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ORIGINAL RESEARCH ARTICLE

Commercial Virtual Reality Applications: Impact on Undergraduate Students' Stress, Mood, and User Perceptions

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Abstract

Mental health and well-being issues are prevalent in undergraduate students, and universities are struggling to meet demand for services. Virtual reality (VR) interventions have emerged as a tool for mental health and well-being, but research lacks end-user perspective. To examine the impact of engagement with five different virtual reality applications on mood and stress and document the user perception of students, a single group (N = 20), pre-post study design was used to evaluate mood and stress before and after the use of five commercial virtual reality applications. Students completed a visual analog scale for mood (VAS-M) and stress (VAS-S), numerically ranked their perception of each application's potential to contribute to their well-being, and numerically rated how they perceived each application to positively contribute to their well-being if used regularly. Paired samples t-tests for mood and stress revealed statistically significant VAS-M changes for Linelight [t(19) = -3.65, p <.01], MultiBrush [t(19) = -4.01, p <.001], and Nature Treks VR [t(19) = -4.06, p < .001]. Guided Meditation [t(19) = 3.08, p <.01] and Nature Treks VR [t(19) = 3.22, p < .01] yielded statistically significant changes in VAS-S scores. Brief engagement with VR applications shows potential mental health and well-being benefits to undergraduate university students. Additionally, end users perceive multiple commercial applications as holding potential to benefit their mental health and well-being. This suggests commercial VR applications could be offered to undergraduate students as well-being services on university campuses.

Introduction

Undergraduate student mental health and well-being has declined over the past 10 years (Healthy Minds Network, 2024). In 2014, 49.9% of undergraduate students in the United States (US) met the threshold for flourishing, an indicator of well-being. Ten years later, a 13.4% decrease was recorded with only 36.5% of US undergraduate students meeting the same criteria (Healthy Minds Network, 2024). This decline is not exclusive to well-being but is also present in traditional mental health outcomes such as depression and anxiety. In 2014, 26% of US university students met PHQ-9 criteria for moderate to severe depression, and prevalence increased to 36% in 2024. In the same study and time span, the number of students meeting GAD-7 criteria for moderate or severe anxiety rose from 22% to 34% (Healthy Minds Network, 2024). The 2024 National College Health Assessment also documented that 86% of US university students reported moderate or high levels of stress (American College Health Association 2025a, b). These trends are not exclusive to the US, as scholars have also documented mental health decline in undergraduate students in other countries (Auerbach et al., 2018).

These findings are concerning since mental health and well-being challenges not only impact a student's quality of life, but also their academic performance. Students with depression have grade point averages that are 0.49 points lower than their non-depressed peers (Hysenbegasi et al., 2005). Students themselves recognize the negative impact of poor mental health on their academic success. Between 2014 and 2024, there was a 17% increase in students indicating they experienced academic impairment due to their mental health within a month's span (Healthy Minds Network, 2024).

Students are also aware that they need help. Between 2007 and 2017, use of university mental health services nearly doubled (Lipson et al., 2019) while enrollment

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increased by approximately 8.4% (National Center for Education Statistics, 2020). Yet 76% of university counseling center directors reported trouble meeting demand for services (Association for University and College Counseling Center Directors, 2024). The struggle to meet demand for services may be due to increased staff turnover, as 12.5% of all clinical positions faced turnover. Additionally, nearly half of all university counseling centers reported difficulty recruiting employees (Association for University and College Counseling Center Directors, 2024). Staff retention and recruitment issues are exacerbated by a lack of funding and resources, which prevent some university counseling services from hiring case managers, or specialized providers (Center for Collegiate Mental Health, 2025). Increased stressors and lack of ability to meet student counseling demands may further contribute to student mental health decline, which has been described as a crisis by a variety of sources (Abrams, 2022; Bono, 2021; CNN, 2024; Flannery, 2023; Mowreader, 2024).

As mental health and well-being needs have increased among university students, recognition has also grown that traditional treatment methods such as 1:1 counseling or therapy may not be cost effective or sustainable (Bantjes et al., 2022). Some scholars have recommended a shift to a multifaceted approach to service delivery with a variety of interventions that not only focus on treatment, but also on prevention (Bantjes et al., 2023). The World Health Organization's (WHO) Comprehensive Mental Health Action Plan emphasizes health promotion and prevention initiatives, particularly in community settings (WHO, 2021). This may be especially relevant on university campuses since it has become clear that many university students experience mental health and well-being problems that are below clinical thresholds. These circumstances may prevent them from seeking or receiving intensive services. Moreover, it may be valuable to implement accessible, preventative services that enhance protective factors, generate positive emotions, and build resiliency (Denovan & Macaskill, 2017; Duffy et al., 2023). The Lancet Psychiatry Commission on Youth Mental Health found that educational settings are pivotal in delivering preventative mental health interventions (McGorry et al., 2024).

Theoretical frameworks like the Broaden and Build Theory of Positive Emotions (Fredrickson, 2004) support this notion of utilizing interventions and experiences that generate positive emotions and *broaden* an individual's thought-action repertoire. The theory posits that this *builds* personal resources. These resources then function as reserves that can be drawn upon to improve coping and well-being (Fredrickson, 2004). Scholars have identified the relevance of the Broaden and Build theory in designing well-being programs for college students (Denovan & Macaskill, 2017). They have also suggested the theory can serve as a framework for technology-based programs that offer new opportunities for innovative solutions to the mental health and well-being concerns of college students (Biber & Davis, 2024).

Technology-Based Solutions

Technology-focused resources hold unique promise since university-aged individuals have expressed interest in using technology for their mental health and well-being. A 2022 study found that 88% of young people were slightly, somewhat, moderately, or extremely interested in using technology to benefit their mental health (Bell et al., 2022). Considering (a) the struggle to meet university student mental health needs, (b) the recommendation to promote holistic well-being services, (c) the emphasis on university-based preventative services, and (d) students' desire to use technology focused interventions, it is reasonable to explore how technology focused interventions can be used on university campuses to benefit students' mental health and well-being. Additionally, technology focused interventions may be cost effective, and of interest to university-aged students (Bantjes et al., 2022; Bell et al., 2022). Since this is an emerging area of study, it is important to investigate how technology focused interventions should be implemented, and what types of programs are of greatest interest to students (Lattie et al. 2019a, b; Sampson et al. 2022). Currently, there is a lack of evidence surrounding the feasibility and acceptability of specific technology focused interventions (Lattie et al. 2019a, b) despite findings that self-driven, technology focused interventions can positively impact university student well-being (Beauchemin et al., 2024).

A systematic review of digital mental health interventions (DMHI) found that 81% of all interventions reviewed were at minimum partially effective on their primary psychological outcome (Lattie et al. 2019a, b). In 2024, another systematic review of DMHI found that 83% showed effectiveness in reducing depression under rigorous controlled environments (Taylor et al., 2024). Yet, scholars have suggested future study of these interventions within the context of college campuses, and an examination beyond effectiveness (Taylor et al., 2024). Specifically, researchers have recommended examining how technology interventions may be implemented (Taylor et al., 2024). Currently, there is a large gap between interest and usage of technology focused interventions. Research has found that 81.5% of students indicated interest in technology focused interventions, but only 10% actually participated (Dear et al., 2019). To address this issue, further examination of students' preferences and

interests regarding specific technology focused interventions is recommended (Jackson et al., 2024). In particular, a closer look at virtual reality interventions is warranted.

Virtual Reality Interventions

The growing interest and popularity of virtual reality (VR) is clear. This is especially applicable within college aged individuals, as 34% of individuals aged 16–24 have previously engaged in virtual reality (Pangarkar, 2025). Virtual reality use is expected to increase as the teenage population ages toward typical college age. A 2024 survey found that 33% of US teens own a virtual reality headset (Piper Sandler, 2024). In general, the VR market has steadily expanded over the last decade, and projections show that the augmented reality and VR market is forecasted for continued growth (Alsop, 2024).

As the body of evidence supporting VR usage for university students' mental health and well-being grows, it is important to investigate university students' interests and preferences regarding specific VR applications in combination with how specific applications impact mental health and well-being. This will increase the likelihood of adoption, use, and efficacious outcomes. Previous studies indicate that VR interventions have been linked to decreased stress and increased well-being among university students (Xu et al., 2024). In particular, nature-based VR virtual experiences may be promising as they have been shown to reduce university students' worry and panic (Browning et al., 2023), and a systematic review of virtual nature interventions found that 64% of the examined studies indicated positive psychological outcomes (Bolouki et al., 2024). However, previous studies are lacking context and student perspective. Additionally, it is unknown if other popular VR programs would also be appealing to undergraduate students in the context of improving their mental health and well-being. In order to contribute to a translational research process, it is vital to understand students' interests and preferences regarding specific VR applications, and how they impact student mental health and well-being. This should be done by considering a variety of commercial VR applications.

Selecting potential VR applications for a university well-being program is complicated by the volume of available resources. Best et al., found over 1,700 virtual reality experiences available via Oculus.com and SteamVR, two popular platforms for accessing VR applications (Best et al., 2022). This vast array of VR options may leave university decision makers overwhelmed, or experiencing analysis paralysis when deciding whether or how VR programming can be implemented within well-being services. A possible solution to gain further insights into what applications may be beneficial to student populations is to have the students trial the applications themselves and provide feedback on their experiences while simultaneously obtaining preliminary efficacy data. Even if a VR experience is beneficial to university students' mental health and well-being, it may not be adopted if students do not perceive the experience to be beneficial or they are not motivated to participate in the experience. Thus, the purpose of this study was to examine undergraduate students' mood and stress levels before and after the use of five commercially available VR applications and to gather data on the perceptions of students using these applications.

Methods

A single group, pre-post study design was used to evaluate university students' mood and stress levels before and after the use of five different commercial virtual reality applications. The study also documented participant user perceptions following engagement with the applications. Undergraduate students ($N=20$) were recruited from a single university in the United States during the 2024–2025 academic year with inclusion criteria that specified participants were 18+years of age, enrolled in 3+credits, and an undergraduate student. Individuals were excluded if they were currently pregnant or planning to become pregnant, reported active psychosis or delusions, or reported a history of seizure or seizure-related disorders since these are all contraindications to VR use. Participants who completed the study were offered a $25 (USD) Amazon gift card.

Study Procedures

Following Institutional Review Board (IRB_00175738) approval, participants ($N=20$) were recruited through a sample of students from a previous VR study who expressed interest in future study involvement, and physical flyers placed in high-traffic areas on campus. Participants were enrolled using a convenience, first-come, first-served sampling approach. Interested individuals were screened for eligibility, then invited to a campus-based individual orientation. They were enrolled in the study following the provision of informed consent, which was collected electronically using Qualtrics XM (Qualtrics, Provo, UT). Potential participants were informed of the potential risks of using VR, data confidentiality practices, recommendations in the case that injury was experienced during the study, and assurance that their participation was voluntary, and could be revoked at any time with no penalty. The single session intervention followed immediately for enrolled participants.

Virtual Reality Session

Sessions occurred in the university library or an alternative classroom building on campus based on participant preference. During the single 3-hour session, participants engaged with five different VR applications presented in random order to control for order effect. The virtual reality applications were Guided Meditation VR, Linelight, MultiBrush, Nature Treks VR, and PowerWash Simulator VR (Table 1). The research team selected these applications following a review of relevant literature and additional evaluation of a variety of popular, commercial VR applications with potential clinical relevance.

Sessions started with an orientation to the Meta Quest 3 (Meta, 2023) virtual reality equipment, and participants were required to demonstrate competency on use of the equipment. The Meta Quest 3 (Meta, 2023) is a stand-alone virtual reality system. This system includes a head mounted display (HMD) and two controllers. Individuals unable to demonstrate equipment competency after 45 min were to be dismissed from the study. Competency was defined as requiring little to no prompting to navigate the Meta Quest 3 (Meta, 2023) interface and use system controllers as assessed by the PI. Once equipment competency was determined, participants proceeded to engaging with each application for 15 min at a time. They were encouraged to take a 10-minute break between application use, though this was not required. During the session, multiple surveys were administered. Participants reported their stress and mood levels before and after the use of each application. After using each application, they also answered a question regarding their perception of the application and how it may impact their well-being. After engaging with all five applications, participants were asked to rank which applications they felt would benefit their well-being from most to least.

Table 1 Virtual reality applications

Guided meditation	Guided meditation application offering a variety of focused meditation sessions and environments
Linelight	Low stakes puzzle application where the user moves a designated line across other lines, following implied cues to complete each task
MultiBrush	3D Art based application that offers an immersive customizable experience. The user can access a variety of art mediums and projects
Nature Treks VR	Nature-based exploration application. Offers multiple types of interactive nature environments to be explored at the user's leisure
PowerWash Simulator VR	A first-person simulation game. The user owns a power wash company, and is tasked with removing dirt from various items

Survey and Measures

Demographic Survey

Prior to engaging with the VR apps, participants completed a demographic survey that gathered data on age, gender identity, academic rank, race/ethnicity, registration status (enrolled credits), and employment status.

Visual Analog Scales for Mood and Stress

Participants completed two digital visual analog scales (VAS) immediately before and after their engagement with each of the five VR apps. One assessed their current mood and the other documented current stress levels. A VAS is a horizontal 100-millimeter, or 10-centimeter line that is anchored on each side by a rating, in this case affective statements (Luria, 1975). The anchors typically range from the least to most extreme symptom case. Respondents are asked to rank their current symptomology along the horizontal line, capturing its intensity at a particular point in time. VAS assessments are highly valued due to their ease of use and ability to measure across a continuum (Makatsori et al., 2014).

The Visual Analog Scale for Mood (VAS-M) has shown significant correlations with the Self-Rating Depression Scale (SDS) (Zung, 1965) and multiple subscales of the Clyde Mood Scale (Clyde, 1963). The VAS-M has also shown significant test-retest reliability ($p < .001$) (Luria, 1975). It is anchored on the left with "very sad" and on the right with "very happy" labels.

The VAS for Stress (VAS-S) has been found to be as effective as the Perceived Stress Scale (PSS) when comparing stress levels between multiple groups (Lesage et al., 2012). The VAS-S has good psychometric properties, including inter-rater reliability, stability, and concordance with the PSS (Lesage et al., 2011). The VAS-S labels at the two anchors are "none at all" and "worst imaginable stress" to place in context the individual's current level of stress.

Evidence regarding the internal validity of digital VAS-S and VAS-M is limited. It is noted that the digital VAS for anxiety (VAS-A) has been found to have moderate stability $r(172) = 0.44, p < .001$ (Abend et al., 2014). This is expected for a measure assessing a momentary construct such as state anxiety (Hornblow & Kidson, 1976; Spielberger, 1983).

User Perceptions

Participants were asked to provide details on their experience with the VR applications using two separate measures, a numeric rating scale evaluating each app's potential

contribution to their well-being, and a rank ordering of the five apps in terms of their perception of how beneficial the applications would be to their well-being if used routinely.

In the numeric rating assessment, which was administered immediately after use of each application, participants were asked, "On a scale of 1–10, how much do you think regular use of this application would positively contribute to your well-being?" A rating of 10 represented the most positive contribution. The rank ordering assessment was administered after participants had trialed all five virtual reality applications. Participants were asked to identify which application they perceived would be most beneficial to their well-being if used routinely and then rank the remaining apps from most to least beneficial.

Data Analysis

Data were collected using Qualtrics XM (Qualtrics, Provo, UT) surveys and analyzed via IBM's SPSS 29.0. Demographic data were summarized using descriptive statistics. To analyze changes in mood and stress across applications over two time points, data were analyzed using a series of paired samples t-tests. Responses to the numeric rating scale were summarized with descriptive statistics. Then, a non-parametric Friedman's test was used to determine whether there were any significant differences in ratings between applications. Rank order data were first analyzed by calculating mean scores based on assigned rank. A Friedman's test was then used to examine any significant differences in the rankings of specific apps regarding their potential benefit to well-being if used routinely.

Results

Demographic data on the participants is presented in Table 2. Participants included female ($n=11$) and male ($n=9$) undergraduate students with representation from all academic ranks.

Table 2 Demographic characteristics of participants (N = 20)

Demographic categories and groupings	M(SD)	*n*	Percent
Age	25.3 (9.00)		
18–21		12	60.00%
22–49		8	40.00%
Gender			
Female		11	55.00%
Male		9	45.00%
Academic Rank			
Freshman		2	10.00%
Sophomore		3	15.00%
Junior		5	25.00%
Senior		10	5 0.00%
Race/Ethnicity			
White/Caucasian		13	65.00%
Asian/Asian American		4	20.00%
Hispanic/Latino		3	15.00%
Registration Status (enrolled credits)			
	13.7 (1.90)		
≥12 credits		19	95.00%
3–11 credits		1	5.00%
Employment Status			
Working part-time		13	65.00%
Unemployed		5	25.00%
Other		2	10.00%

Mood and Stress

Results of the paired samples t-tests of VAS-M scores revealed higher mood scores post-participation with the Guided Meditation, Linelight, MultiBrush, and Nature Treks VR apps (Fig. 1). This positive change in mood was statistically significant for Linelight $t(19) = -3.65$, $p < .01$, $d = 0.82$, with mood increasing from pre-intervention ($M=66.55$, $SD=15.18$) to post-intervention ($M=75.80$, $SD=15.18$), MultiBrush $t(19) = -4.01$, $p < .001$, $d=-0.90$, with mood increasing from pre-intervention ($M=62.05$, $SD=18.14$ to post-intervention ($M=72.50$, $SD=18.45$), and Nature Treks VR $t(19) = -4.06$, $p < .001$, $d=-0.90$, with mood increasing from pre-intervention ($M=60.45$, $SD=18.76$ to post-intervention ($M=72.20$, $SD=18.93$).

The analysis comparing pre-intervention VAS-S scores to post-intervention VAS-S scores documented a reduction in participant stress levels following interaction with the Guided Meditation, MultiBrush, Nature Treks VR and Powerwash Simulator apps (Fig. 2). However, only Guided Meditation $t(19)=3.08$, $p<.01$, $d=0.69$, with stress decreasing from pre-intervention ($M=17.70$, $SD=17.82$) to post-intervention ($M=11.35$, $SD=15.36$), and Nature Treks VR $t(19)=3.22$, $p < .01$, $d = 0.72$, with stress decreasing from pre-intervention ($M=19.35$, $SD=19.31$) to post-intervention ($M=12.85$, $SD=18.53$) yielded statistically significant reductions in stress.

While baseline mood and stress scores varied slightly by application, one-way ANOVA tests confirmed no significant differences in baseline mood or stress scores by application ($p > .05$).

Experience Perception

Results of the numeric rating scale asking participants immediately after use how much they thought regular use of specific apps would positively contribute to their well-being (1 = not at all, 10 = very much) yielded similar results across all applications with students perceiving Linelight ($M=6.70$, $SD=2.75$) slightly more favorably

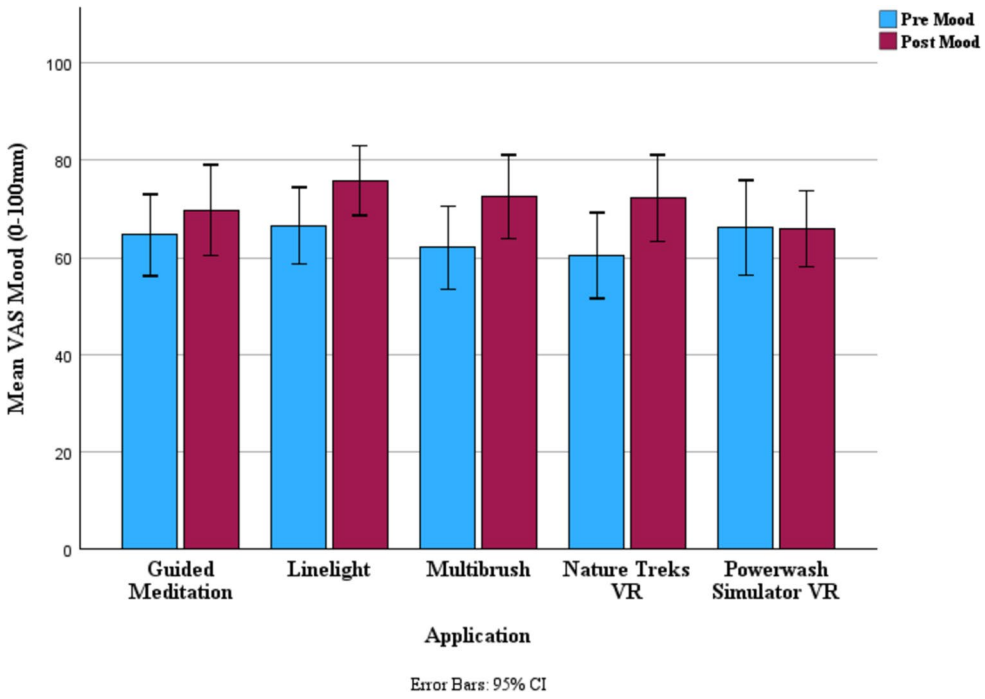

Fig. 1 Visual analog mood scores by vr application; pre- and post-intervention(N = 20)

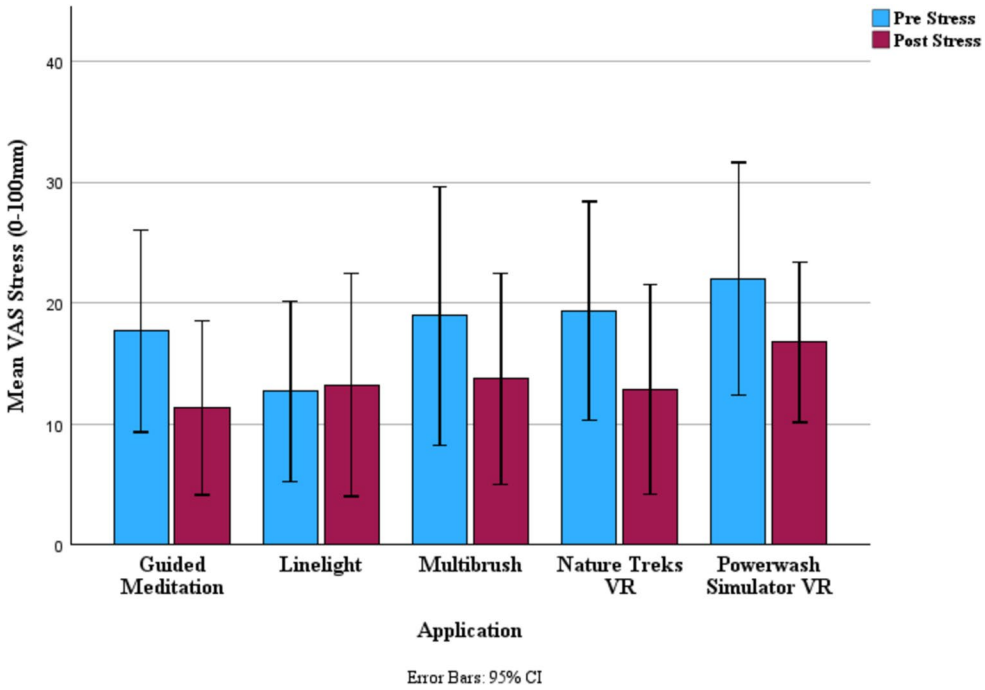

Fig. 2 Visual analog stress scores by vr application; pre- and post-intervention (N = 20)

than MultiBrush (M=6.26, SD=2.75), Guided Meditation (M=6.22, SD=2.50), Nature Treks (M=5.70, SD=2.11) and Powerwash Simulator (M=5.40, SD=2.44). The non-parametric Friedman's test revealed no significant differences in scores across applications $\chi 2(4)=5.1$, $p = .274$.

After participants had engaged with all five applications, they were asked to rank order the apps from most beneficial to least beneficial. Assigned ranks were converted to an average score to facilitate comparisons. Since a ranking of 1 indicated most beneficial, lower numbers indicated a more favorable ranking. Results were: Linelight (M=2.10, SD=1.17), Nature Treks VR (M=2.95, SD=1.28), MultiBrush (M=3.25, SD=1.52), PowerWash Simulator VR (M=3.30, SD=1.38), and Guided Meditation VR (M=3.40, SD=1.47). A non-parametric Friedman's test did not indicate significant difference in rankings among virtual reality

applications $\chi 2(4) = 9.0$, $p = .06$ and how undergraduate students perceived their potential to benefit their well-being if used routinely.

Discussion

The findings from this study suggest that multiple commercially available virtual reality applications show potential to positively impact undergraduate university students' short-term mental health and well-being. This is significant given the growing number of university students dealing with these issues (Lipson et al., 2022). In particular, confirmation that brief engagement with Linelight, MultiBrush, and Nature Treks VR led to significant improvement in mood and interaction with Guided Meditation and Nature Treks VR resulted in significant reduction in stress is encouraging as increased affect and decreased stress are associated with depression and anxiety (Rackoff & Newman, 2020) and depression and anxiety are prevalent in undergraduate students (American College Health Association, 2025b).

This study also addressed a gap in the current literature by examining student perceptions of each VR application in the context of its potential to benefit their well-being if used routinely. Past research has identified the need to gather data from prospective end users (Jackson et al., 2024; Liu et al., 2023; Lui et al., 2024). Given the recognition that technology-focused interventions, even if effective, are not used if the targeted demographic does not perceive it as useful (Donkin & Glozier, 2012), this research makes a significant contribution by documenting the targeted demographic held greater than average belief that all five of the evaluated commercial VR applications could contribute to their well-being.

Limitations and Recommendations

While this study's findings are encouraging, it is recognized the research is limited by a small sample from a single university, that may not be representative of other undergraduate students. The current study also lacked a comparison group, which limits the internal validity and ability to attribute the virtual reality intervention to the observed changes. Additionally, the one-time, brief interaction with specific applications could have generated a different response than what would occur if university students engaged with the applications on a regular basis. Researchers have determined that a novelty effect can sometimes occur when individuals engage with new technology-focused interventions (Elston, 2021), and efficacy can decline over time. Conversely, some participants stated the 15-minute session was not long enough to explore all features of some applications and to feel comfortable in using the application to benefit their mental health and well-being. There is an association between VR familiarity and positive attitudes regarding virtual reality therapies, and positive perceptions of a treatment are associated with better outcomes (Gergov et al., 2021; Karlsonn et al., 2011; Lindner et al., 2019). It has also been shown that participants find virtual reality therapy best suitably delivered within their home (Gomez Bergin et al., 2024). It is possible that efficacy may increase with extended use and under preferred conditions. Future studies should examine changes in mood and stress following use of these applications over multiple sessions to better model their efficacy in a potential university well-being program. Additionally, more complex VR experiences may warrant session times greater than 15 min. It should also be acknowledged that despite offered breaks, the 3-hour session could have induced fatigue which may have impacted perceived well-being measures.

Researchers should also evaluate additional commercial VR applications in terms of their potential mental health and well-being benefits in undergraduate students. Given the large volume of existing VR resources (Best et al., 2022), findings from this study suggest other applications likely exist that could contribute to positive changes in mood and stress. A VR well-being program that includes a wider array of applications would likely appeal to a greater number of students as variety and choice have been identified as key influencers on well-being program participation and adherence (Sylvester et al., 2016).

In addition to the identification of specific VR commercial applications that contribute to positive mental health and well-being outcomes, future research should also consider different models and structures for delivering interventions. To date, most VR efficacy studies have focused on participant use of a single application (Suntharajah et al., 1983). However, findings from this study suggest that programming could be designed where individuals have access to multiple applications from which they can choose. This could be particularly helpful when designing an ongoing well-being program as some participants in this study questioned if they would become bored with certain applications if used repetitively over time. Additionally, since new VR apps are continuously being released and others discontinued (Best et al., 2022; Hamad & Jia, 2022), the inclusion of multiple applications could assist with making subtle adjustments to offerings while maintaining program continuity. Future investigation of applications should come from multiple lenses, such as highly controlled studies with comparison groups. The use of experimental designs such as a randomized controlled trial or crossover design, will increase the internal validity and strengthen causal inferences related to the virtual reality intervention. Additionally,

a pragmatic research design such as using a RE-AIM approach may be beneficial to promote external validity and generalizability, where programs are planned and evaluated according to a framework that considers reach, effectiveness, adoption, implementation, and maintenance. A mixed methods approach is recommended to gather further insights as to the feasibility and usability of this intervention. Self-reported constructs such as VAS may be susceptible to demand characteristics. Future research should complement self-reported measures with relevant objective measures, such as cortisol and/or heart rate biomarkers. It may also be beneficial to examine a larger diverse student population spanning multiple universities, specifically considering barriers and facilitators to virtual reality use for well-being (Taylor et al., 2024).

Conclusion

As universities explore ways to expand mental health and well-being services, programming that incorporates commercial VR applications appears to be a viable option. The four applications that yielded significant changes in mental health outcomes in this study should be considered when designing programs (Guided Meditation VR, Linelight, MultiBrush, and Nature Treks VR). The benefits participants experienced after only brief engagement (15-minute sessions) suggests VR use may be a time-effective well-being intervention that can be incorporated into the busy lives of university students. Additionally, all five applications used in this study were available at a one-time cost of $25 USD or less at the time of this study making them cost effective not only for universities, but also for students who may be interested in continued use post-graduation. While some institutional supports would be necessary to assist students in use of VR equipment and app selection, the cost-benefit ratio for universities would likely be minimal compared to other mental health services. Universities could consider offering VR headsets, such as the Meta Quest 3, to students at no to low cost by establishing a rental program or by providing free use within designated areas on campus. University rental programs can complement existing well-being services by being offered through university well-being departments. Programs may also benefit from offering VR rentals through general university services, such as the academic library, to reduce perceived stigma related to well-being services. Ideally, undergraduate students who use these applications may build protective factors that reduce the need for more intensive services, which can reduce the burden in which university counseling centers face. Additionally, these applications may develop coping skills they can continue to use post-graduation. Virtual reality programming offered on university campuses may also reach a population of students who avoid traditional mental health and well-being services due to stigma, or access barriers.

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Data Availability Data supporting the findings of this study are available upon reasonable request from the corresponding author

Declaration

Ethical Considerations This study received ethical approval from the Institutional Review Board (IRB #00175738) of the University of Utah. Participants provided informed consent prior to participation.

Competing interests On behalf of all authors, the corresponding author states that there are no conflicts of interest to report.

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