



JOURNAL OF CREATIVE INDUSTRY AND SUSTAINABLE CULTURE

<https://e-journal.uum.edu.my/index.php/jcisc>

How to cite this article:

Gopalan,V., Bakar, J.A.A., & Youran,Z. (2025). ANTI-DA: Gamified mobile therapy for covid-19 depression and anxiety among university students. *Journal of Creative Industry and Sustainable Culture*, 4 (4), 42-55. <https://doi.org/10.32890/jcisc2025.4.4>

MOBILE THERAPY FOR DEPRESSION AND ANXIETY AMONG UNIVERSITY STUDENTS: THE ANTI-DA APP

¹Valarmathie Gopalan, ²Juliana Aida Abu Bakar, ³Abdul Syafiq Bahrin¹, ⁴Zhao Youran

School of Creative Industry Management & Performing Arts, Universiti Utara Malaysia,
Malaysia

School of Computing and Data Science, Xiamen University Malaysia, Malaysia

¹Corresponding author email: valarmathie.gopalan@uum.edu.my

Received: 16/8/2025

Revised: 3/9/2025

Accepted: 15/9/2025

Published: 31/10/2025

ABSTRACT

Depression and anxiety are critical mental health challenges among university students, often stemming from academic stress, social transitions, and personal uncertainties. Traditional counselling services, while beneficial, remain underutilized due to stigma, financial cost, and limited accessibility. This creates an urgent need for innovative and student-centered interventions that can provide immediate, engaging, and stigma-free support. Mobile health applications have shown promise in this regard, yet many lack features that sustain user motivation and active participation. Addressing this gap, the present study introduces and evaluates ANTI-DA, a gamified mobile therapy app specifically designed to help university students manage depression and anxiety. A quantitative pre-post research design was employed with thirty student participants, who completed standardized assessments of depression, anxiety, usability, and intrinsic motivation before and after using the app. Findings demonstrated significant reductions in depression and anxiety levels, alongside high usability ratings, immersive gameplay experiences, and strong intrinsic motivation. The study contributes to students, higher education stakeholders, and the broader community by offering both a practical intervention for future digital mental health solutions. Importantly, aligns with the United Nations' Sustainable Development Goal 3 (Good Health and Well-being), advancing efforts to promote accessible mental health support for university students.

Keywords: Anxiety, Depression, Gamification, Mobile application, Mental health

INTRODUCTION

Depression and anxiety are among the most pressing mental health concerns affecting university students worldwide. Academic pressures, financial instability, social transitions, and uncertainties about the future contribute to heightened stress, leaving students vulnerable to psychological distress if not adequately addressed. According to the World Health Organization (WHO), depression and anxiety are leading contributors to the global burden of disease, with young adults disproportionately affected (Kupcova, Danisovic, Klein, & Harsanyi, 2023). In Malaysia and other nations, the prevalence of these conditions among university students has raised urgent concerns for both educators and policymakers (Shek, Zhu, & Dou, 2023; Haikal, Doucette, Meisel, Birch, & Barnett, 2022; Yang, Ye, & Feng, 2021). This highlights the importance of aligning mental health interventions with the United Nations' Sustainable Development Goal (SDG) 3: Good Health and Well-being, which emphasizes the need for accessible, equitable, and effective mental health services for all.

Traditional counselling and psychotherapy have long been recognized as effective in treating depression and anxiety. However, they are often hindered by structural and cultural barriers that limit their relevance and accessibility in today's context. Besides that, a long waiting lists, limited availability of trained professionals, financial costs, and the most importantly the illusion of stigma associated with seeking mental health care prevent many students from obtaining timely support. Moreover, these approaches tend to be resource-intensive and difficult to scale, making them insufficient to meet the needs of increasingly large and diverse student populations. As a result, traditional methods, while valuable, no longer adequately address the demand for fast, flexible, and student-centered mental health support for Gen Zs.

In response, digital platforms have emerged as promising alternatives. Mobile health applications, in particular, offer an accessible, cost-effective, and stigma-free means of delivering mental health interventions. With rising smartphone penetration among young people, such tools are well-positioned to integrate into students' daily routines. Nevertheless, despite their potential, many existing mental health apps lack engaging features that encourage sustained use and intrinsic motivation. Students frequently abandon these tools after minimal interaction, limiting their therapeutic impact. This underscores the gap for innovative interventions that not only deliver evidence-based therapy but also foster long-term engagement.

Gamification has gained significant attention as a strategy to address this challenge. By incorporating elements such as points, challenges, leaderboards, and rewards into non-game contexts, gamification has been shown to enhance user motivation and adherence (Al Fatta, Maksom, & Zakaria, 2018). Empirical studies indicate that gamified interventions can improve participation, reduce symptoms of depression and anxiety, and increase intrinsic motivation (Xie, 2022; Firth, Torous, Nicholas, Carney, Rosenbaum & Sarris, 2017; Josephine, Josefine, Philipp, David & Harald, 2017). Despite these promising outcomes, the majority of gamified mental health applications remain exploratory, with limited evaluation in higher education contexts, particularly within Malaysia.

To address this gap, the present study introduces and evaluates ANTI-DA, a gamified mobile app designed to reduce depression and anxiety among university students.

RELATED WORKS

WHAT IS GAMIFICATION?

Gamification refers to the integration of game design elements such as points, badges, leaderboards, challenges, and rewards into non-game contexts with the aim of enhancing user engagement, motivation, and overall experience (Deterding, Dixon, Khaled & Nacke, 2011; Hunter & Werbach, 2012). The core principle is not to transform the activity itself into a game, but rather to leverage mechanics traditionally associated with games to encourage sustained participation and desirable behaviours. Scholars generally

agree that gamification transforms otherwise routine or monotonous activities into more interactive and enjoyable experiences (Cheng, Davenport, Johnson, Vella & Hickie, 2019).

The first game application orientation, involves employing complete games in contexts such as learning or therapy. For example, SPARX, a serious game designed to deliver cognitive behavioural therapy (Del Vecchio, Mammarella, Giusti, Casacchia & Roncone, 2024), has been used successfully with adolescents experiencing depression. The second, beyond gaming orientation, embeds specific game elements into existing platforms or processes. This is evident in fitness applications like Nike Run Club (Rodrigues, Lopes, Borges, Oliveira & Oliveira, 2021), which use leaderboards, virtual badges, and progress tracking to promote physical activity and adherence to exercise routines. Besides that, gamification has gained prominence in education, health promotion, and behavioural change interventions. In education, platforms such as Kahoot! and Duolingo demonstrate how leaderboards, streaks, and rewards can sustain learners' motivation over extended periods. In healthcare, mobile apps like Zombies, run! combine storytelling with mission-based tasks to encourage jogging and physical exercise, showing that narrative elements can be as impactful as points or scores (Farič, Potts, Rowe, Beaty, Hon & Fisher, 2021). Such examples underline the growing recognition that gamification is not only about competition but also about embedding feedback, narrative, and storytelling to sustain long-term engagement (Ibrahim, Jamali, & Suhaimi, 2021).

Despite this growing interest, much of the current research on gamification remains exploratory, with limited empirical testing in clinical or mental health contexts. While features such as points, levels, and leaderboards are commonly adopted (Mekler, Brühlmann, Tuch, & Opwis, 2017; Mekler, Brühlmann, Opwis, & Tuch, 2013), other potentially powerful components such as personalized avatars, adaptive feedback systems, and social interaction features are still underutilized (Kalogiannakis, Papadakis, & Zourmpakis, 2021). For instance, personalized avatars have been shown to increase identification and immersion in digital interventions, yet few mental health applications integrate such features systematically. Similarly, adaptive feedback that adjusts to a user's progress could strengthen perceived support, but its application is often limited to experimental prototypes.

This signals the need for more targeted applications and rigorous evaluations, particularly among vulnerable groups such as university students. As this population faces high academic stress and unique developmental challenges, gamification holds potential to make mental health interventions not only more accessible but also more engaging. Therefore, this study proposes a gamified mobile application can bridge the gap between traditional interventions and the lived experiences of university students by combining therapeutic content with interactive and motivational mechanics.

GAMIFICATION IN MENTAL HEALTH

Depression and anxiety are among the most common mental health disorders affecting young adults, particularly university students. Research consistently shows that these conditions frequently co-occur, with estimates suggesting up to 90% comorbidity between the two (Bartova et al., 2023). This overlap complicates diagnosis and treatment, as symptoms such as persistent sadness, loss of motivation, excessive worry, and physical manifestations like fatigue or sleep disturbance often intersect. Comorbidity also increases the risk of poor academic performance, social withdrawal, and suicidal ideation, underscoring the need for holistic and integrative approaches to intervention (Tiller, 2012).

A range of therapies has proven effective in addressing depression and anxiety. Cognitive Behavioral Therapy (CBT) remains the gold standard, focusing on restructuring negative thought patterns and maladaptive behaviors (Beck, Rush, Shaw, Emery, DeRubeis, & Hollon, 2024). Complementary approaches, however, have gained recognition for their capacity to enhance well-being. Music therapy has demonstrated efficacy in reducing depressive symptoms and improving emotional regulation (Erkkilä et al., 2011). Hope therapy, grounded in Snyder's hope theory, emphasizes goal-setting and pathways thinking, which have been shown to strengthen resilience and self-efficacy among students (Tian, Yan, &

Wang, 2018). Likewise, laughter therapy has emerged as a cost-effective, non-invasive method that can reduce stress and anxiety levels while enhancing social connectedness (Ozturk & Tekkas-Kerman, 2022).

Despite their effectiveness, these therapies face barriers in traditional delivery formats. University students often encounter stigma, making them reluctant to seek counselling. Accessibility remains another concern, with limited numbers of trained professionals leading to long waiting lists. Additionally, the cost of therapy sessions can be prohibitive, especially for students from lower-income backgrounds. Even when services are available, the rigidity of scheduling and the lack of integration into students' daily lives reduce the likelihood of consistent participation.

Recent studies in Malaysia reveal alarming levels of depression and anxiety among university students, underscoring the urgency of addressing these issues locally. Azlan, Mohamad, Dahlan, Ismail, Kadir, Kamaruddin, Shibraumalisi, Syed Mohamad dan Shamsuddin (2024) reported that nearly 31% of students experienced depression, while up to 60% reported anxiety and 26% stress. A national survey further indicated that about 29% of students were at risk of anxiety, with prevalence cutting across both public and private universities (Azlan et al., 2024). Wong, Wong, Ng, Bostanudin, & Tan (2023) found that 53.9% of students experienced moderate to extremely severe depression, 66.2% reported anxiety, and 44.6% reported stress. According to Amir Hamzah, Nik Farid, Yahya, Chin, Su, Rampal dan Dahlui (2019) revealed that among first-year undergraduates, 21% had depression, 50% anxiety, and 12% stress. More recently. These findings expose not only the alarming prevalence of mental health challenges among Malaysian university students but also the inadequacy of conventional approaches demanding urgent exploration of innovative, accessible, and stigma-free interventions that can be meaningfully embedded into students' everyday lives.

GAMIFICATION AND MENTAL HEALTH INTERVENTIONS

Gamification has emerged as a promising strategy in mental health interventions, offering an innovative way to address challenges of engagement and motivation. However, existing research demonstrates both potential and limitations. Table 1 provides a structured overview of key studies, their focus, findings, and identified gaps.

Table 1

Existing Studies on Gamification and Mental Health

First Author & Year	Focus	Key Findings	Limitations / Gap
Firth et al. (2017)	Smartphone interventions for anxiety & depression	Mobile-based interventions reduce symptoms effectively	Did not explore gamification; general population focus
Josephine et al. (2017)	Internet/mobile depression interventions	Online therapy effective in symptom reduction	Lack of engaging features to sustain user adherence
Fleming et al. (2017)	Serious games & gamification in mental health	Games show promise for therapy delivery	Limited clinical trials; focus on children/adolescents
Xie (2022)	Gamification for children's mental health	Identified positive features (points, feedback)	Evidence still preliminary; narrow age group
Boon & Fung (2014)	Serious games & gamification	Autonomy and avatars boost motivation	Not tested with university students
Homm (2021)	Gamification for young adults with depression	Gamification increases focus and motivation	Conceptual design, limited empirical data

Ibrahim et al. (2021)	Gamification design for mental health	Highlighted importance of narrative & feedback	No large-scale empirical testing
Kalogiannakis et al. (2021)	Gamification in education	Storytelling, avatars, quizzes enhance engagement	Application in mental health remains underexplored

The reviewed literature shows that mobile and internet-based interventions are effective in reducing depression and anxiety symptoms (Firth et al., 2017; Josephine et al., 2017). However, their long-term impact is limited by a lack of features that sustain user engagement. Gamification has been identified as a viable strategy to overcome this barrier, with design elements such as points, feedback, storytelling, and avatars shown to boost intrinsic motivation and adherence (Boon & Fung, 2014; Ibrahim et al., 2021; Kalogiannakis et al., 2021).

Nevertheless, most studies remain exploratory or conceptual in nature (Homm, 2021; Ibrahim et al., 2021), and empirical validation of gamification's therapeutic effectiveness is still limited. Much of the research has also been conducted among children or general populations (Fleming et al., 2017; Xie, 2022), leaving university students who face distinct academic pressures, transitional challenges, and social stressors largely underexamined. Contextually, in Malaysia and other similar cultural settings, the scarcity of research is particularly striking (Zailani, Ahmad, Tuah & Tze, 2025), given that stigma and limited access to professional support strongly influence how students engage with mental health resources.

Another gap in the literature is the narrow therapeutic scope of many existing interventions. While individual therapies such as CBT or resilience training have been incorporated into gamified apps, few platforms integrate multiple evidence-based therapies into a single cohesive framework. This reduces their ability to holistically address the complex and comorbid nature of depression and anxiety.

Hence, this study addresses this gap by proposing ANTI-DA, a gamified mobile application specifically designed for Malaysian university students. Unlike many previous interventions, ANTI-DA integrates a range of therapies including CBT, music therapy, hope therapy, and laughter therapy within an engaging gamified structure. In doing so, it provides not only an accessible and stigma-free avenue for mental health support, which is aligned with SDG Goal 3: Good Health and Well-being.

METHODOLOGY

This study adopted a Design and Development Research (DDR) approach, which is widely recognized for the systematic creation and evaluation of innovative technological solutions. DDR emphasizes both the practical development of interventions and the empirical testing of their effectiveness through iterative refinement. In this study, DDR was applied to the design and development of ANTI-DA, a gamified mobile application aimed at reducing depression and anxiety among university students, followed by a pilot usability and feasibility evaluation.

A quantitative pre-post research design was employed to measure psychological changes before and after participants engaged with the app. A total of 30 undergraduate students were recruited through purposive sampling, reflecting the study's focus on university students as a group particularly vulnerable to depression and anxiety. While the sample size is relatively small, it aligns with the purpose of pilot testing, which seeks to refine intervention design, usability, and measurement instruments rather than generate broadly generalizable findings.

Evaluation of the app integrated usability, engagement, motivation, and psychological outcomes using validated instruments. The System Usability Scale (SUS) was used to measure user perceptions of usability, while the Game Experience Questionnaire (GEQ) assessed immersion, flow, and enjoyment during gameplay. The Intrinsic Motivation Inventory (IMI) evaluated motivation, interest, and satisfaction

generated by gamification features, and the Depression, Anxiety, and Stress Scale (DASS-21) was administered pre- and post-intervention to measure changes in participants' mental health status.

Framing this project as a DDR study combined with pilot usability testing strengthens its methodological rigor and replicability. By combining multiple evaluation tools, the methodology captures both the technical performance and the therapeutic potential of the ANTI-DA app.

DESIGN AND DEVELOPMENT OF ANTI-DA APP

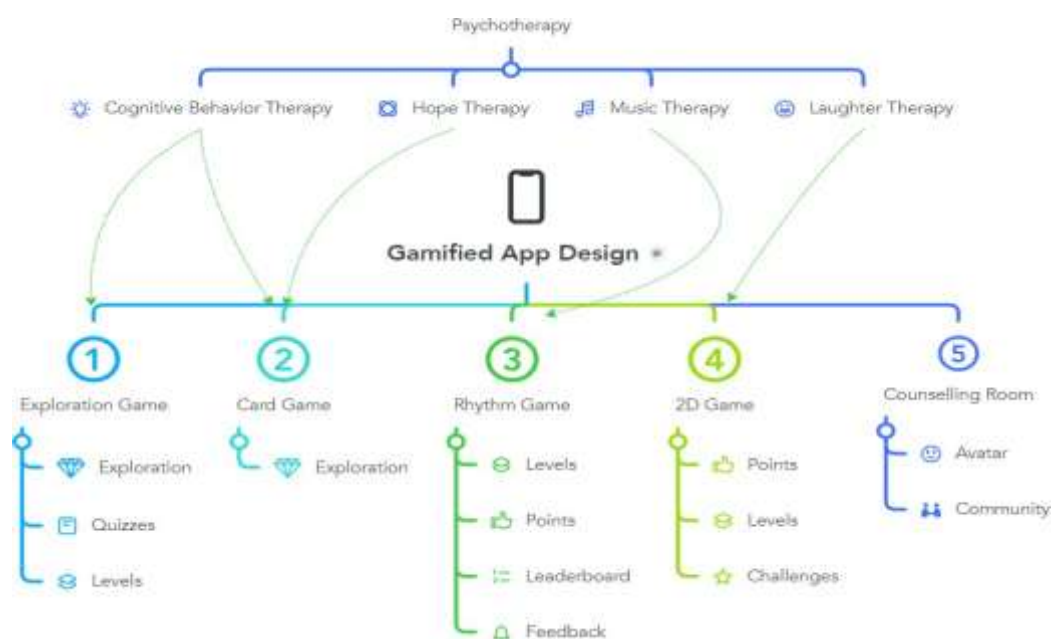
The design of ANTI-DA was grounded in psychotherapy approaches while incorporating gamification elements to maximize engagement and sustain user motivation. Four therapeutic techniques were integrated into the app, namely cognitive behavioral therapy (CBT), music therapy, hope therapy, and laughter therapy. These approaches were carefully selected based on their proven effectiveness in addressing depression and anxiety, and then translated into interactive digital modules designed for university students.

The app consisted of four game-based modules and one online therapy chat room; each strategically aligned with therapeutic objectives. For example, the module Hope Exploration combined CBT and hope therapy by guiding students through exploration tasks and reflective quizzes designed to reframe negative thoughts and encourage goal-oriented thinking. Rhythm Star embedded music therapy into a rhythm-based game where players tapped in synchrony with music, with progression tracked through points, levels, and leaderboards. Another module, Dot Fighter, creatively incorporated laughter therapy by using humorous and light-hearted interactions to reduce tension and enhance positive emotions. Additionally, a motivational card game was designed to integrate CBT and hope therapy principles, using randomized challenges and exploration cards to encourage problem-solving, reflection, and resilience building.

In addition to the gaming modules, the Therapy Room function served as an online chat feature that enabled therapist–student communication. This space was enriched with customizable avatars and light social interaction features, which reduced the sense of isolation often associated with self-guided therapy apps. By embedding elements such as rewards, progression systems, feedback loops, and storytelling narratives, each module was designed to ensure that therapeutic engagement was both enjoyable and clinically meaningful.

Figure 1

Mapping of the ANTI-DA App Design with Psychotherapy



ANTI-DEPRESSION AND ANXIETY APP

The “ANTI-DA” app was designed to target the prevalent issues of depression and anxiety among university students. This comprehensive app comprises five distinct modules, including four interactive games and an online chat room dedicated to therapy and therapeutic sessions. Each module is carefully tailored to integrate specific psychotherapy techniques alongside engaging gamification elements to ensure maximum user involvement and therapeutic impact. The app's user interface features a well-structured main menu and settings menu, accompanied by a detailed narration aimed at acquainting users with the app's mission and functionality. The interactive gaming modules are thoughtfully designed to cater to different psychotherapeutic approaches and include Rhythm Star, Dot Fighter, a card game, and Hope Exploration. Additionally, the online chat room, known as the Therapy Room, provides a crucial platform for facilitating professional treatment sessions and user interaction. The ANTI-DA interfaces are as shown in Figure 2(a), (b), (c), (d), (e), (f).

Rhythm Star, the music rhythm puzzle game within the app, provides users with an immersive music therapy experience. By engaging with falling notes set to soothing tunes, players can utilize various actions such as tapping, swiping, holding, and countering, creating a deeply engaging and focused gaming encounter. The incorporation of gamification elements such as dynamic difficulty levels, point systems, real-time feedback, progress bars, and leaderboards ensures heightened user engagement and motivation. Dot Fighter game, players navigate a large dot to collect smaller dots while avoiding missed dots that could reduce their health points. Laughter therapy is creatively embedded within this game as a sound effect, adding an innovative therapeutic element. The game is structured into six levels of increasing difficulty and includes gamification elements like scoring and progression levels to effectively motivate and challenge the players.

The card game module seamlessly integrates cognitive behavioral therapy (CBT) and hope therapy, allowing users to draw and read motivational cards as part of their therapeutic journey. By incorporating elements of exploration and randomness during the drawing process, the game aims to empower users with motivational quotes intended to foster a positive outlook and emotional well-being.

Hope Exploration, another interactive module, is designed as an immersive exploration game that effectively combines CBT and hope therapy. Through a series of sessions, players uncover hidden information and participate in reinforcing quizzes, thereby facilitating the internalization and application of therapeutic concepts. The game integrates elements including diverse levels, exploration dynamics, and interactive quizzes to actively engage and challenge the users.

The Therapy Room, the online chat module within the app, provides a vital platform for users to interact with therapists and peers. Featuring gamification elements such as avatars and interactive social features including likes, edits, and deletions, the module seeks to enrich the therapeutic experience and foster a sense of community and support among users.

Figure 2

(a) Main Menu (b) Rhythm Game World (c) Dot Fighter (d) Cognitive Behaviour Therapy and Hope Therapy (e) Quizzes (f) Counselling Room



RESULT

The evaluation of the ANTI-DA app focused on usability, game experience, and intrinsic motivation to determine its effectiveness as a gamified mental health intervention. The System Usability Scale (SUS) results indicated strong usability, with the app achieving an average score of 82.2. According to Sauro's (2010) grading scale, this score is classified as "good." A closer look at the distribution of responses showed that 57% of participants rated the app with an A grade and 43% with a B grade, confirming that users found the app intuitive, accessible, and easy to navigate.

Beyond usability, the Game Experience Questionnaire (GEQ) was used to assess participants' overall gameplay experience across seven dimensions: Immersion, Flow, Competence, Positive Affect, Negative Affect, Tension, and Challenge.

As shown in Figure 3, the results highlighted overwhelmingly positive experiences. Immersion scores ranged from 4.20 to 4.37, reflecting high levels of sensory and imaginative involvement. Flow scores between 3.23 and 4.20 suggested that participants were able to focus effectively during gameplay. Competence scores, ranging from 3.60 to 4.00, indicated that players experienced a sense of achievement and mastery. Similarly, Positive Affect scores between 4.30 and 4.37 revealed strong enjoyment and happiness. Conversely, dimensions associated with negative experiences scored low. Tension/Annoyance averaged 1.93, while Negative Affect ranged from 1.63 to 1.80, suggesting that the app did not induce frustration or distress. The Challenge dimension, with scores between 2.40 and 3.37, indicated a moderate level of difficulty, which was sufficient to maintain engagement without overwhelming users. These results demonstrate that participants found the app to be engaging, enjoyable, and free from unnecessary stress or negative emotional responses.

Further insights were obtained from the Intrinsic Motivation Inventory (IMI), which assessed interest and enjoyment, perceived impact on depression and anxiety, and the value and usefulness of the app. As illustrated in Figure 4, the results were consistently high across all categories. The average score for interest and enjoyment was 6.04, indicating that participants were highly motivated to use the app. The average score for depression and anxiety reduction was 6.07, reflecting participants' perceptions of significant improvements in their mental health. Finally, the value and usefulness dimension achieved an average of

6.02, confirming that users regarded the app as an important and beneficial tool for addressing student well-being.

Taken together, these findings demonstrate that ANTI-DA was perceived as a highly usable, engaging, and meaningful intervention. The combination of strong usability ratings, positive gameplay experiences, and high motivational scores indicates that the app successfully integrated therapeutic and gamification elements to provide both clinical and experiential benefits for university students.

Figure 3

Game

Experience

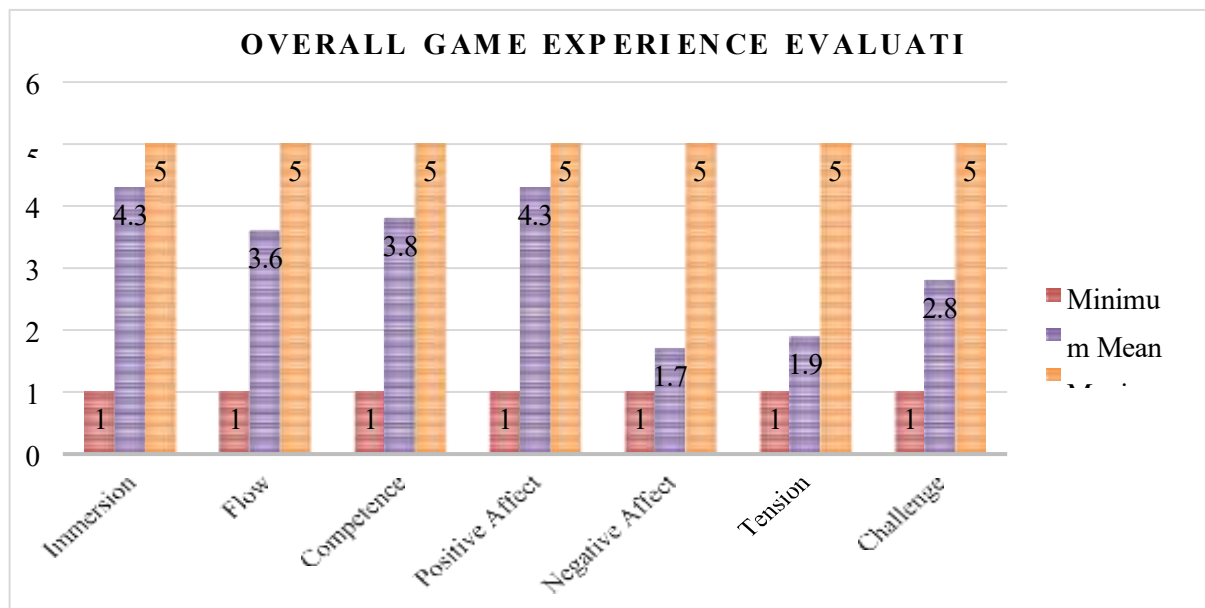
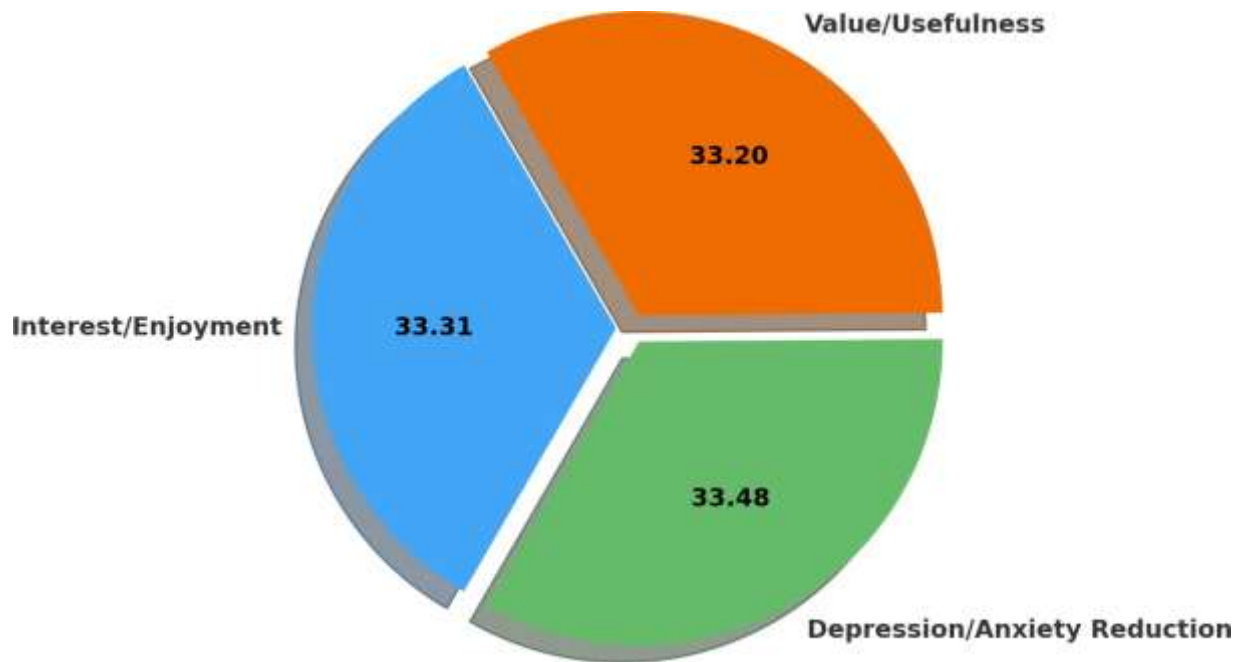


Figure 4

Intrinsic Motivation Inventory (IMI)



DISCUSSION

The findings of this study demonstrate that the ANTI-DA app achieved strong usability, reflected in high SUS scores, suggesting that participants found the app easy to navigate and intuitive to use. This result aligns with previous studies emphasizing that usability is a key determinant of sustained engagement with digital mental health interventions (Zhou, Li, Havawala, & Lepp, 2022). Beyond usability, the integration of gamification features provided participants with an immersive and engaging experience. High scores for immersion, competence, and positive affect highlight the app's effectiveness in fostering sustained focus, promoting feelings of accomplishment, and eliciting enjoyment. These findings are consistent with prior work that has shown gamification to enhance intrinsic motivation and therapeutic adherence (Firth et al., 2017; Sardi, Idri, & Fernández-Alemán, 2017).

Low scores for negative affect and tension further suggest that the app was unlikely to induce frustration or boredom, but instead helped alleviate anxiety. This pattern resonates with outcomes from earlier gamified interventions such as *SPARX*, which also demonstrated reductions in depression and anxiety without generating additional stress (Schoneveld, Lichtwarck-Aschoff, & Granic, 2018). The integration of multiple therapeutic approaches—including CBT, music therapy, hope therapy, and laughter therapy—distinguishes ANTI-DA from many existing health apps, which often lack evidence-based foundations (Torous, Nicholas, Larsen, Firth, & Christensen, 2018).

The Intrinsic Motivation Inventory (IMI) results offer further support for the app's impact. The high average score for interest and enjoyment (6.04) indicates that gamification elements effectively captured user engagement, supporting Boon and Fung's (2014) argument that autonomy and avatar control can significantly enhance motivation. The score for depression and anxiety reduction (6.07) confirms the perceived therapeutic value, consistent with meta-analyses showing the effectiveness of digital CBT and gamified approaches in reducing mental health symptoms (Firth et al., 2017). Finally, the score for value and usefulness (6.02) suggests that participants saw the app as a relevant and beneficial tool for their daily lives, echoing Shek, Zhu, and Dou's (2023) call for accessible, stigma-free interventions tailored to young people.

Despite these promising findings, limitations must be acknowledged. The small sample size restricts generalizability, reflecting a common challenge in pilot studies of gamified mental health tools (Fleming et al., 2017). Additionally, the short-term evaluation does not address the sustainability of outcomes over longer periods. Future research should therefore expand to larger, more diverse samples, incorporate longitudinal designs, and explore the potential of underutilized gamification features such as adaptive feedback and social collaboration, which may further enhance engagement and therapeutic impact (Kalogiannakis, Papadakis, & Zourmpakis, 2021).

CONCLUSION

This study provides evidence that the ANTI-DA app is a promising gamified mobile intervention for reducing depression and anxiety among university students. By integrating evidence-based therapies with gamification mechanics, the app demonstrated strong usability, immersive user experiences, and high motivational outcomes. These results highlight its potential as an engaging, accessible, and stigma-free complement to traditional counselling services.

Beyond practical outcomes, this study contributes to the broader discourse on digital mental health by illustrating how therapeutic content can be meaningfully embedded in gamified systems. The findings align with the United Nations' Sustainable Development Goal 3 (Good Health and Well-being), advancing efforts to ensure inclusive and equitable access to mental health support.

Future research should involve larger and more diverse student populations, adopt longitudinal designs to examine sustained impacts, and explore advanced gamification features such as adaptive feedback and peer support to further strengthen engagement. Collaboration with universities and mental health professionals is also encouraged to embed apps like ANTI-DA into broader student wellness strategies.

The primary beneficiaries of this study are university students, who gain accessible and stigma-free support for their mental health, and higher education institutions, which can adopt the app as a scalable complement to existing services. More broadly, the app also benefits mental health practitioners, policy-makers, researchers, and developers, offering a replicable framework for innovative digital health solutions. By supporting the cultivation of a mentally healthier youth demographic who represent the future of the nation the app holds considerable promise in enhancing overall mental health outcomes and contributing to long-term societal well-being.

ACKNOWLEDGMENTS

This research did not receive any specific grant from funding agencies in the public or commercial sectors.

AUTHOR CONTRIBUTIONS

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by all authors.

CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS STATEMENT

Informed consent was obtained from all individual participants included in the study.

REFERENCES

- Amir Hamzah, N. S., Nik Farid, N. D., Yahya, A., Chin, C., Su, T. T., Rampal, S. R. L., & Dahlui, M. (2019). The prevalence and associated factors of depression, anxiety and stress of first year undergraduate students in a public higher learning institution in Malaysia. *Journal of Child and Family Studies*, 28(12), 3545-3557. <https://doi.org/10.1007/s10826-019-01537-y>
- Azlan, S. M., Mohamad, F., Dahlan, R., Ismail, I. Z., Kadir, H., Kamaruddin, K. N., Shibraumalisi, N.A., Syed Mohamad, S.N., & Shamsuddin, N. H. (2024). Self-system and mental health status among Malaysian youth attending higher educational institutions: A nationwide cross-sectional study. *Malaysian Family Physician*, 19, 1-10. <https://doi.org/10.51866/oa.341>
- Al Fatta, H., Maksom, Z., & Zakaria, M. H. (2018). Game-based learning and gamification: Searching for definitions. *International Journal of Simulation: Systems, Science and Technology*, 19(6), 41.1–41.5. <https://doi.org/10.5013/IJSSST.a.19.06.41>
- Bartova, L., Dold, M., Volz, H. P., Seifritz, E., Möller, H. J., & Kasper, S. (2023). Beneficial effects of Silexan on co-occurring depressive symptoms in patients with subthreshold anxiety and anxiety disorders: Randomized, placebo-controlled trials revisited. *European Archives of Psychiatry and Clinical Neuroscience*, 273(1), 51–63. <https://doi.org/10.1007/s00406-022-01390-z>
- Beck, A. T., Rush, A. J., Shaw, B. F., Emery, G., DeRubeis, R. J., & Hollon, S. D. (2024). *Cognitive therapy of depression*. Guilford Publications.
- Boon, J. S. T., & Fung, D. S. S. (2014). Serious games and the gamification of mental health interventions. In *Serious Games* (pp. 89–110). Springer. https://doi.org/10.1007/978-981-4560-26-9_6

- Cheng, V. W. S., Davenport, T., Johnson, D., Vella, K., & Hickie, I. B. (2019). Gamification in apps and technologies for improving mental health and well-being: Systematic review. *JMIR Mental Health*, 6(6), e13717. <https://doi.org/10.2196/13717>
- Christians, G. (2018). The origins and future of gamification. *Scholar Commons*, 21(2), 127–148. https://scholarcommons.sc.edu/senior_theses/254
- Del Vecchio, S., Mammarella, S., Giusti, L., Casacchia, M., & Roncone, R. (2024). ‘I Can’t Get No Satisfaction’... Experience in the treatment, satisfaction, and professional support of young depressed people using SPARX. *Rivista di psichiatria*, 59(4), 139-146.
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining “gamification.” In *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments* (pp. 9–15). ACM. <https://doi.org/10.1145/2181037.2181040>
- Erkkilä, J., Punkanen, M., Fachner, J., Ala-Ruona, E., Pönttiö, I., Tervaniemi, M., Vanhala, M., & Gold, C. (2011). Individual music therapy for depression: Randomised controlled trial. *British Journal of Psychiatry*, 199(2), 132–139. <https://doi.org/10.1192/bjp.bp.110.085431>
- Farič, N., Potts, H. W., Rowe, S., Beaty, T., Hon, A., & Fisher, A. (2021). Running app “Zombies, Run!” users' engagement with physical activity: A qualitative study. *Games for Health Journal*, 10(6), 420-429.
- Firth, J., Torous, J., Nicholas, J., Carney, R., Rosenbaum, S., & Sarris, J. (2017). Can smartphone mental health interventions reduce symptoms of anxiety? A meta-analysis of randomized controlled trials. *Journal of Affective Disorders*, 218, 15–22. <https://doi.org/10.1016/j.jad.2017.04.046>
- Fleming, T. M., Bavin, L., Stasiak, K., Hermansson-Webb, E., Merry, S. N., Cheek, C., Lucassen, M., Lau, H. M., Pollmuller, B., & Hetrick, S. (2017). Serious games and gamification for mental health: Current status and promising directions. *Frontiers in Psychiatry*, 7, 215. <https://doi.org/10.3389/fpsy.2016.00215>
- Haikalas, M., Doucette, H., Meisel, M. K., Birch, K., & Barnett, N. P. (2022). Changes in university student anxiety and depression from pre- to during-COVID-19: Perceived stress, academic challenges, loneliness, and positive perceptions. *Emerging Adulthood*, 10(2), 534–545. <https://doi.org/10.1177/21676968211058516>
- Homm, B. (2021). Gamification for mental health: Designing a supportive treatment concept for depression in young adults (Doctoral dissertation, Technische Hochschule Ingolstadt).
- Hunter, D., & Werbach, K. (2012). *For the win* (Vol. 2). Wharton Digital Press.
- Ibrahim, E. N. M., Jamali, N., & Suhaimi, A. I. H. (2021). Exploring gamification design elements for mental health support. *International Journal of Advanced Technology and Engineering Exploration*, 8(74), 114–125. <https://doi.org/10.19101/IJATEE.2020.S1762123>
- Jing, Z., Gangshan, F., Xin, Z., & Haizhong, Z. (2019). Gamification in the field of educational technology: A learning catalyst of beyond gaming. *E-Education Research*, 40(3), 20–26. <https://doi.org/10.13811/j.cnki.eer.2019.03.003>
- Josephine, K., Josefine, L., Philipp, D., David, E., & Harald, B. (2017). Internet- and mobile-based depression interventions for people with diagnosed depression: A systematic review and meta-analysis. *Journal of Affective Disorders*, 223, 28–40. <https://doi.org/10.1016/j.jad.2017.07.021>
- Kalogiannakis, M., Papadakis, S., & Zourmpakis, A. I. (2021). Gamification in science education: A systematic review of the literature. *Education Sciences*, 11(1), 22. <https://doi.org/10.3390/educsci11010022>
- Kupcova, I., Danisovic, L., Klein, M., & Harsanyi, S. (2023). Effects of the COVID-19 pandemic on mental health, anxiety, and depression. *BMC Psychology*, 11(1), 108. <https://doi.org/10.1186/s40359-023-01130-5>
- Mekler, E. D., Brühlmann, F., Opwis, K., & Tuch, A. N. (2013). Do points, levels and leaderboards harm intrinsic motivation? An empirical analysis of common gamification elements. *Proceedings of the First International Conference on Gameful Design, Research, and Applications*, 66–73. <https://doi.org/10.1145/2583008.2583017>

- Mekler, E. D., Brühlmann, F., Tuch, A. N., & Opwis, K. (2017). Towards understanding the effects of individual gamification elements on intrinsic motivation and performance. *Computers in Human Behavior*, 71, 525–534. <https://doi.org/10.1016/j.chb.2015.08.048>
- Ozturk, F. O., & Tekkas-Kerman, K. (2022). The effect of online laughter therapy on depression, anxiety, stress, and loneliness among nursing students during the COVID-19 pandemic. *Archives of Psychiatric Nursing*, 41, 271–276. <https://doi.org/10.1016/j.apnu.2022.09.006>
- Rodrigues, I., Lopes, J. M., Borges, A., Oliveira, J., & Oliveira, M. (2021). How can Gamified applications drive engagement and brand attitude? The case of Nike run club application. *Administrative Sciences*, 11(3), 92.
- Report Linker. (2022, April 4). Global mental health apps market size, share & industry trends analysis report by application, by platform type, by regional outlook and forecast, 2021–2027. <https://finance.yahoo.com/news/global-mental-health-apps-market-095700210.html>
- Sardi, L., Idri, A., & Fernández-Alemán, J. L. (2017). A systematic review of gamification in e-Health. *Journal of Biomedical Informatics*, 71, 31–48. <https://doi.org/10.1016/j.jbi.2017.05.011>
- Sauro, J. (2010). A practical guide to measuring usability. Measuring Usability LLC, Denver, 12, 124.
- Shek, D. T., Zhu, X., & Dou, D. (2023). A mental health survey and the promotion of psychological well-being in university students under COVID-19. *Journal of Alternative Medicine Research*, 15(1), 9–173.
- Tian, M., Yan, S., & Wang, N. (2018). Evaluating the effectiveness of Snyder's theory-based group hope therapy to improve self-efficacy of university students in finance. *NeuroQuantology*, 16(6), 118–124.
- Tiller, J. W. G. (2012). Depression and anxiety. *Medical Journal of Australia*, 1(October), 28–32. <https://doi.org/10.5694/mja12.10628>
- Wong, S. S., Wong, C. C., Ng, K. W., Bostanudin, M. F., & Tan, S. F. (2023). Depression, anxiety, and stress among university students in Selangor, Malaysia during COVID-19 pandemics and their associated factors. *PloS one*, 18(1), e0280680.
- Xie, H. (2022). A scoping review of gamification for mental health in children: Uncovering its key features and impact. *Archives of Psychiatric Nursing*, 41(1), 132–143. <https://doi.org/10.1016/j.apnu.2022.07.003>
- Yang, C., Ye, H. J., & Feng, Y. (2021). Using gamification elements for competitive crowdsourcing: Exploring the underlying mechanism. *Behaviour & Information Technology*, 40(9), 837–854. <https://doi.org/10.1080/0144929x.2020.1733088>
- Zailani, A. U., Ahmad, W. N. W., Tuah, N. M., & Tze, N. P. T. P. P. (2025). Designing a Culturally Adaptive Information Framework for Anxiety Disorders: A Mixed-Methods Thematic Analysis in Malaysia. *Journal of Applied Data Sciences*, 6(3), 1904–1920. <https://doi.org/10.47738/jads.v6i3.771>