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Virtual reality-based mindfulness applications: a commercial health app review

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ABSTRACT

Background Mindfulness can positively impact physical and mental health, but face-to-face programmes are limited by poor accessibility, availability and cost. Virtual reality (VR) offers immersive audiovisual environments that could improve mindfulness practice.

Objectives To evaluate commercially available VR apps related to mindfulness.

Methods App stores and relevant online platforms were searched for VR apps related to mindfulness. Results were screened against eligibility criteria and relevant data extracted. Six raters used the Mobile App Rating Scale (MARS) to assess the quality of VR apps.

Results Five VR apps related to mindfulness were included, that is, Headspace XR, Hoame, Innerworld, Maloka and TRIPP. These provided access to meditative and mindfulness sessions, guided by virtual instructors in some cases and situated in a range of virtual landscapes accompanied by sound or music. TRIPP received the highest average MARS score (4.1), followed by Hoame (3.8), Maloka (3.6), Headspace XR (3.4) and Innerworld (3.3). Most VR apps scored the highest on functionality (3.4–4.2), while the information category scored the lowest (3.1–3.7). The intraclass correlation was moderate.

Conclusion This review provides important insights into VR apps related to mindfulness such as their availability and quality. Only five VR apps were identified related to mindfulness practice with an overall moderate MARS quality score (3.62/5.00). These may provide a convenient and immersive way to access and engage in regular mindfulness practice, particularly for novices. Rigorous scientific research should assess the effectiveness of these VR apps in improving physical and mental health through immersive digital mindfulness practice.

INTRODUCTION

Mindfulness is a state of consciousness by which one is aware of emotions, feelings, beliefs and understandings in the present moment without making judgements.[1] Rooted in Buddhism, it is a psychological attribute that can help a person focus on the present moment without being critical. Mindfulness incorporates breathing or relaxation techniques to reduce stress, depression, anxiety, psychological distress, blood pressure and resting heart rate.[2] Mindfulness-based stress reduction and mindfulness-based cognitive therapy are standardised mindfulness-based programmes (MBPs) incorporating contemplative practices such as breathing, sitting, walking or meditating, understanding experiences and letting go of long-term avoidance of experiences.[3] Clinical trials of MBPs have shown significant improvements in mental health and well-being (ie, anxiety, depression, psychological distress), acceptance, compassion, non-attachment[4] and quality of life and mood.[5] Systematic reviews have shown mindfulness is effective in improving psychological functioning by increasing self-awareness, improving emotional balance and coping skills.[6 7] However, face-to-face MBPs suffer from limited accessibility, availability and cost, with some people less comfortable with in-person group-based mindfulness practice.[8 9]

Digital technologies can overcome some of the constraints of face-to-face MBPs. A review of mobile mindfulness applications (apps) (n=23) found some provide videos and text explaining mindfulness while others relied on guided meditation tracks to educate users.[10] However, few had high ratings on the Mobile App Rating Scale (MARS) in terms of visual design, level of engagement, functionality and information quality.[10] The review concluded many apps claimed to be mindfulness related, but most only offered guided meditation, timers or reminders. Furthermore, a recent systematic review of 45 trials of mindfulness apps reported only small improvements in anxiety and depression.[11] A review of mindfulness apps in European app stores showed they are often low quality, lack data security, have no privacy policy or are not based on mindfulness or behaviour change techniques.[12] In addition, any smartphone app is limited in terms of the interaction and visualisations it can provide.

Virtual reality (VR) is an immersive technology where users experience three-dimensional audiovisual environments via a wraparound VR headset and hand controllers or haptic gloves. It has been defined as the '*use of interactive simulations created with computer hardware and software to present users with opportunities to engage in environments that appear and feel similar to real-world objects and events*'.[13] VR can simulate real-life environments and scenarios as well as abstract worlds where users can interact with objects while navigating a virtual space filled with sounds or music. It is starting to be used in healthcare for managing chronic conditions such as anxiety, depression, diabetes, obesity, pain and rehabilitation, among others.[14–16] VR-based apps incorporating aspects of mindfulness are also being explored to enhance mindfulness.[5 17] A narrative review of seven VR apps for mindfulness which were trialled found VR-based mindfulness training seemed to be more effective than conventional mindfulness, helping to reduce anxiety and depression and improve sleep and mood, but they can cause cybersickness if a person remains immersed in a virtual experience for too long.[18] However, this review focused solely on scientifically developed VR apps for mindfulness and not commercial ones.

While some VR-based mindfulness apps have been developed and evaluated by researchers, there are potentially other VR mindfulness apps available via the online app stores that can be downloaded and used by patients and the public. Given the growing popularity of mindfulness practice and VR technologies, a rigorous review of commercially available VR-based mindfulness apps that examines and reports their quality could add value for those considering using them. Furthermore, clear recommendations from commercial health app reviews can help improve the quality of future health apps[19] which could lead to better patient and health services outcomes long term. Hence, this review aimed to identify and evaluate commercially available VR-based apps for mindfulness.

METHODS

We undertook a commercial health app review following clear methodological guidance[19] and employed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses checklist when reporting the review (online supplemental file 1).[20] Our team reviewing the individual apps consisted of three experienced mindfulness practitioners and mindfulness researchers (AB, EM, TE), two experts in digital health (medical informatics) research (SO'C, MZ) and a postdoctoral health researcher (SG). All had conducted scientific reviews previously, with two experienced in reviewing health apps (SO'C, MZ), and all had reasonable digital literacy skills.

Search strategy

We searched the major app stores (ie, iOS (Apple app), Android (Google Play) and Meta) using relevant terms such as 'mindfulness', 'mindfulness-meditation', 'VR mindfulness', 'VR mindfulness-meditation', 'VR mindfulness apps', 'VR mindfulness-based apps', 'VR mindfulness-based stress reduction apps', 'VR mindfulness-based cognitive therapy apps', 'VR mindfulness-meditation apps' and 'VR mental health apps' between September and December 2023. We also searched the National Health Service App Library (now closed) and the Organisation for the Review of Care and Health Apps (https://orchahealth.com/our-products/health-app-library/) platforms. We used the 'Target user' (T), 'Evaluation' (E), 'Connectedness' (C) and 'Health domain' (H) or 'TECH' framework to develop eligibility criteria.[19] The target users were adults aged 18 years and above, excluding those aimed solely at children or adolescents. The evaluation focused on all VR apps (ie, fully and partially immersive) that incorporated education, training, strategies or techniques related to mindfulness. VR apps that only contained timers, reminders or guided meditation were excluded, as were online or web-based platforms offering mindfulness and mobile mindfulness apps, as scientific reviews exist in these areas.[10 21 22] VR apps that were under development or in prototype form were also excluded. Connectedness centred on VR apps that did and did not connect to other devices or apps, and we included both in the review. Finally, the Health domain included all physical and mental health conditions as well as apps related to maintaining general health and well-being. VR apps were restricted to the English language.

Screening and data extraction

We found 262 VR apps related to mindfulness which we screened against eligibility criteria and those not relevant were discarded. The remaining VR apps were downloaded to a Meta Quest VR headset for review, and those not meeting the inclusion criteria were excluded. Consensus discussion was used to resolve disagreements (figure 1, online supplemental file 2). Next, we extracted relevant data from the VR app, the app store and websites associated with each VR app to Microsoft Excel.

Analysis

We generated descriptive statistics to summarise aspects of the VR apps and used the MARS to determine VR app quality.[23] MARS consists of 19 items across four dimensions (ie, engagement, functionality, aesthetics and information quality), with each item rated on a 5-point Likert scale. MARS has good reliability of the subscales (α=0.80–0.89) and the overall scale (α=0.90), as well as good objectivity (subscales: intraclass correlation coefficient (ICC)=0.50–0.80; overall=0.90). Six reviewers independently rated each VR mindfulness app using the MARS, with the mean scores per dimension and the mean overall quality score across dimensions calculated. Inter-rater reliability for the MARS scores was also assessed (tables 1 and 2, online supplemental file 3) using SPSS Statistics (V.29). We created ICCs on all MARS items to allow for the appropriate calculation of weighted values of rater agreement. Each reviewer also

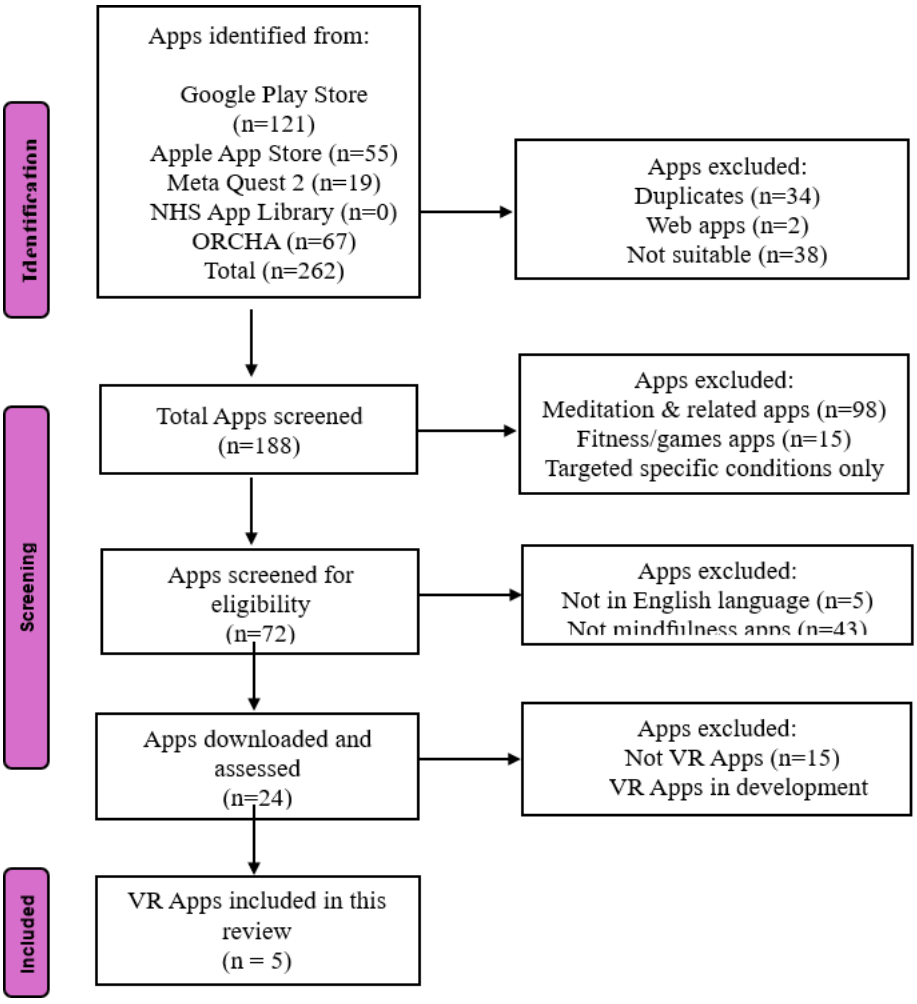

Figure 1 PRISMA flow diagram to show selection of VR mindfulness apps. NHS, National Health Service; ORCHA, Organisation for the Review of Care and Health Apps; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; VR, virtual reality.

documented analytical memos for each VR app covering the four dimensions of MARS which were summarised descriptively. Finally, we searched for empirical evidence that evaluated the included VR apps to determine if their effectiveness, acceptability, usability or satisfaction had been scientifically evaluated.

RESULTS

VR app characteristics

Five VR apps related to mindfulness were included, which were: (1) Headspace XR, (2) Hoame, (3) Innerworld, (4) Maloka and (5) TRIPP, all released between 2019 and 2024 (figure 1). The VR apps provided access to meditative and mindfulness sessions, guided by virtual instructors in some cases, and situated in a range of virtual landscapes accompanied by sound or music. The five VR apps were for all age groups except Innerworld, which started from 17 years of age (with parental guidance). All five VR apps were available on the Meta Quest 2 and 3 and Pro VR platforms and ran on Android and iOS operating systems. The average user rating score was 4.12 out of 5 (range: 3.3–4.5) (table 1). All five VR apps provided in-app purchases such as additional guided meditation tracks and reminders to practice mindfulness and other activities. Four VR apps required payment/subscriptions and one, Maloka, was free. The VR apps also allowed users to share their experiences via social media platforms such as Facebook and X (formerly Twitter) (table 2).

MARS ratings

TRIPP received the highest average MARS score (4.06), followed by Hoame (3.77), Maloka (3.61), Headspace XR (3.37) and Innerworld (3.31) (table 3, online supplemental file 3). Some of the apps had high ratings on the MARS subscales of visual aesthetics, engagement, functionality and information quality. The five included apps were evaluated by six raters and the intraclass correlation (ICC) indicated that agreement of raters was moderate (ICC=0.72, 95% CI 0.51 to 0.86). The average overall quality rating for the five mindfulness-based apps reviewed was M=3.62 (SD=0.31, range: 3.31–4.06), demonstrating moderate quality.

Table 1 Characteristics of VR apps related to mindfulness

App	Ages	Operating system	Supported VR platforms	Content	Viewer ratings (n)	Developer and download size	Release date and version
Headspace XR	All	Android and iOS	Meta Quest 2 and 3 and Pro	Headspace is a virtual playground—provides an option to share the user's experience in social networks such as Facebook and Twitter. Headspace has an app community. It provides in-app purchase that includes additional guided meditation tracks. Internet connection is not needed. https://www.headspace.com/xr	4.4 (44)	Nexus Studios 1.94 GB	Release date: 2024 Version: 0.9.238
Hoame	All	Android/Meta	Meta Quest 2 and 3 and Pro	Has 350 guided meditations, nature landscapes, exercises, breathwork, and guided and self-guided meditation. Sound baths, visualisations, body scans or sleep classes. A 'salt cave' and 'infrared sauna' to promote restoration, relaxation and mindfulness. Tranquil sandboxes. Daily study classes, events, workshops, logging of community progress, mood quizzes, customisation of meditation/mindfulness areas and 'on-demand' experiences. https://www.hoame.app/	3.3 (249)	Hoame 1.45 GB	Release date: 2022 Version: 2.609
Innerworld	17+	iOS 14.0 or later	Meta Quest, Meta Quest 2 and 3 and Pro	Virtual community to explore behaviours, emotions and thoughts through group support, events and courses. Virtual guides run mental health meetings. Simple timers. https://www.inner.world/home/	4.5 (482)	Innerworld 255.43 MB	Release date: 2022 Version: 2.0.234
Maloka	All	Android 5.1 and up and iOS	Meta Quest, Meta Quest 2 and 3 and Pro	Users build their own tropical island that grows as they practise mindfulness. Accompanied by a 'spirit' guide or 'voice of the universe' who monitors and provides advice. Mindfulness library, breathwork, body scans, sound baths, guided meditation, basic yoga. https://www.playmaloka.com/	4.2 (471)	PlayMaloka 922.62 MB	Release date: 2021 Version: 1.4.3
TRIPP	All	Android 10 and up and iOS	Meta Quest, Meta Quest 2 and 3 and Pro	Mood on demand (has a lifetime version), >100 guided immersive mindfulness/meditation exercises (short, medium, long sessions), sleep, mixed reality gifts, personalised experiences and multiday challenges. Offers visually guided breathing techniques and mood logging. https://www.tripp.com/	4.2 (3000)	TRIPP, Inc 2.33 GB	Release date: 2019 Version: 5.3.7.6433

VR, virtual reality.

Engagement

Engagement in the MARS checklist refers to whether an app is entertaining, interesting, customisable, interactive and the content (e.g., visual information, language and design) is well targeted to users.[23] All five VR apps offered different levels of engagement to increase user interest, with most rated as relatively entertaining. The average MARS rating for engagement was M=3.68 (SD=0.39, range: 3.34–4.07) (table 3). For instance, TRIPP and Hoame offered tools such as a mood survey and progress tracker, while Maloka offered a virtual spirit guide, the ability to build a personalised virtual island, and provided users with rewards. Most of the VR apps provided settings that allowed users to customise features such as background music or sounds, avatars, content, notifications, prompts, reminders and sharing options. Most VR apps also allowed a certain level of interaction with users being able to provide their mood and receive prompts and feedback. Hoame included add-on features like the 'hoamie score' for a better experience and enabled users to capture and share images or videos. Hoame and TRIPP also allowed the presence of other VR app users in some of the meditative sessions, although these shared virtual spaces could sometimes be empty. TRIPP and Innerworld offered live VR group activities and events, although some were not related to mindfulness practice, while Maloka had a library of experiences users could share with their online community. Finally, the content in all five VR apps seemed appropriate for the target audience, although Maloka, Innerworld and Headspace XR used animated or cartoonish graphics that may not appeal to adult audiences.

Functionality

Functionality in the MARS checklist refers to the features (functions) and components (buttons, menus, icons) of an app, if it is easy to learn and navigate, and has a logical flow with gestural design. Most of the features of the five VR apps performed reasonably well with virtual environments and menus that were easy to use and logical to navigate with clear labels, icons and instructions. The average MARS rating for functionality was M=3.78 (SD=0.56, range: 3.38–4.22) (table 3). However, it was not clear how to exit some virtual experiences and return to the main menu, and the VR apps were sometimes slow or froze occasionally. Moving between screens or virtual settings tended to be logical and uninterrupted with smooth transitions, although audio options could be added in some

Table 2 Additional characteristics of VR apps related to mindfulness

App and pricing	In-app purchases	Internet connection	Trial period/free demo	Subscription availability	Privacy policy	App community	Social media	Guides/ instructors
Headspace XR Price: £22.99	✓	✓	✓	✓	✓	✓	✓	✓
Hoame 1-month pass: £7.99/ month (includes 1-week free trial) 6-month pass: £39.23/6 months 1-year pass: £62.59/year	✓	✓	✓ (7 days)	✓	✓	✓	✓	✓
Innerworld Membership: £14.99/ month Membership: £99.99/ year	✓	✓	✓	✓	✓	✓	✓	✓
Maloka Price: free on iOS, Google Play and Meta Quest store	✓	✓	✓	✓	✓	✓	✓	✓
TRIPP Membership: £7.99/ month Membership: £29.99/ year	✓	✓	✓	✓	✓	✓	✓	✓

VR, virtual reality.

cases to enable easier navigation. The gestural design features used included interactions such as taps, swipes or scrolls using the hand controllers which were relatively consistent and intuitive across most components or screens in the VR apps.

Aesthetics

In the MARS checklist, aesthetics encompasses the graphic design, overall visual appeal of an app, its colour scheme and stylistic consistency. The layout of the VR apps in terms of the arrangement and size of buttons, icons, menus or content was satisfactory with simple and clear displays that looked professional. The average MARS rating for aesthetics was M=3.59 (SD=0.24, range: 2.78–4.28) (table 3). The graphics were mostly high quality, with Hoame in particular having high-quality stereoscopic videos and photorealistic images. However, Innerworld's and Maloka's graphics were lower in quality with more animated or cartoonish virtual environments

Table 3 MARS mean quality scores of included VR mindfulness-based apps (all six raters)

App	Engagement	Functionality	Aesthetics	Information	Overall	Subjective quality
Headspace XR	3.34	3.59	3.45	3.07	3.37	2.29
Hoame	3.40	4.17	3.89	3.62	3.77	2.94
Innerworld	3.73	3.38	2.78	3.41	3.31	2.95
Maloka	3.87	3.55	3.55	3.43	3.61	3.00
TRIPP	4.07	4.22	4.28	3.67	4.06	3.72

MARS, Mobile App Rating Scale; VR, virtual reality.

that appeared lower in resolution than the other VR apps. Overall, most of the VR apps were visually appealing with consistent colour schemes and patterns, shapes and virtual spaces scaled to represent realistic environments and experiences.

Information

Finally, information in the MARS checklist refers to the quality of the information contained in the app (i.e., text, feedback, measures, references) and whether it was from a credible source. All VR apps matched how they were described on the app stores or the company website, although the content was not always related to mindfulness practice, with some apps more focused on meditation and well-being. The average MARS rating for information was M=3.44 (SD=0.31, range: 3.07–3.67) (table 3). It was difficult to gauge the accuracy of information provided in the live virtual events and the expertise of those guiding virtual sessions, as well as claims made as to the effect of the VR app on a person's physical and mental health. Some of the VR apps had specific and measurable goals such as users tracking their feelings, mood or emotions and ranking themselves against others. The quality and quantity of information provided on the VR apps seemed appropriate and relevant to their stated aims, with different virtual worlds for users to experience and practise breathing and other meditative and relaxation techniques. Information in the VR apps was provided in a range of audiovisual and text formats, in particular visual explanations of concepts through charts, graphs, images or videos.

DISCUSSION

Overall, the commercial VR apps related to mindfulness, that is, Headspace XR, Hoame, Innerworld, Maloka and TRIPP, had a moderate quality score (3.62), with functionality and engagement scoring high and TRIPP receiving the highest average MARS score. VR seems to offer a uniquely immersive experience that can deepen engagement with mindfulness practice, while being accessible and intuitive to users. The VR app environments also provided a calm environment that may make it easier to practice mindfulness, especially for a novice. Furthermore, simulated live sessions (e.g., within Innerworld and TRIPP) offered additional virtual experiences that could be more authentic and personalised. While traditional meditation apps provide simplicity and convenience, making them suitable for a broad audience, they may lack the immersive benefits of VR.[24]

As MARS scores varied across the VR apps, further research exploring how to design a VR app for mindfulness could add value. Only a few apps named people who they considered experts in the development of the VR environments or delivery of the content. Hence, it is not clear if end users were involved in co-designing these VR technologies. Using several co-design methods, tools and theories is popular when creating digital mental health interventions as users can share their perspectives on the design features, functionality and content they prefer, which can lead to more personalised and usable technologies.[25] Involving experienced mindfulness practitioners and researchers in the design of virtual experiences and guidelines on how to use a VR mindfulness app in parallel with face-to-face individual or group sessions could also be beneficial for creating high-quality VR apps for mindfulness.[26]

The five VR apps reviewed tended to educate, inform or remind users for meditative practices, often using techniques like exercise and relaxation. However, all VR apps came from commercial sources which could limit credibility, with only two having some scientific evidence supporting them. An observational study examined Innerworld for providing cognitive–behavioural immersion (CBI) to people (n=127) experiencing depression and anxiety who reported lower anxiety symptoms.[27] A pilot study also investigated the feasibility of Innerworld for CBI with individuals (n=48) recovering from substance use showing increased positive affect, with participants liking the community approach, immersive experience and anonymity.[27] A scoping review of VR apps included Innerworld but only described how it works in terms of forming online health communities where peer-led events allowed users to support each other, although it raised concerns over the potential impact of unqualified mental health support.[28] A clinical trial of TRIPP with patients with cancer undergoing surgery (n=54) found no difference in quality of life between the intervention and control groups, although feelings and adherence rates improved.[29] TRIPP was also explored in a substance use treatment setting using focus groups with patients (n=25) and staff (n=11), revealing it helped patients engage with mindfulness practice to reduce negative emotions and cultivate a sense of well-being.[30] While one study included Hoame when co-designing VR interventions with young people, it did not evaluate the VR app in any way,[31] and no research studies exist for Headspace XR or Maloka. Overall, the scientific evidence base for all VR apps is limited.

Although a systematic review of VR apps for mindfulness training (n=7) indicated they may improve mental health conditions in adults (e.g., levels of mindfulness, meditation, sleep quality, emotion regulation), their quality was not evaluated, the VR training was mainly limited to single sessions and standardised measures for mindfulness and meditation-related outcomes were not always used.[18] Hence, robust research investigating their feasibility and effectiveness on physical and mental health outcomes of adult and child populations is needed.[12] Furthermore, while MARS is a useful tool to assess the quality of mobile health apps, it does not cover features such as privacy and security. Martínez-Pérez *et al*[32] highlight many health apps do not have enough security and privacy mechanisms to protect user data, something all VR app users should be aware of when providing personal information as it may be shared with others.

VR apps have additional challenges. First, a small number of participants may experience harm during mindfulness practice, for example, being retraumatised. An experienced practitioner could reduce the likelihood of this occurring by assessing risk beforehand and adapting the delivery and content of the mindfulness session.[33] In a VR app, this risk could be mitigated by using a disclaimer clearly stating it is not a therapeutic tool and recommending users access a qualified healthcare practitioner if they have mental health concerns. Hence, VR apps could be supportive tools alongside face-to-face mindfulness practice, so those who require trauma-informed and neurodiversity-informed adaptations can be catered for. Traditional mindfulness programmes are designed to unfold gently over time so that practitioners can reassure novices of the practices to follow, help dispel myths about and support personal inquiry and reflection, helping to shape and improve mindfulness practice. These nuanced in-person discussions and personal connections may not easily be replicated in VR, meaning VR may be best placed as an adjunct to traditional therapy. However, for those uncomfortable with in-person group sessions, VR may present a useful way to widen access to mindfulness practice. Professional practitioners seem to have mixed views on using VR technologies to help people practise mindfulness, with some considering them a distraction from the core practice, while others believing VR apps could add value to self-awareness and self-reflection for some individuals.[34] In addition, as the evidence base is only emerging, there are no clinical guidelines recommending their use for different populations of people with mental health issues. Therefore, those considering VR mindfulness apps may have to source and try them independently as it will take time before they become integrated into healthcare services.

Second, VR headsets and hand controllers are not always easy and comfortable to use and can cause discomfort if worn or used incorrectly. The software may also be hard to utilise, with virtual spaces difficult to navigate, particularly if someone's digital literacy skills are low.[16] If used for too long, a person may also experience VR-induced side effects such as eyestrain, nausea, dizziness, headaches and mental overload.[35] Therefore, clear guidelines outlining when, how often and for how long a VR app should be used to practise mindfulness could be provided along with hands-on training for those who need it. Miltiadis *et al*[36] also highlight that simulator sickness could be reduced by sitting rather than standing during the virtual experience, being more actively engaged in the simulation and using better quality hardware and software that renders images and videos seamlessly.

Third, many VR apps cost money and users need to subscribe to regular fees, along with having Internet access to enable content and updates to be downloaded to a VR headset. Fourth, the VR equipment needs regular charging so the battery life can sustain periods of use, with some devices needing replacement or upgrading after a few years, bringing additional costs. These barriers may prevent some people, such as those from lower socioeconomic groups or with declining visual acuity or cognitive function, from using a VR app. Thus, people could be encouraged to use freely available apps or use low-fidelity (i.e., cardboard) VR headsets and standard smartphone/mobile apps for mindfulness practice which cost less and are less energy intensive.

Review limitations

The review has several limitations. Although an extensive search of the VR app stores was conducted, only apps available in the UK and in English were included. Therefore, VR apps related to mindfulness that were released privately, available in other countries or in other languages, may have been missed, which limits the generalisability of the results. Furthermore, terminology related to mindfulness can vary across scientific fields and regions of the world, meaning our search strategy may not have captured all relevant terms, and additional searches such as using search engines like Google were not undertaken, so some pertinent commercial VR apps may have been missed. In addition, the MARS tool was developed for standard mobile health apps used on smartphones and not for VR-based apps that require VR headsets and hand controllers. As these technologies have additional design features and functionality, the MARS tool may not have captured all aspects of the VR apps which may limit the utility of the review findings.

CONCLUSION

The use of VR for mindfulness practice is in an early stage of development, and this review provides important insights into VR apps related to mindfulness such as their availability and quality (i.e., engagement, functionality, aesthetics and information). Only five VR apps, that is, Headspace XR, Hoame, Innerworld, Maloka and TRIPP, were identified related to mindfulness practice with an overall moderate MARS quality score (3.62/5.00). TRIPP received the highest average MARS score (3.89), followed by Hoame (3.62), Maloka (3.53), Innerworld (3.38) and Headspace XR (3.34). However, these scores mask weaknesses in the MARS scale as it does not assess the credibility or scientific evidence, privacy or security of mobile or VR apps. These VR apps may provide a convenient and immersive way to access and engage in regular mindfulness practice, particularly for novices, and may address some of the limitations with face-to-face and mobile app mindfulness programmes. However, rigorous scientific research is needed to assess the effectiveness of these VR apps in improving physical and mental health outcomes through immersive mindfulness practice.

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