



Topic Exploration Report ¹

Topic explorations are designed to provide a high-level briefing on new topics submitted for consideration by Health Technology Wales. The main objectives of this report are to:

- Determine the quantity of evidence available for a technology of interest.
- Identify any gaps in the evidence.
- Inform decisions on topics that warrant fuller assessment by Health Technology Wales (HTW).

Topic exploration report number	TER537
Topic	Virtual reality interventions to support people with mental health difficulties
Summary of findings	<p>Due to the high demand for mental health services in Wales, many people are not getting timely access to the treatment and support they need. Some virtual reality (VR) technologies can be delivered by a wider range of mental health professionals than standard care. Additionally, some VR technologies can be delivered remotely, which would allow some people to get help in their homes.</p> <p>We identified eight systematic reviews, many of which included randomised controlled trials (RCTs), which included numerous mental health conditions, including anxiety and stress, social anxiety, generalised anxiety disorder, phobias, post-traumatic stress disorder, depression, obsessive-compulsive disorder, borderline personality disorder, eating disorders, schizophrenia, substance-use, neurocognitive disorders and neurodevelopmental conditions. One health-economic evaluation was embedded within an RCT.</p> <p>A large amount of evidence was identified for most conditions, but in particular for anxiety, stress, mood, phobias, and schizophrenia and psychotic disorders. Most of the conditions reported mixed findings on the effectiveness of VR. Obsessive-compulsive disorder and eating disorders were the only conditions which reported only a positive treatment effect with VR. Limited evidence was found for use of VR in borderline personality disorder and attention deficit hyperactivity disorder. Whilst some of the reviews included children, adults made up the majority. Most studies included people in outpatient settings. Limited economic evidence was identified. One health-economic evaluation found that VR could be cost-effective in people with psychosis compared to standard care. There was heterogeneity in the virtual reality protocol used, condition treated, and outcomes measured. The scope would need to be refined should this progress to a fuller appraisal. Standard of care in Wales would also need to be clarified.</p>

¹ [Cyfieithu dogfennau HTW wedi'u cyhoeddi o'r Saesneg i'r Gymraeg](#)
Translation of published technical HTW documents from English into Welsh

Introduction and aims

Virtual reality (VR) is a simulated environment with scenes and objects that people can explore while wearing a headset or viewing a screen. This creates an immersive experience that can trigger emotional responses like those in real-world situations. VR technologies can help deliver treatments, including:

- Cognitive behavioural therapy (CBT) - people can practice challenging distorted cognitive patterns and learn more adaptive behaviours and responses, closely monitored by therapists. CBT includes exposure therapy, which allows people to immerse themselves in real-world situations while being in the safety of their home or clinic.
- Therapeutic VR programs - guide people through meditation and relaxation exercises in calming, controlled virtual settings.
- Social skills training - VR simulates social interactions and provides a platform for practising social skills in a range of scenarios.
- Addiction recovery - VR simulates environments that trigger cravings or addictive behaviours, allowing people to develop coping strategies in a controlled setting.
- Eating disorders - VR can help to alter perceptions of body image and simulate environments to practice healthy eating behaviours.
- Symptom management in psychotic conditions - VR environments can mimic scenarios where patients may typically experience hallucinations, helping them learn coping mechanisms in a safe setting.
- Cognitive training - VR can target specific cognitive deficits, such as impaired memory, attention, and executive functions.

The Topic Proposer stated that there is currently significant variation in standard care for psychological therapies in Wales. Due to the high demand for mental health services in Wales, many people are not getting timely access to the treatment and support they need. Some VR technologies can be delivered by a wider range of mental health professionals than standard care. Additionally, some VR technologies can be delivered remotely, which would allow some people to get help in their homes.

Due to the large volume of secondary evidence identified during the literature search, we did not search for primary clinical-effectiveness studies. We searched for primary economic evidence as no secondary evidence was identified. We searched for systematic reviews on VR interventions for all mental health conditions. As there were many systematic reviews identified, we only reported those which included multiple mental health conditions, and included systematic reviews of individual conditions if they were not described in the more broad systematic reviews.

Given the rapidly evolving nature of VR in mental health, we searched for evidence published in the last five years (2019 onwards). Furthermore, as NICE produced guidance on VR for agoraphobia (NICE 2023), and HTW produced guidance on VR for management of anxiety during medical procedures (HTW 2022), we did not search for evidence for these conditions.

Evidence overview

Health Technology Assessments and Topic Exploration Reports

Health Technology Wales (HTW) produced a health technology assessment (HTA) on anxiety and a topic exploration report (TER) on group therapy, and the National Institute for Health and Care Excellence (NICE) published a HTA on phobias. These are described below.

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Anxiety

A similar topic was the subject of previous HTW guidance: *HTW GUI017-2: Virtual reality interventions for the management of pain associated with medical procedures* (HTW 2022). The evidence partially supports the adoption of VR interventions for the management of pain and anxiety in adults and children undergoing medical procedures, but the evidence is insufficient to support routine adoption.

This topic was also the subject of a previous HTW topic exploration report, which did not progress to full appraisal: *HTW TER194 Virtual reality as a tool to facilitate virtual group therapy support clinics or group psychological support* (HTW 2020).

Phobias

Agoraphobia (fear of being in situations where escape might be difficult or that help wouldn't be available if things go wrong)

NICE recommended that gameChangeVR (a VR technology) can be used in the NHS while more evidence is generated, to treat severe agoraphobic avoidance in people with psychosis aged 16 and older. This recommendation was based on evidence from a randomised controlled trial (RCT) by Freeman *et al.* 2022a, which showed that gameChangeVR plus usual care was more effective than standard care (SoC) in reducing agoraphobic avoidance and distress at six months in people with high and severe agoraphobic avoidance. This was supported by an additional secondary analysis of the RCT by Freeman *et al.* 2022b. Cost modelling suggests that gameChangeVR may be cost effective in people with psychosis who have severe agoraphobic avoidance. NICE recommended that the following should only be used in research: Amelia Virtual Care to treat agoraphobia, gameChangeVR to treat mild-to-moderate agoraphobic avoidance in people with psychosis, and XR Therapeutics to treat agoraphobia (NICE 2023).

Systematic reviews

Overview

We identified six systematic reviews which included numerous mental health conditions within the same review (Dellazizzo *et al.* 2020; Halldorsson *et al.* 2021; Philippe *et al.* 2022; Pira *et al.* 2023; Riches *et al.* 2023; Cortez-Vázquez *et al.* 2024). Of these, four reviews included anxiety (specific type of anxiety was not reported), stress and mood; three reviews included phobias; three reviews included schizophrenia and psychotic disorders; two reviews included post-traumatic stress disorder (PTSD); two reviews included depression; two reviews included neurocognitive disorders; two reviews included neurodevelopmental conditions; one review included social anxiety; one review included generalised anxiety disorder; one review included eating disorders; and one review included substance use.

For conditions not included in the more broad systematic reviews, one systematic review was identified specifically for obsessive-compulsive disorder (OCD) (Kafes A.Y. 2021), and one systematic review was identified specifically for emotional disorders (borderline personality disorder [BPD]) (Hudon *et al.* 2022). One health-economic evaluation was embedded within an RCT evaluating VR in people with psychosis (Pot-Kolder *et al.* 2020).

Four of the systematic reviews included adults and children (Dellazizzo *et al.* 2020; Philippe *et al.* 2022; Kafes A.Y. 2021; Riches *et al.* 2023), one of the reviews included only children (Halldorsson *et al.* 2021), and three of the reviews and the primary study included only adults (Pira *et al.* 2023; Hudon *et al.* 2022; Cortez-Vázquez *et al.* 2024; Pot-Kolder *et al.* 2020). The countries in which the studies were conducted were only clearly reported in three of the reviews and the primary study, and included the UK, USA and the Netherlands (Halldorsson *et al.* 2021; Hudon *et al.* 2022; Riches *et al.* 2023; Pot-Kolder *et al.* 2020). Two of the reviews and the

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primary study reported outcomes from outpatients (Halldorsson et al. 2021; Hudon et al. 2022; Pot-Kolder et al. 2020). One of the reviews mainly included outpatients but outcomes from some inpatients were reported (Riches et al. 2023). The setting was not clearly reported in the other reviews. One of the reviews reported using VR relaxation (Riches et al. 2023) and one reported using VR breathing interventions (Cortez-Vázquez et al. 2024).

Anxiety (specific type of anxiety not reported), stress and mood

There were mixed findings on the effectiveness of VR for anxiety, stress and mood; three systematic reviews reported a positive effect (Philippe et al. 2022; Riches et al. 2023; Pira et al. 2023) and one systematic review reported no significant treatment effect (Cortez-Vázquez et al. 2024).

In the systematic review by Philippe et al. (2022), 65 RCTs of 2,842 participants comparing VR to SoC, 69 RCTs comparing VR with a waitlist or placebo control (n = 2,974), and 21 observational studies (n = 305) reported that VR was effective as a treatment modality in people with anxiety-, mood-, stress-, and trauma-related disorders (Philippe et al. 2022).

Another systematic review by Riches et al. (2023) included 18 studies (n = 848). Most participants had stress or anxiety-related conditions. Studies provided evidence of the acceptability and short-term effectiveness of VR to increase relaxation and reduce stress (Riches et al. 2023).

Seven studies using VR interventions for addressing stress in 403 participants were included in the systematic review by Pira et al. (2023). These studies reported that VR was effective in reducing stress and promoting self-care and positive coping skills also without the presence of a therapist (Pira et al. 2023).

One of the systematic reviews did not find a significant treatment effect with VR. Cortez-Vázquez et al. (2024) included a meta-analysis of 5 RCTs (n = 469) comparing VR breathing interventions to non-VR breathing interventions in adults. There were no significant differences in overall mental health, stress, anxiety or mood. There was no evidence that participants liked VR breathing interventions more than non-VR (Cortez-Vázquez et al. 2024).

Social anxiety

There were mixed findings on the effectiveness of VR for social anxiety. In the review of meta-analyses by Dellazizzo et al. (2020), two meta-analyses of RCTs reported a significant improvement in symptoms with people with social anxiety treated with VR. This benefit was not maintained at three-months follow up in one of the meta-analyses in the review by Dellazizzo et al. (2020). Another meta-analysis did not find a significant treatment effect for VR in people with social anxiety, compared to SoC (Dellazizzo et al. 2020).

Generalised anxiety disorder

An RCT of 27 participants was included in the systematic review by Pira et al. (2023) and did not find a significant difference in those with generalised anxiety disorder treated with VR compared to standard mental-imagery exposure therapy.

Phobias

There were mixed findings on the effectiveness of VR for specific phobias; one systematic review reported a positive effect (Pira et al. 2023), one reported no significant effect (Halldorsson et al. 2021), and one reported mixed findings (Dellazizzo et al. 2020).

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A meta-analysis of four studies, in the review by Dellazizzo et al. (2020), reported a significant treatment effect using VR for fear of heights and fear of spiders. However, another meta-analysis, in the review by Dellazizzo et al. (2020), included two studies that did not find a significant treatment effect of VR on fear of spider outcomes. A meta-analysis of RCTs, in the review by Dellazizzo et al. (2020), reported a significant treatment effect in people treated with VR for fear of flying.

A study in the systematic review by Pira et al. (2023) reported that VR was effective in improving positive functioning and well-being in 25 people with fear of spiders. Another small study in the systematic review by Pira et al. (2023) found that VR was effective in treating fear of flying.

One RCT of 32 children in the systematic review by Halldorsson et al. (2021), reported no significant effect on autistic children with specific phobias compared to a waiting-list control.

Post-traumatic stress disorder

There were mixed findings on the effectiveness of VR for specific phobias (Dellazizzo et al. 2020; Pira et al. 2023).

The review by Dellazizzo et al. (2020) included a meta-analysis of RCTs which found mixed findings for the effectiveness of VR for people with PTSD.

One unpublished study of 11 participants and one published study of 89 participants, in the systematic review by Pira et al. (2023), also reported mixed findings. PTSD symptoms significantly improved, together with better use of emotion regulation strategies. However, VR did not significantly improve psychological recovery or quality of life of people with PTSD at six-months in the published study (Pira et al. 2023).

Obsessive-compulsive disorder

Based on evidence from five studies of 139 adults, the systematic review by Kafes A.Y. (2021) reported that VR was effective when used in the treatment of OCD.

Depression

There were mixed findings on the effectiveness of VR for depression; one review reported a positive effect (Pira et al. 2023), and one review reported mixed findings (Dellazizzo et al. 2020).

Two studies of 94 participants with depression were included in the systematic review by Pira et al. (2023). Both studies showed a significant effect on different areas of positive functioning, from self-compassion to positive emotions and subjective well-being.

Two meta-analyses in the review by Dellazizzo et al. (2020) reported mixed findings for the effectiveness of VR in treating comorbid depressive symptoms.

Emotional disorders

No significant difference was found for self-reported BPD measures in 11 people treated with VR for BPD, in the systematic review by Hudon et al. (2022). However, the qualitative component showed that the participants reported that VR had more impact and was more powerful than no VR (Hudon et al. 2022).

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Eating disorders

In the systematic review by Philippe et al. (2022), nine RCTs of 628 participants comparing VR to SoC reported that VR was effective as a treatment modality in people with eating disorders.

Schizophrenia and psychotic disorders

There were mixed findings on the effectiveness of VR for schizophrenia and psychotic disorders; two systematic reviews reported no significant effect or an inconclusive effect of VR (Philippe et al. 2022; Dellazizzo et al. 2020), and one review reported a positive effect (Pira et al. 2023).

In the systematic review by Philippe et al. (2022), four RCTs of 292 participants comparing VR to SoC, 28 RCTs comparing VR with a waitlist or placebo control (n = 1,735), and 32 observational studies (n = 1,267) reported that VR was inconclusive as an effective treatment modality in people with schizophrenia and psychotic disorders.

A meta-analysis of RCTs in the review by Dellazizzo et al. (2020) found no significant effect of VR on compliance in people with schizophrenia.

One-hundred-and-fifty participants from two RCTs and one pilot study, in the systematic review by Pira et al. (2023), reported that VR significantly improved paranoid symptoms in people with psychosis and also had a positive effect on self-esteem, acceptance and emotional-regulation strategy.

Substance-use

In the systematic review by Philippe et al. (2022), one RCT of 11 participants comparing VR to SoC, five RCTs (n = 219) comparing VR with a waitlist or placebo control, and eight observational studies (n = 181) reported that VR was inconclusive as an effective treatment modality in people who use substances.

Neurocognitive disorders

There were mixed findings on the effectiveness of VR for neurocognitive disorders; one systematic review reported an inconclusive effect of VR (Philippe et al. 2022), and one review reported a positive effect (Dellazizzo et al. 2020)

In the systematic review by Philippe et al. (2022), 11 RCTs of 331 participants comparing VR to SoC, one RCT (n = 30) comparing VR with a waitlist or placebo control, and 10 observational studies (n = 273) reported that VR was inconclusive as an effective treatment modality in people with dementia and related disorders.

A meta-analysis of RCTs in the review by Dellazizzo et al. (2020) found that VR significantly improved some outcomes among people with mild cognitive impairment and dementia (Kim et al. 2019).

Neurodevelopmental conditions

In the systematic review by Philippe et al. (2022), seven RCTs of 222 participants comparing VR to SoC, 24 RCTs (n = 877) comparing VR with a waitlist or placebo control, and 24 observational studies (n = 212) reported that VR was inconclusive as an effective treatment modality in people with developmental disorders, excluding ADHD.

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An observational study of two participants, in the systematic review by Philippe et al. (2022), reported that VR is an emerging treatment modality in people with ADHD.

In the review of meta-analyses by Dellazizzo et al. (2020), one meta-analysis found no significant improvement in outcomes following VR-use in autistic people.

Economic evidence

One health-economic evaluation was embedded within an RCT evaluating VR in 116 people with psychosis, compared to SoC, at three months and six months (Pot-Kolder et al. 2020). The average mean incremental costs for a treatment responder on social participation ranged between €8,079 and €19,525. The average incremental cost per quality-adjusted life year (QALY) was €48,868 over the six months of follow-up, with 99.98% showing improved QALYs. Sensitivity analyses show costs to be lower when relevant baseline differences were included in the analysis. Average costs per treatment responder now ranged between €6,800 and €16,597, while the average cost per QALY gained was €42,030.

Evidence Standards Framework

VR as an intervention for mental health difficulties is a digital health technology and was determined to be a Tier C technology according to the [Evidence Standards Framework for Digital Health Technologies](#). Technologies within this classification treat a condition. For technologies of this classification, it is recommended that one or more high-quality interventional studies (experimental or quasi-experimental design) to support the claimed benefits of the digital health technology, done in a setting relevant to the UK, is produced to demonstrate effectiveness of the technology.

Areas of uncertainty

The identified reviews included people with many different conditions, treated with many different VR protocols/mechanisms of VR delivery/whether VR was given with or without other behavioural interventions, and evaluated using different outcome measures. Clarity would be needed on the scope of any appraisal should it proceed. Additionally, SoC in Wales would need to be clarified and how variable pathways are across conditions.

There was limited economic evidence and evidence on the long-term clinical effectiveness of VR for all mental health conditions. Limited evidence was identified for use of VR in people with BPD and ADHD. Most of the evidence reported outcomes from outpatient settings, and limited evidence included inpatients. Whilst children were included in some of the reviews, most evidence came from the adult population.

Literature search results

Health technology assessments and guidance

[HTW](#)

HTW guidance (GUI017-2): Virtual reality interventions for the management of pain associated with medical procedures (2022): <https://healthtechnology.wales/reports-guidance/virtual-reality-distraction-therapy/>

Not all parts of the appraisal are relevant to this TER

HTW TER194 Virtual reality as a tool to facilitate virtual group therapy support clinics or group psychological support (2020): <https://healthtechnology.wales/reports-guidance/virtual-reality-group-therapy/>

[NICE](#)

NICE Health technology evaluation (HTE15) (2023). Virtual reality technologies for treating agoraphobia or agoraphobic avoidance: early value assessment: <https://www.nice.org.uk/guidance/hte15>

[Healthcare Improvement Scotland](#)

No evidence found

[Hand search published SIGN Guidelines](#)

No evidence found

[Health Information and Quality Authority](#)

No evidence found

[EUnetHTA](#)

No evidence found

[International HTA Database](#)

No evidence found

[International Guidelines Library](#)

No evidence found

Evidence reviews and economic evaluations

Cortez-Vázquez, G., Adriaanse, M., Burchell, G.L., Ostelo, R., Panayiotou, G. and Vlemincx, E., 2024. Virtual Reality Breathing Interventions for Mental Health: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Applied Psychophysiology and Biofeedback, pp.1-21: <https://doi.org/10.1007/s10484-023-09611-4>

Dellazizzo, L., Potvin, S., Luigi, M. and Dumais, A., 2020. Evidence on virtual reality-based therapies for psychiatric disorders: meta-review of meta-analyses. Journal of medical Internet research, 22(8), p.e20889: [doi:10.2196/20889](https://doi.org/10.2196/20889)

Halldorsson, B., Hill, C., Waite, P., Partridge, K., Freeman, D. and Creswell, C., 2021. Immersive virtual reality and digital applied gaming interventions for the treatment of mental health problems in children and young people: the need for rigorous treatment development and clinical evaluation. Journal of Child Psychology and Psychiatry, 62(5), pp.584-605. <https://doi.org/10.1111/jcpp.13400>

Hudon, A., Gaudreau-Ménard, C., Bouchard-Boivin, M., Godin, F. and Cailhol, L., 2022. The use of computer-driven technologies in the treatment of borderline personality disorder: a systematic review. Journal of Clinical Medicine, 11(13), p.3685. <https://doi.org/10.3390/jcm11133685>

Kafes, A.Y., 2021. Behavioral intervention techniques used in the treatment of obsessive compulsive disorder: Systematic review. *Psikiyatride Guncel Yaklasimlar*, 13(4), pp.726-738. https://media.proquest.com/media/hms/PFT/1/f07xJ?_s=CuZdE2MpJQcTXcfn3FO5SOvm8dw%3D

Philippe, T.J., Sikder, N., Jackson, A., Koblanski, M.E., Liow, E., Pilarinos, A. and Vasarhelyi, K., 2022. Digital health interventions for delivery of mental health care: systematic and comprehensive meta-review. *JMIR mental health*, 9(5), p.e35159: [doi:10.2196/35159](https://doi.org/10.2196/35159)

Pira, G.L., Aquilini, B., Davoli, A., Grandi, S. and Ruini, C., 2023. The Use of Virtual Reality Interventions to Promote Positive Mental Health: Systematic Literature Review. *JMIR mental health*, 10(1), p.e44998. doi: [10.2196/44998](https://doi.org/10.2196/44998)

Pot-Kolder, R., Veling, W., Geraets, C., Lokkerbol, J., Smit, F., Jongeneel, A., Ising, H. and Van Der Gaag, M., 2020. Cost-effectiveness of virtual reality cognitive behavioral therapy for psychosis: health-economic evaluation within a randomized controlled trial. *Journal of medical Internet research*, 22(5), p.e17098. doi: [10.2196/17098](https://doi.org/10.2196/17098)

Riches, S., Jeyarajaguru, P., Taylor, L., Fialho, C., Little, J., Ahmed, L., O'Brien, A., van Driel, C., Veling, W. and Valmaggia, L., 2023. Virtual reality relaxation for people with mental health conditions: a systematic review. *Social Psychiatry and Psychiatric Epidemiology*, 58(7), pp.989-1007: <https://link.springer.com/article/10.1007/s00127-022-02417-5>

Evidence supplied by topic proposer

Freeman D, Lambe S, Kabir T, Petit A, Rosebrock L, Yu LM, et al. (2022a). Automated virtual reality therapy to treat agoraphobic avoidance and distress in patients with psychosis (gameChange): a multicentre, parallel-group, single-blind, randomised, controlled trial in England with mediation and moderation analyses. *The Lancet Psychiatry*;9(5):375-88: DOI:[https://doi.org/10.1016/S2215-0366\(22\)00060-8](https://doi.org/10.1016/S2215-0366(22)00060-8)

Freeman D, Lambe S, Galal U, Yu LM, Kabir T, Petit A, et al. (2022b). Agoraphobic avoidance in patients with psychosis: Severity and response to automated VR therapy in a secondary analysis of a randomised controlled clinical trial. *Schizophrenia Research*;250:50-9: <https://doi.org/10.1016/j.schres.2022.10.008>

Maples-Keller, J.L., Bunnell, B.E., Kim, S.J. and Rothbaum, B.O. (2017). The use of virtual reality technology in the treatment of anxiety and other psychiatric disorders. *Harvard review of psychiatry*, 25(3), pp.103-113: https://journals.lww.com/hrjournal/fulltext/2017/05000/the_use_of_virtual_reality_technology_in_the.3.aspx

Date of search	11 April 2024
Concepts used	Virtual reality, mental health, depression, anxiety, OCD, schizophrenia, eating disorders, BPD, substance-use disorder, addiction

Proposed research question and evidence selection criteria (if selected)

Proposed Research question	What is the clinical and cost effectiveness of virtual reality as an intervention for mental health conditions?
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	Inclusion criteria	Exclusion criteria
Population	People with mental health conditions (clarify condition[s] and adult/child)	
Intervention	Virtual reality	
Comparison/ Comparators	Standard care psychological therapies (needs to be clarified)	
Outcome measures	Change in symptoms of mental health condition Length of time waiting for an intervention Patient satisfaction Health related QoL Resource use Economic outcomes	

Proposed speciality	
Proposed specialities	Mental and behavioural disorders; Caring for older people; Paediatrics; Health service organisation and delivery; Learning disability