

Digital Mental Health Interventions for University Students: Current Evidence and Future Directions

Authors Details

Toluwase Grace Obafemi¹ 

Department of Nursing Science, The School of Allied Health Science, Miva Open University, Abuja, Nigeria

Micheal Abimbola Oladosu^{2*} 

Department of Chemical Sciences, Faculty of Sciences, Anchor University, Ayobo, Lagos, Nigeria.

Moses Adondua Abah³ 

Department of Biochemistry, Faculty of Pure and Applied Sciences, Federal University of Wukari, Wukari, Taraba State, Nigeria.

Fatimah Omoyeni Adigun⁴ 

Department of Nursing Science, Faculty of Basic Allied and Medical Sciences, Anchor University, Ayobo, Lagos, Nigeria.

Celina Okafor⁵ 

Department of Nursing Science, Faculty of Basic Allied and Medical Sciences, Anchor University, Ayobo, Lagos, Nigeria.

Olaide Ayokunmi Oladosu⁶ 

Department of Computer Science, Faculty of Science and Technology, Babcock University, Ilishan-Remo, Ogun State, Nigeria

Confidence Rose Ani⁷

Department of Nursing, Faculty of Health Sciences, Maryam Abacha American University, Maradi Region, Niger.

Corresponding Author: *Michael Abimbola Oladosu*

ABSTRACT: University students experience disproportionately high rates of depression, anxiety, and psychological distress, yet fewer than one in three affected students access face-to-face care because of stigma, cost, workforce shortages, and scheduling conflicts. Digital mental health interventions (DMHIs) - internet- and mobile-based programmes,

mindfulness and acceptance-based apps, conversational agents/chatbots, and telehealth-delivered counselling, have been proposed as scalable, low-cost alternatives capable of closing this treatment gap. This narrative review synthesises evidence from systematic reviews, meta-analyses, and randomised controlled trials (RCTs) published between 2020 and 2025 on the effectiveness, engagement, and implementation of DMHIs for university students. Across intervention types, DMHIs produce small-to-moderate reductions in depressive and anxiety symptoms relative to waitlist or information-only controls, with guided and blended formats generally outperforming fully automated, unguided ones. However, real-world engagement remains poor, attrition is high, evidence for chatbot- and AI-based tools is still preliminary, and privacy, regulatory, and equity concerns persist. We present a taxonomy of DMHI modalities, a synthesis of comparative effect sizes, and an engagement/attrition framework, and propose future directions including hybrid stepped-care models, culturally adapted content, transparent data governance, and rigorous, adequately powered trials with standardised outcome and engagement reporting.

Keywords: *Digital mental health; university students; mobile health; internet-based intervention; chatbot; telehealth; mental health apps.*

1. Introduction

Poor mental health among university students has become one of the most consistently documented public health concerns in higher education globally. Pooled prevalence estimates place depressive symptoms at roughly 29–34% and anxiety symptoms at 32–39% among college and university populations, with substantial heterogeneity by region, academic discipline, and assessment tool [1-3]. Country-level surveys corroborate these figures: a nationwide Chinese survey of over 6,000 students reported that 37.8% endorsed clinically significant depression, anxiety, or stress complaints [4], while reviews focused on low- and middle-income countries have documented similarly elevated, and in some cases higher, depression prevalence [5]. Sharp increases in demand for university counselling services since 2020 have outpaced the capacity of on-campus providers, leaving many students on waiting lists or without care at all [6,7].

Digital mental health interventions (DMHIs), broadly defined as technology-delivered tools that provide psychoeducation, self-help exercises, guided or unguided therapy, or conversational support through websites, mobile applications, wearables, or telehealth

platforms, have been promoted as a scalable response to this unmet need [6,8]. Their appeal to university settings is intuitive: students are near-universal smartphone owners, are comfortable navigating digital interfaces, and can access DMHIs outside office hours and across time zones, which is particularly relevant for distance and international learners. Over the past five years, the evidence base has expanded rapidly, encompassing internet- and mobile-based cognitive behavioural therapy (CBT) programmes, mindfulness and acceptance and commitment therapy (ACT) apps, gratitude and positive-psychology interventions, fully automated conversational agents (chatbots), and telehealth-delivered individual therapy [1,6,9-18].

Despite this proliferation, questions remain about the comparative effectiveness of different DMHI modalities, the durability of their effects, the extent to which trial-based efficacy translates into real-world engagement, and the ethical and equity implications of large-scale digital deployment[8,19-21]. This review synthesises evidence published between 2020 and 2025 to address three questions: (i) What is the current evidence for the effectiveness of DMHIs in university student populations? (ii) What factors govern engagement, adherence, and attrition? (iii) What are the priority directions for research, policy, and practice going forward?

2. Methods (Narrative Review Approach)

This is a narrative, evidence-mapping review rather than a formal systematic review. Sources were identified through targeted searches of PubMed, JMIR journals, PsycINFO-indexed outlets, Scopus, and Web of Science for systematic reviews, meta-analyses, umbrella reviews, and randomised controlled trials published in English between January 2020 and 2025, using combinations of the terms “digital mental health,” “university/college students,” “mobile app,” “internet-based intervention,” “chatbot,” “conversational agent,” “telehealth,” “engagement,” and “attrition.” Priority was given to peer-reviewed systematic reviews/meta-analyses and RCTs with published outcome data; grey literature and non-peer-reviewed sources were excluded.

3. Burden of Mental Illness Among University Students

The transition to university coincides with the peak age of onset for most mental disorders, and academic, financial, and social pressures compound this vulnerability [2,5]. Table 1 summarises recent prevalence estimates. These figures underscore why scalable

intervention models are urgently needed: even modest improvements in access, delivered digitally, could meaningfully reduce population-level burden if engagement barriers can be overcome.

Table 1. Prevalence of common mental health problems among university students, 2020–2025

Study (ref.)	Design / population	Region	Condition	Pooled/reported prevalence
Li et al., 2022[2]	Systematic review & meta-analysis, global college students	Global	Depression	33.6% (95% CI 29.3–37.8%)
Li et al., 2022[2]	Same as above	Global	Anxiety	39.0% (95% CI 34.6–43.4%)
Akhtar et al., 2020[5]	Systematic review & meta-analysis	Low- and middle-income countries	Depression	Elevated vs. high-income country estimates (study-level pooled rate)
Yu et al., 2022[4]	Cross-sectional survey, n=6,032	China	Depression/anxiety/stress complaints	37.8% reported at least one complaint
Zhang & Wang, 2022[3]	Commentary on Li et al. (2022)	Global	Depression & anxiety (subgroup)	Regional variation, e.g., Africa region depression ~40.1%

4. Taxonomy and Evidence Base of Digital Mental Health Interventions

DMHIs for university students can be grouped into four broads, sometimes overlapping, categories: (i) internet- and mobile-based structured psychological programmes (largely CBT, ACT, or mindfulness-based); (ii) fully or partially automated conversational agents/chatbots; (iii) gamified or positive-psychology micro-interventions; and (iv) telehealth-delivered individual or group therapy that substitutes or supplements in-person counselling. Figure 1 shows the Taxonomy of digital mental health interventions (DMHIs) for university students.

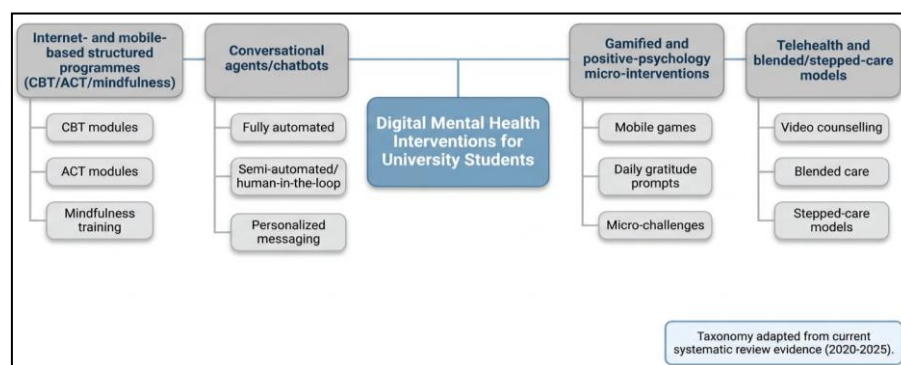


Figure 1. Taxonomy of digital mental health interventions (DMHIs) for university students.

Sources: Adapted from references [6,9,13]

4.1 Internet- and mobile-based structured programmes

Multi-module, largely CBT- or ACT-informed programmes remain the most extensively studied DMHI format. A three-armed RCT of the *StudiCare Mindfulness* internet- and mobile-based intervention (n=387) found that both unguided and “guidance-on-demand” versions produced large improvements in mindfulness ($d=0.91-1.06$) and moderate improvements in depression, anxiety, and stress relative to a waitlist control, with effects sustained at six months [9]. Similarly, a smartphone-delivered psychological flexibility (ACT-based) programme targeting medical student burnout demonstrated feasibility and preliminary efficacy in a randomised protocol subsequently completed as a full trial [10]. App-based CBT programmes tailored specifically for college populations, such as a gamified self-help CBT tool trialled in South Korean university students, have shown reductions in depressive symptoms following one month of use compared with waitlist controls [12]. Brief, single-construct interventions, for example, a three-week smartphone-delivered gratitude exercise app, have also produced significant reductions in depression, anxiety, and stress among students reporting moderate-to-severe distress, although usage frequency was not correlated with outcome, raising questions about minimum effective “dose”[11].

4.2 Conversational agents and chatbots

Automated and semi-automated conversational agents have attracted considerable research interest because of their scalability and 24-hour availability. A pilot RCT of an AI-based chatbot for anxiety and depression in university students reported significant symptom improvement relative to a waitlist condition over a brief intervention period [13]. A proof-of-concept study conducted during the COVID-19 pandemic found that a healthy-coping chatbot achieved good engagement and user-reported reductions in stress among students [14]. More sophisticated multimodal agents, including an AI-enhanced wellbeing application (“Mind Tutor”) [15] and an embodied robotic positive-psychology coach [16], have likewise demonstrated feasibility and short-term psychological benefit in pilot trials, although sample sizes remain small. A 2023 systematic review and meta-analysis of conversational-agent RCTs across populations (not exclusively students) found small-to-moderate pooled effects on depressive and anxious symptoms [17], while a companion

scoping review highlighted marked heterogeneity in outcome measures and a paucity of long-term follow-up data specific to chatbot interventions [18].

4.3 Telehealth and blended/stepped-care models

Rather than replacing face-to-face counselling, many institutions have integrated telehealth and brief digital “add-ons” alongside traditional therapy. A longitudinal study combining telehealth check-ins with a companion smartphone app for students already receiving campus counselling found that the blended approach was associated with improved outcomes and high acceptability over and above therapy alone [22]. More broadly, post-pandemic comparative data from university counselling centres indicate that telehealth and in-person therapy produce broadly comparable clinical outcomes, supporting continued integration of remote modalities into stepped-care pathways rather than treating them as inferior substitutes.

Table 2. Selected randomised controlled trials of digital mental health interventions in university students, 2020–2025

Intervention (ref.)	Modality	Sample	Comparator	Primary outcome	Key finding
StudiCare Mindfulness [9]	Internet/mobile mindfulness (guided & unguided)	n=387 students	Waitlist control	Mindfulness, depression, anxiety, stress	Large mindfulness gains ($d=0.91-1.06$); moderate mental health gains sustained at 6 months
Mind Booster Green [12]	App-based gamified CBT	Korean college students	Waitlist control	Depression symptoms	Significant reduction after 1-month use
Gratitude app (PROSIT) [11]	Smartphone gratitude micro-intervention	Students with moderate–severe distress	Active/waitlist comparison	Depression, anxiety, stress	Significant improvement; use frequency not correlated with outcome
AI chatbot (pilot) [13]	Fully automated conversational agent	University students	Waitlist control	Anxiety, depression	Significant short-term symptom improvement
Chatbot healthy-coping tool [14]	Chatbot (proof-of-concept)	Students, COVID-19 period	Pre-post / engagement analysis	Stress, engagement	Good engagement; user-reported stress reduction

Intervention (ref.)	Modality	Sample	Comparator	Primary outcome	Key finding
Telehealth + smartphone app [22]	Blended telehealth + mobile app	Students in traditional therapy	Therapy-alone (longitudinal)	Symptom trajectories (EMA)	Blended approach associated with improved outcomes and high acceptability
ACT-based flexibility app [10]	Smartphone ACT/psychological-flexibility training	Medical students	Randomised protocol (waitlist)	Burnout, wellbeing	Feasibility and preliminary efficacy established

5. Synthesising Comparative Effectiveness

Aggregating across systematic reviews and meta-analyses published since 2020, several consistent patterns emerge. First, DMHIs as a class produce statistically significant, small-to-moderate improvements in depressive and anxiety symptoms compared with waitlist or information-only controls; a 2025 systematic review and meta-analysis restricted to students with clinically elevated symptoms confirmed medium-sized pooled effects for both outcomes [1]. Second, guided or “human-supported” formats tend to outperform fully automated ones, though the size of this advantage is modest and guidance intensity required for benefit appears lower than previously assumed, “on-demand” guidance performed comparably to full guidance in at least one large trial [9]. Third, a comprehensive systematic review applying the RE-AIM implementation framework to 95 studies published 2019–2024 found that more than 80% of trialled DMHIs were effective or partially effective on their primary outcome, but reach and adoption were consistently limited, with samples skewing disproportionately female and white, and real-world uptake remaining modest even when efficacy was established [6]. Fourth, chatbot- and AI-based interventions currently show promising but less mature evidence, constrained by small trials, short follow-up, and inconsistent outcome measurement [17,18]. An earlier umbrella review of seven systematic reviews similarly concluded that DMHIs are broadly effective for university students, but called for more standardised effectiveness reporting across the field [23]. A related meta-analysis specific to psychological wellbeing (rather than symptom reduction alone) found small-to-moderate benefits of digital interventions [24]. Figure 2 presents the Forest-plot style comparison of pooled effect sizes for depression and anxiety outcomes across DMHI modality categories.

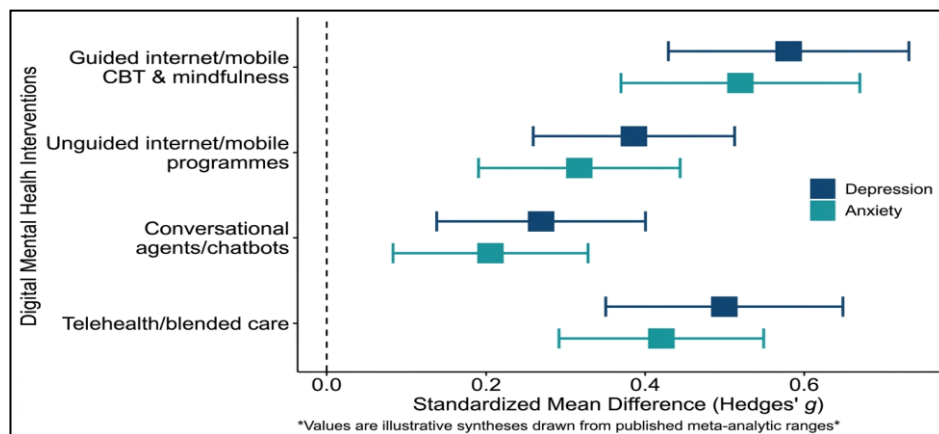


Figure 2. Forest-plot style comparison of pooled effect sizes for depression and anxiety outcomes across DMHI modality categories.

Sources: Based on concept from references [1,17,24].

6. Engagement, Adherence, and the “Law of Attrition”

Perhaps the most persistent challenge facing DMHIs is not whether they work under trial conditions, but whether students actually use them for long enough to benefit. Systematic reviews of engagement and adherence describe a recurring “funnel” pattern: large proportions of students who download or enrol in a DMHI never complete onboarding, and of those who start, only a minority complete a full intervention course [19,20]. A systematic literature review of adherence reporting in digital depression interventions found wide variability in how engagement is measured across trials, hampering cross-study comparison and slowing consensus on what constitutes a clinically meaningful “dose” [19]. Implementation-science perspectives argue that engagement should be treated as a design and delivery problem rather than solely a participant-motivation problem, meaning gamification, tailored reminders, brief human check-ins, and integration with existing campus services (rather than stand-alone deployment) are more likely to sustain use [8]. A narrative review synthesising real-world engagement data further notes that engagement rates are highly variable across DMHIs and settings, with a subset of “superusers” driving much of the observed benefit, and that qualitative accounts of barriers do not always align with quantitative predictors of actual use [21]. Real-world, non-trial usage patterns are consistently worse than those observed in controlled studies, a discrepancy attributed in part to the additional structure, reminders, and accountability present in research settings but absent in unsupervised app-store deployment. Figure 3 illustrates the Engagement and attrition funnel across the digital mental health intervention lifecycle.

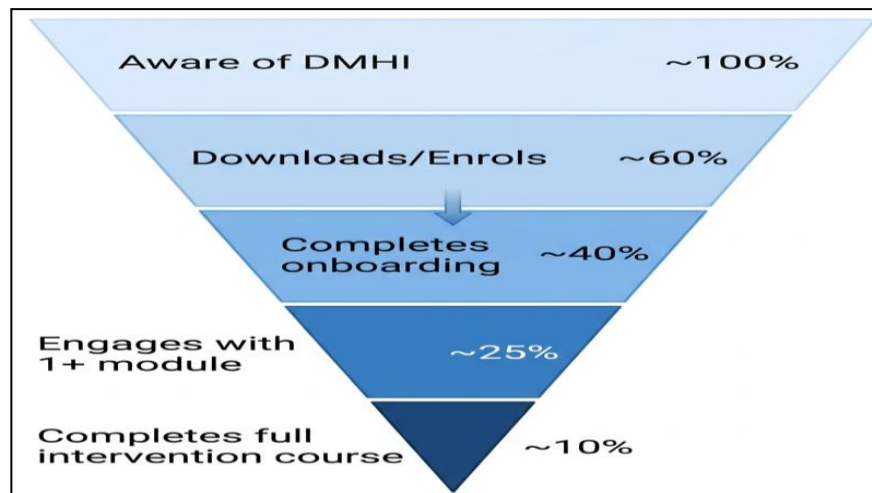


Figure 3. Engagement and attrition funnel across the digital mental health intervention lifecycle.

Sources: Adapted from references [6,8,19,20]

Table 3. Engagement and implementation indicators reported across digital mental health intervention reviews

Review (ref.)	Focus	Key engagement/implementation finding
Taylor et al., 2024 (RE-AIM) [6]	Reach, effectiveness, adoption, implementation, maintenance across 95 studies	>80% of DMHIs effective/partially effective; reach skewed female/White; adoption/uptake modest in real-world settings
Forbes et al., 2023[19]	Adherence/engagement metric reporting in digital depression trials	Highly inconsistent definitions and reporting of adherence across trials, hindering comparison
Yap et al., 2025 (protocol) [20]	Umbrella review protocol on engagement/adherence definitions	No field-wide consensus yet on how engagement/adherence should be defined or measured
Liu & Schueller, 2023 [8]	Implementation science perspective on DMHIs	Recommends embedding DMHIs within existing service pathways rather than stand-alone deployment to improve real-world uptake
Boucher & Raiker, 2024 [21]	Narrative review of engagement/retention across DMHIs	Engagement highly variable across studies; ‘superuser’ subgroups drive much of observed benefit

7. Ethical, Privacy, and Equity Considerations

The scaling of DMHIs raises ethical questions that have received growing attention since 2021. Skorburg and Friesen described a set of “gaps” opened by the rapid, pandemic-driven adoption of digital mental health tools, including diminished clinician oversight, unclear accountability for adverse events, and epistemic uncertainty about which populations digital tools serve well versus poorly [25]. Commercial mental health apps have also faced regulatory scrutiny over data-sharing practices with third-party advertisers, underscoring that privacy protections for sensitive psychological data have not kept pace

with market growth. For university populations specifically, equity concerns are salient: DMHI trial samples remain skewed toward female, White, and English-speaking students, raising questions about generalisability to male students, racial and ethnic minorities, first-generation students, and non-native English speakers who may face additional barriers to engagement or for whom content has not been culturally adapted [6]. Institutions procuring DMHIs or telehealth platforms should therefore require transparent data-governance terms, evidence of testing in diverse student subgroups, and clear protocols for escalating students who disclose risk of self-harm to appropriate human support.

8. Future Directions

Several priorities emerge from this synthesis. First, trials should move beyond waitlist-controlled efficacy designs toward pragmatic, effectiveness-focused trials embedded in real campus settings, with standardised engagement metrics to allow cross-study comparison [19,20]. Second, stepped-care and blended models, in which DMHIs serve as a first-line, low-intensity option with clear referral pathways into telehealth or in-person care for students who do not respond, appear better supported by current evidence than DMHIs deployed as free-standing replacements for clinical care [6,22]. Third, chatbot and generative-AI-based tools require larger, longer-duration trials with safety-focused evaluation (including handling of crisis disclosures) before broad institutional endorsement [17]. Fourth, future intervention development and trials should proactively recruit and report outcomes for underrepresented student subgroups, and adapt content linguistically and culturally rather than assuming one-size-fits-all applicability [6]. Finally, universities and developers should adopt transparent, independently audited data-privacy standards as a precondition for institutional adoption, given documented cases of sensitive mental health data being shared with third parties [25].

9. Conclusion

DMHIs offer a scalable, evidence-supported means of extending mental health support to university students who would otherwise go without care, with the strongest and most consistent evidence supporting guided or blended internet- and mobile-based CBT/ACT/mindfulness programmes. Chatbot-based and fully automated tools show promise but remain comparatively early-stage. The central unresolved challenge is not efficacy but engagement: closing the gap between trial-based benefit and sustained real-

world use, while addressing legitimate privacy, equity, and safety concerns, will determine whether DMHIs meaningfully reduce the population burden of student mental illness over the coming decade.

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