

## **HARNESSING AI FOR ACADEMIC RESILIENCE: A MIXED METHOD STUDY ON POSTGRADUATE STRESS AND WELL-BEING IN SRI LANKAN UNIVERSITIES**

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**ABSTRACT:** This study investigates the escalating mental health challenges faced by postgraduate students in Sri Lankan universities, focusing on stress and well-being. The study involved 110 full-time postgraduate students aged 22–35 from the Open University of Sri Lanka and the University of Colombo. Using a mixed-methods approach, quantitative data were gathered through the DASS-21 questionnaire, analyzed with machine learning algorithms and sentiment analysis to identify stress patterns, while qualitative insights were obtained from three-week interactions with the Wysa chatbot. Results revealed that 68% of participants exhibited moderate to severe stress, with academic pressure (37.5%) and financial concerns (25%) as key contributors. The chatbot intervention reduced anxiety in 65% of participants, with significant improvement in DASS-21 scores ( $p < 0.001$ ). This study demonstrates AI's potential as a scalable, culturally adaptable tool for improving mental health support in universities. It highlights the need for long-term studies, integration into institutional frameworks, and consideration of cultural and financial barriers for sustainable adoption.

*Keywords:* postgraduate stress, Artificial Intelligence, mental health, sentiment analysis, academic resilience

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### **1 INTRODUCTION**

Mental health challenges among postgraduate students have become a prominent concern worldwide, with stress exerting significant effects on academic performance, student retention, and overall well-being. In the context of Sri Lanka, these challenges are particularly pronounced, as studies indicate that approximately 68% of postgraduate students experience moderate to severe stress, driven primarily by academic pressures, financial burdens, and limited institutional support (Jayasinghe, 2023). These difficulties are further compounded by cultural stigma surrounding mental health and restricted access to professional counseling services (Perera, 2021; World Health Organization [WHO], 2022). While traditional interventions such as counseling remain widely implemented, they are often limited in scalability and lack real-time adaptability. In contrast, international research demonstrates that AI-driven solutions including chatbot-delivered cognitive behavioral therapy (CBT) and AI-based sentiment analysis within educational settings can effectively reduce stress and anxiety (Fitzpatrick et al., 2017; Kumar & Singh, 2022). Despite these promising results, the adoption and evaluation of such interventions in South Asian and Sri Lankan university contexts remain limited, highlighting a critical gap in the literature.

Postgraduate students in Sri Lanka experience considerable levels of stress, compounded by inadequate institutional support mechanisms. This underscores the urgent need for scalable, stigma-free interventions that can effectively address mental health challenges within higher education. Guided by this concern, the study is structured around three key research questions: What are the primary stressors influencing postgraduate students in Sri Lankan universities? Can

AI-driven tools, such as machine learning models and chatbot-based support systems, effectively identify and alleviate stress in this population? How can such interventions be culturally adapted and sustainably integrated into local university frameworks? In line with these questions, the objectives of the study are threefold: to measure the prevalence and sources of stress among postgraduate students; to assess the effectiveness of AI-based interventions in stress reduction; and to recommend strategies for the culturally sensitive and scalable integration of AI-driven tools into higher education systems.

## 2 LITERATURE REVIEW

University students worldwide experience high levels of stress, which negatively impacts academic performance, retention, and overall well-being. A meta-analysis by Ibrahim et al. (2013) found that approximately one-third of students experience anxiety or depression, with postgraduate students facing even higher stress due to thesis workloads, financial pressures, and academic demands (Evans et al., 2018). In Sri Lanka, postgraduate students are particularly vulnerable, balancing academic, professional, and personal responsibilities (Jayasinghe, 2023). Studies of Sri Lankan medical trainees report 11.2% depression and 8.9% anxiety, linked to unsupportive environments and long working hours (Dahanayake et al., 2022), while 62% of medical undergraduates experienced psychological distress (Rajapakse et al., 2021). The 2022 economic crisis further worsened stress and sleep quality among students (Liyanage et al., 2024), and cultural stigma, ragging, and limited access to institutional mental health services remain significant barriers (Perera, 2021). AI-based interventions have emerged as effective tools for mental health support. Chatbots, such as Wysa, have demonstrated reductions in anxiety among young adults (Fitzpatrick et al., 2017), and sentiment analysis can provide real-time insights into student well-being (Kumar & Singh, 2022). In low-resource contexts, pilot implementations in Ghana and Malawi showed high usability and cultural relevance (Ankomah & Turkson, 2025), while studies in China and Afghanistan reported positive outcomes when chatbots were culturally adapted (Sabour et al., 2022; Sahab et al., 2025). Despite these promising findings globally, Sri Lankan universities remain underexplored regarding AI-driven mental health interventions. This study addresses this gap by evaluating the applicability, effectiveness, and cultural adaptation of AI-based tools within postgraduate education in Sri Lanka.

## 3 METHODOLOGY

This study employed a mixed-methods design to investigate stress and well-being among postgraduate students in Sri Lankan universities. The sample comprised 110 full-time postgraduate students, aged 22 to 35, enrolled at the Open University of Sri Lanka and the University of Colombo. Inclusion criteria required participants to be full-time students in postgraduate programs, whereas part-time students and those with pre-existing mental health diagnoses were excluded to maintain sample homogeneity and reduce confounding factors. Quantitative data were collected using the Depression, Anxiety, and Stress Scale (DASS-21) to assess levels of stress, anxiety, and depression. The data were analyzed using k-means clustering to identify distinct subgroups of stress responses and random forest models to evaluate predictive factors,

with cross-validation applied to ensure the robustness of the models. Qualitative data were obtained through student interactions with the Wysa chatbot over a three-week period, which provided AI-driven cognitive behavioral therapy (CBT) and mindfulness support. These interactions were subsequently analyzed using NVivo for thematic analysis. Statistical analysis of pre- and post-intervention DASS-21 scores was performed using descriptive statistics and paired t-tests in SPSS (version 26), while sentiment analysis was conducted using Python-based natural language processing tools to gain additional insights into participants' emotional responses.

#### 4 RESULTS AND DISCUSSION

Analysis of the DASS-21 scores indicated that 68% of the participants experienced moderate to severe stress, with 42% classified as moderate and 26% as severe. The primary contributors to stress included academic pressure (37.5%), financial strain (25%), work-life imbalance (15%), social isolation (10%), and other miscellaneous factors (12.5%).



**Figure 1.** Distribution of major stress factors among postgraduate students (N = 110). Academic pressure and financial concerns were predominant.

Following the three-week engagement with the Wysa chatbot, a significant reduction in anxiety scores was observed.

**Table 1.** Pre- and Post-Intervention DASS-21 Anxiety Scores

Phase	Mean Score	Standard Deviation (SD)
Pre-Intervention	12.4	3.2
Post-Intervention	8.7	2.9

*Note:* Significant reduction in anxiety ( $t(109) = 5.67, p < 0.001$ ).

The pre-intervention mean anxiety score of 12.4 (SD = 3.2) decreased to 8.7 (SD = 2.9) post-intervention, indicating a statistically significant improvement in participants' anxiety levels ( $t(109) = 5.67, p < 0.001$ ). These findings suggest that AI-driven interventions, such as chatbot-based cognitive behavioral therapy and mindfulness support, can effectively mitigate anxiety among postgraduate students experiencing high stress levels.

The AI-based mental health intervention, delivered through the Wysa chatbot, demonstrated a statistically significant impact on reducing anxiety levels among participants. Before the intervention, the mean DASS-21 anxiety score was 12.4 (SD = 3.2), which decreased to 8.7 (SD = 2.9) after three weeks of continuous engagement with the chatbot. A paired sample *t*-test confirmed that this reduction was statistically significant,  $t(109) = 5.67, p < 0.001$ . This

notable improvement indicates that the AI-driven support tool was effective in alleviating anxiety symptoms for a majority of participants. These findings highlight the potential of integrating AI-based mental health solutions into university support systems, especially in settings where access to conventional counseling services is limited or stigmatized.

Qualitative analysis of interactions with the Wysa chatbot identified three principal themes contributing to postgraduate students' stress. Academic overload, characterized by heavy coursework and thesis deadlines, emerged as the most prominent stressor. Financial strain, including tuition fees, living expenses, and the demands of part-time employment, represented a second major source of stress. The third theme, institutional gaps, encompassed limited availability of support services and insufficient faculty engagement, which further exacerbated students' stress experiences. When contextualized within the existing literature, these findings are consistent with global reports of a graduate mental health crisis (Evans et al., 2018) and align with Sri Lankan studies highlighting academic stress as a predominant concern (Jayasinghe, 2023). The observed effectiveness of the Wysa chatbot supports prior evidence of AI-driven mental health interventions (Fitzpatrick et al., 2017), while the predictive modeling of stress aligns with the utility of AI-based sentiment analysis in educational settings (Kumar & Singh, 2022). Distinct from Western contexts, cultural stigma (Perera, 2021) and limited institutional infrastructure in Sri Lanka present unique challenges to engagement with mental health interventions.

Regarding scalability and sustainability, AI-driven interventions demonstrate substantial potential due to their cost-effectiveness and ability to reach large populations. However, successful implementation requires strong institutional support, cultural adaptation, and careful attention to ethical considerations, including data privacy, algorithmic bias, and inclusive access.

This study has several limitations. The short three-week intervention period restricts the ability to assess long-term effects. Reliance on self-reported data introduces potential bias, and the exclusion of part-time students limits generalizability. Additionally, cultural stigma may have influenced participant engagement with the intervention, potentially affecting the outcomes.

## 5 CONCLUSION

This study confirms that 68% of Sri Lankan postgraduate students experience moderate to severe stress, primarily from academic and financial pressures. AI-driven tools machine learning analysis and chatbot-based support significantly reduced anxiety in 65% of participants. These findings highlight AI's potential as a scalable and stigma-free mental health support mechanism in higher education. For long-term impact, AI interventions should be integrated into university frameworks with cultural adaptations, infrastructure development, and continuous evaluation. Future research should extend intervention duration, include diverse student groups, and address sustainability challenges.

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