTERFACE

SAVE contain two distinct modules: a publicly accessible interface for students and faculty members, and a secure administrative section for managing various mental health assessment tools. For the object of this study, only the Beck Depression Inventory-II (BDI-II) was integrated to triage and refer students exhibiting depressive symptoms. This selection aimed to avoid the overload of the multidisciplinary care team.

The SAVE was developed as an instrument to screen university students for symptoms of mental disorders (e.g., anxiety, stress, well-being, and happiness). Furthermore, there exists the potential to refer individuals requiring diagnosis and care to a specialized multi-professional team. Initially, the instrument was designed to assess only depressive symptoms to prevent overburdening of services. However, it is feasible to incorporate any mental health assessment questionnaires.

The system's accessibility through computers, tablets, and mobile devices connected to the internet facilitates its utilization by students. It features a login and password homepage (figure 1a). Upon accessing the system with institutional credentials, users are directed to a page where they can select the desired questionnaire. In this version, only one option was available to students, as previously mentioned (figure 1b). After selecting the emotional assessment option, students are directed to the consent form page (figure 1c). Upon acceptance of the consent form, students proceed to the first question of the questionnaire (figure 1d). Questions are presented individually, and as students respond, they are guided to subsequent questions until completion. At the conclusion of the questionnaire, if a student's score is equal to or greater than 10, information is provided for contacting the institution's multidisciplinary team (figure 1e).

ETHICAL APPROVAL AND DATA COLLECTION

The project focusing on assessing depressive symptoms among University students received ethical approval from the Ethics Committee for Research with Humans of the State University of Ponta Grossa (UEPG), under approval number 21592019.0.0000.0105 and final approval number 3.591.164.

After Ethics Committee's endorsement, data collection started through all questionnaires concluded within SAVE, serving as a screening tool for individuals manifesting depressive symptoms. Each response's score was encrypted and stored securely within the University's database infrastructure.

DISCLOSURE AND QUESTIONNAIRE ADMINISTRATION

To evaluate the efficacy of the tool in screening students, SAVE was made accessible via the university's website or through the designated URL (https://calculadoraemocional.apps.uepg.br/login). Access to the tool requires users to authenticate using their institutional credentials. Extensive disclosure efforts were undertaken to encourage widespread participation in the SAVE initiative. The platform was accessible to all undergraduate and postgraduated students of University. Participants completed a questionnaire comprising twenty-one (21) items based on the BDI-II instrument. The cutoff score was established following Beck and colleagues' study (1961) (BECK, 1961). Following the questionnaire completion, participants were categorized into four emotional states: normal, mild, moderate, or severe depressive symptoms. Those scoring above 9 were directed to contact the multidisciplinary support team (comprising psychologists, nurses, physiotherapists, and social workers). Additionally, the multidisciplinary support team received the e-mail addresses of students who had score above 9. In case where students did not initiate contact, the support team enter in contact to them, inviting their participation in the support program.

DATA ANALYSIS

This study assayed questionnaire responses collected through the sampling process. The analysis period lengthens from October 2019 to September 2020.

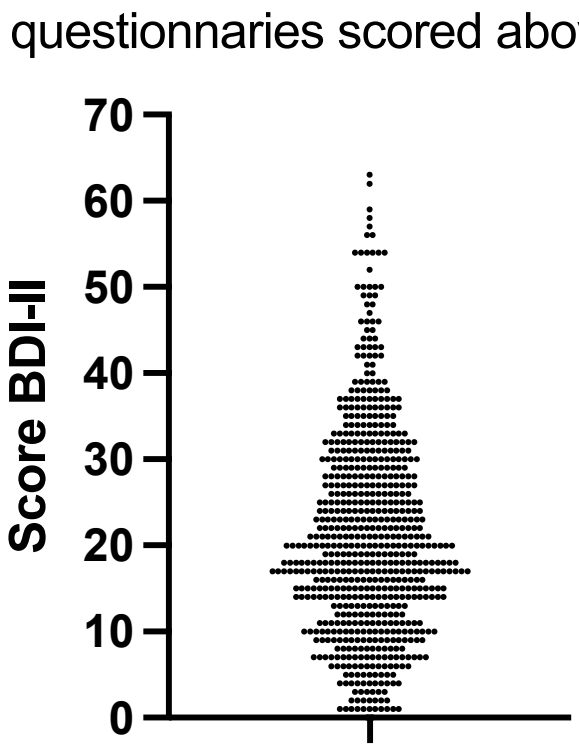
RESULTS AND DISCUSSION

The study analyzed data from 671 completed surveys collected through the SAVE platform from undergraduate students, which was recorded for 6.7% of the overall student population enrolled in the UEPG. This participation rate is comparable to the 6.8% reported in a study conducted by Sum et al. (2024) among students at The University of Hong Kong using Qualtrix software (SUM et al., 2024). However, it is lower than the rates obtained in two studies conducted at others public universities in the state of Paraná (28.1% and 13.6%) (LOPES; NIHEI, 2021; RUFINO et al., 2024). Despite the importance of seeking

professional mental health support, some students may not participate with it due to a variety of reasons, such as viewing stress as a normal part of university life, fear of judgment, shame, and doubt about the effectiveness of such support (LEE; JUNG, 2018).

The BDI-II scores varied from 0 to 63, with an average of 21.3 (standard deviation of 12). The scores of all participants are illustrated in Graphic 1. Using the cutoff score listed by BECK et al. (1961), we estimated that 16.5% of undergraduates were non-depressed (BDI-II score less than 10), 20.4% were mildly depressed (BDI-II score ranging from 10 to 16), 39.1% were moderately depressed (BDI-II score between 17 and 29), and 24.0% were severely depressed (BDI-II score greater than 30) (Graphic 2) (BECK, 1961). The tool demonstrated an impressive referral rate of 83.5% of students who sought specialized multiprofessional care through the platform. This impressive rate ensures that proper diagnosis and treatment can be provided. Notably, undergraduates are highly connected and frequently utilize mobile technologies (JACOBSEN; FORSTE, 2011). Previous studies have demonstrated that mobile technology can be utilized for enhancing mental health outcomes (BROGLY et al., 2021).

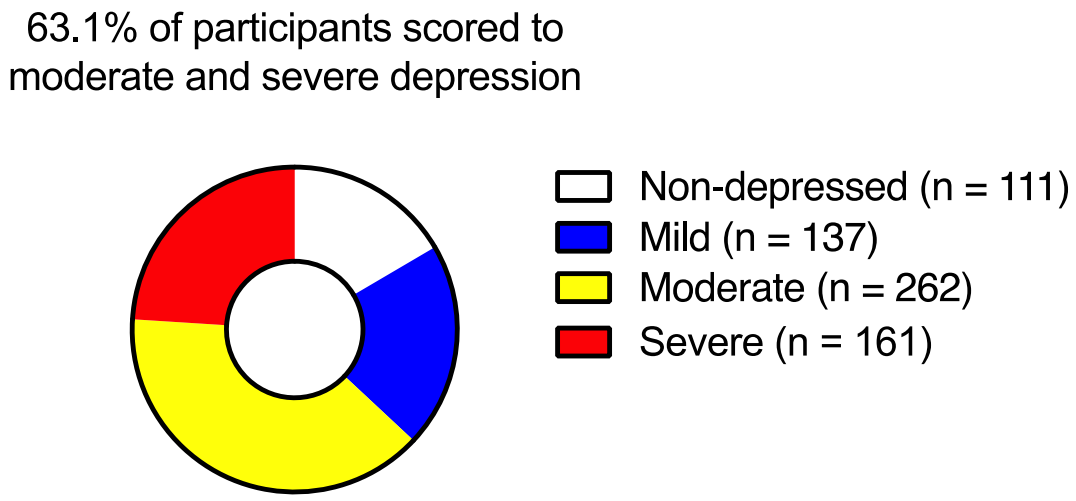
Graphic 1 – Representative graph of the score from all questionnaries completed on SAVE. Each dot represents the score from one questionnaire. The Beck Depression Inventory-II (BDI-II) scores varied from 0 to 63. Using the cutoff score listed by BECK et al. (1961), score less than 10 were non-depressed, score ranging from 10 to 16 were mildly depressed, score between 17 and 29 were moderately depressed, and score greater than 30 were severely depressed.



Source: Prepared by the author(s)

Our study revealed a higher prevalence than those reported in previous studies conducted at Brazilian universities (LOPES; NIHEI, 2021; RUFINO et al., 2024) and international universities (CHOW et al., 2021; SAYEED et al., 2023; SETIADI et al., 2021). The discrepancy may be attributed to the use of varying assessment scales or cut-off values. The higher prevalence of our study may be due to the chosen of cutoff score (BDI-II score higher than 9). While other studies used higher cutoff score (BDI-II score higher than 13) (SETIADI et al., 2021). Rezende et al. (2008) found a prevalence of 79% in medical students at a public university in Brazil. However, in their study, a cutoff score of 3 on the BDI was used (REZENDE et al., 2008).

Graphic 2 – Classification of severities of depression obtained through SAVE as non-depressed (BDI-II score less than 10), mild (BDI-II score ranging from 10 to 16), moderate (BDI-II score between 17 and 29), and severe (BDI-II score greater than 30) depressive symptoms. Percentage of cases of non-depressed (16.5%), mild (20.4%), moderate (39.1%), and severe (24.0%) depressive symptoms.



Source: Prepared by the author(s)

Moreover, our study utilized data from a seven-month period during the COVID-19 pandemic (March to September 2020). When we compute the scores obtained during this period alone, the prevalence of depression increased to 92.5%. The COVID-19 pandemic has exacerbated global worries about mental health, particularly in the psychological consequences observed during previous pandemics as a result of quarantine measures intended to prevent the spread of the virus and reduce the burden on healthcare systems (WORLD HEALTH ORGANIZATION, 2020). During the COVID-19 pandemic, students have faced additional stressors as disease prevention and protection measures have impacted education. There was an interruption in face-to-face activities, changes in schedules and the transition of classes to the virtual environment in most educational institutions around the world (LOPES; NIHEI, 2021). A study carried out during the COVID-19 pandemic

revealed that young people aged 18 to 25, especially university students, showed more symptoms of depression, anxiety and stress. The authors attributed this result to the additional stress caused by the need to adapt to remote educational activities (OZAMIZ-ETXEBARRIA et al., 2020). These measures involve significant changes of daily routines, including the suspension of person activities, the implementation of physical distancing protocols, and mandatory social isolation. Furthermore, these measures evoke fear of infection, disease severity, and the subsequent economic and social repercussions (LOPES; NIHEI, 2021).

Considering the increasing significance of mental health and well-being in the university students, it has become essential to develop strategies that promote help-seeking behavior among students and detect risk factors and early signs of potential mental health issues (ISHIMARU et al., 2023). Students are overwhelmed with a massive amount of information and have limited time to memorize it all. This excess of information generates feelings of disappointment and an inability to manage everything, resulting in an increased incidence of errors. In the end, this destabilizes the well-being of students and leads to illness (SIDDIQUI et al., 2020). It is important for professionals of educational to recognize the importance of the mental health as a key component for enhancing the overall quality of their educational systems (ALHENAKI et al., 2023).

CONCLUSION

The new internet-based tool for the emotional assessment of academics could direct undergraduate students with depressive symptoms to contact the multidisciplinary support team. This demonstrated be a good tool for early detection and intervention for mental health issues among students at university.

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