



Topic Exploration Report

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:

1. Determine the quantity and quality of evidence available for a technology of interest.
2. Identify any gaps in the evidence/ongoing evidence collection.
3. Inform decisions on topics that warrant fuller assessment by Health Technology Wales.

Topic:	Virtual reality for exercise plan management
Topic exploration report number:	TER193

Introduction and aims

Health Technology Wales researchers searched for evidence on virtual reality as a tool to help follow an exercise plan in people who are using exercise to manage or improve any disease or condition.

Summary of findings

We identified three primary studies evaluating the effectiveness of virtual reality as a tool to enable exercise regimes to improve the status of health or disease. Two studies enrolled people with metabolic diseases and one involved healthy volunteers. A wide range of different outcomes were measured across the studies including enjoyment of the exercise plan, interaction with or adherence to exercise, general physiological and disease-specific health outcomes.

From the limited amount of evidence reviewed, it appears that virtual reality interventions could have some benefits when used as a tool to enable exercise regimes. Nevertheless, since the studies focused on different populations and measured a wide range of outcomes, more evidence is needed to establish how virtual reality-assisted exercise plans affect relevant clinical outcomes and in what situations they are effective.

Evidence

No existing sources of secondary evidence (health technology assessments, systematic reviews or economic evaluations) were identified.

Primary evidence:

A 2017 study (Zeng et al) was conducted on a cohort of 12 healthy college students to compare the effect of the VirZoom VR exercise bike on physiological and psychological outcomes in comparison to a traditional stationary exercise bike. The outcomes measured in the study included participants' VR experience, blood pressure, rating of perceived exertion, self-efficacy and enjoyment. The study reported statistically significant changes in rate of perceived exertion, enjoyment and self-efficacy when using the VR intervention. The rate of perceived exertion was measured using the Borg Scale while self-efficacy and enjoyment was measured by surveys using a 5-point Likert scale.

One study published in 2019 assessed virtual reality exercise interventions in a cohort of 21 participants with self-reported levels of physical activity below the current recommendations and classified as overweight (body mass index greater than 25). Affective valence (pleasure/displeasure on an 11 point scale) was the primary outcome and enjoyment and prefrontal haemodynamics were secondary outcomes. Preference for and tolerance of exercise intensity was also measured as part of the study. The experimental design was within subject consisting of three conditions: high immersion (VR headset and headphones), low immersion (television screen and speakers) and control (no audiovisual stimulation). Affective valence was statistically significantly greater during high immersion exercise than other types of exercise.

A study by Lee and Shin (2013) entitled "Effectiveness of virtual reality using video gaming technology in elderly adults with diabetes mellitus" was conducted on a cohort of 55 subjects with diabetes mellitus and compared virtual reality exercise in addition to diabetes education to control (represented by diabetes education alone). The measured outcomes included balance (one-leg-standing (OLS), Berg Balance Scale (BBS), functional reach test (FRT) and timed up-and-go test (TUG)), strength (sit-to-stand test), gait and falls efficacy (Modified Falls Efficacy Scale questionnaire (MFES)). Statistically significant differences were observed in the virtual reality exercise group in terms of balance (including OLS, BBS, FRT and TUG) as well as velocity, cadence and the MFES scores.

Conclusions

Virtual reality interventions could have some benefits when used as a tool to enable exercise regimes, but the amount of evidence identified in the context of this topic exploration report is insufficient to draw any firm conclusions on their use. Further research is needed into how this technology affects outcomes of most relevance to patients, and in what specific health and care settings it could be beneficial.

Brief literature search results

Resource	Results
HTA organisations	
Healthcare Improvement Scotland:	We did not identify any relevant information from this source.
Health Technology Assessment Group	We did not identify any relevant information from this source.
Health Information and Quality Authority	We did not identify any relevant information from this source.
UK guidelines and guidance	
SIGN	We did not identify any relevant information from this source.
NICE	We did not identify any relevant information from this source.
Secondary literature and economic evaluations	
ECRI	We did not identify any relevant information from this source.
Cochrane library	We did not identify any relevant information from this source.
Medline	We did not identify any relevant information from this source.
Primary studies	
Medline	<ul style="list-style-type: none"> • Zeng, N., Pope, Z., & Gao, Z. (2017). Acute effect of virtual reality exercise bike games on college students' physiological and psychological outcomes. <i>Cyberpsychology, Behavior, and Social Networking</i>, 20(7), 453-457. • Jones, Leighton, and Panteleimon Ekkekakis. "Affect and prefrontal hemodynamics during exercise under immersive audiovisual stimulation: Improving the experience of exercise for overweight adults." <i>Journal of Sport and Health Science</i> (2019). • Lee, S., & Shin, S. (2013). Effectiveness of virtual reality using video gaming technology in elderly adults with diabetes mellitus. <i>Diabetes technology & therapeutics</i>, 15(6), 489-496.
Cochrane library	We did not identify any relevant information from this source.

Date of search:	October 2019
Concepts used:	Immersive virtual reality, exercise, metabolic syndrome, cystic fibrosis, overweight