FPIN's Clinical Inquiries

Virtual Reality in the Treatment of Generalized Anxiety Disorder

Morgan Hungenberg, DO; Shawnecca Burke, MD; Aline Hansen-Guzman, MD; Shaun Thompson, MD; and Corey Lyon, DO, University of Colorado Family Medicine Residency Program, Denver, Colorado

Kristen DeSanto, MSLS, MS, RD, AHIP, University of Colorado Health Sciences Library, Denver, Colorado

Clinical Question

Does therapy with virtual reality decrease generalized anxiety in adults?

Evidence-Based Answer

Virtual reality does not appear to be effective and should not be used in the treatment of generalized anxiety disorder (GAD). (Strength of Recommendation [SOR]: B, based on randomized controlled trials [RCTs].) In trials including anxiety disorders such as phobias and fear of flying, virtual reality may be better than no treatment, but it is not superior to traditional behavioral therapy or cognitive behavior therapy (CBT). (SOR: B, based on meta-analysis of RCTs.)

Evidence Summary

A 2019 meta-analysis of nine RCTs (N = 371) analyzed the treatment of specific phobias, social phobias, and agoraphobia when using virtual reality exposure therapy (VRET) compared with in vivo exposure therapy.[1] VRET included a computer-generated presentation that provided input to the user's sensory system via specific glasses with a head-mounted display or through a projection system in an enclosed room. In vivo exposure involves the patient being exposed to their phobia in real live exposures that gradually increase in intensity each time the person has a lessened reaction to the previous exposure. When comparing these treatments for a specific phobia, there was no difference in symptom improvement between VRET and in vivo exposure therapy (four trials; n = 153; effect size [ES] = −0.15; 95% CI, −0.47 to 0.16). When examining trials treating social phobia, there was a small ES favoring in vivo exposure (three trials; n = 148; ES = −0.50; 95% CI, −0.83 to −0.16). Examining agoraphobia specifically, the result was also nonsignificant (two trials; n = 70; ES = −0.01; 95% CI, −0.47 to 0.45).

A 2012 meta-analysis of 21 RCTs (N = 803) evaluated VRET combined with traditional behavioral therapy or CBT to treat various anxiety disorders including fear of flying, panic disorder, agoraphobia, social phobia, posttraumatic stress disorder, arachnophobia, and acrophobia.[2] The VRET groups were compared with a waitlist group (no therapy), traditional behavioral therapy, or group CBT. VRET combined with traditional behavioral therapy or CBT demonstrated a large effect on social phobia (two trials; n = 87; ES = 1.01; 95% CI, 0.69 to 1.33) and fear of flying (two trials; n = 84; ES = 0.53; 95% CI, 0.41 to 0.64) compared with patients on a waitlist. VRET combined with traditional behavioral therapy or CBT resulted in no improvement in various anxiety disorders compared with patients who were treated only with traditional behavioral therapy or group CBT (15 trials; n = 535; ES = 0.16; 95% CI, −0.03 to 0.36).

A 2019 RCT in Taiwan examined the effectiveness of virtual reality environments on GAD in 60 adults 50 to 70 years of age.[3] Patients were ▶

diagnosed with GAD based on a score of 5 or higher on the seven-item GAD questionnaire (GAD-7) and a score of 27 or higher on the Mini-Mental State Examination. While cycling on a stationary bike, patients experienced virtual reality with a projection-based system on a large screen with 270 degrees of interactive forest or park scenes compared with a placebo group who watched a projector of watercolor paintings while also cycling on a stationary bike. Stress was measured using physiologic signs, including galvanic skin response, heart rate, and electroencephalogram, which were continuously recorded by biosensors. After participants cycled at 50% to 60% of their maximum heart rate on a stationary bike for 20 minutes, alpha waves were evaluated on an electroencephalogram. Wave values increase when patients are more awake and relaxed, and they were measured for two and a half minutes while the participant sat in a comfortable position. The value of alpha waves was significantly higher in the virtual environment group compared with the control group (6.53 μV vs. 4.05 μV; $P = .01$), suggesting a more relaxed state or less anxiety. The virtual environment group also demonstrated a significantly lower galvanic skin response (measured as the resistance of the skin gland as a marker for sympathetic nervous activity with increases in emotions such as stress or anger; 0.81 micromhos vs. 1.10 micromhos; $P = .03$) compared with the control group, suggesting less stress and anger. The heart rate after cycling was not significantly different between the two groups (89.2 beats per minute vs. 89.1 beats per minute; $P = .20$).

A 2011 RCT compared virtual reality with or without biofeedback with no treatment for the management of GAD in 25 adult patients.[4] The eight virtual reality sessions involved the use of a headset with a mobile phone showing scenes of a campfire, beach, and waterfall. In the biofeedback group, the patient's heart rate controlled the intensity of the fire, waves, and waterfall flow. Test participants completed a Beck Anxiety Inventory (scores range from 0 to 63) immediately before and after a treatment session. Their scores improved from baseline with virtual reality plus biofeedback (26.7 to 14.5; $P < .05$), as did virtual reality without biofeedback (29.4 to 19.3; $P < .05$). The waitlist control group's scores were not significantly different from baseline (27.5 to 19.8; $P = .11$). There was no comparison between the two intervention groups and the waitlist group. Scores on the Hamilton Anxiety Rating Scale did not change in a statistically significant manner for any of the groups.

A 2010 RCT evaluated the effectiveness of virtual reality as a treatment in 20 adult patients diagnosed with GAD.[5] Patients were randomized to a virtual reality–based protocol reinforced by an at-home mobile phone experience with or without biofeedback or a waitlist group. The virtual reality–based protocol included eight sessions involving both relaxation and exposure scenarios. The biofeedback group had the same sessions but added biofeedback support. The patients assigned to the virtual reality–based protocol without biofeedback had a decrease in anxiety of 2.4 points ($P < .05$) as measured on the Beck Anxiety Inventory and a decrease of 2.1 points ($P < .05$) on the Penn State Worry Questionnaire (scores range from 16 to 80) when comparing pre- and postintervention scores. The virtual reality–based protocol with biofeedback also showed a decrease in anxiety pre- and posttreatment scores on the Beck Anxiety Inventory of 1.8 points ($P < .05$) and the State-Trait Anxiety Inventory Form Y-2 (scores range from 20 to 80) of 1.8 points ($P < .05$). A decrease in the Penn State Worry Questionnaire score was also noted among patients on the waitlist (–2.1 points; $P < .05$). There was no comparison between the two intervention groups and the waitlist group.

Address correspondence to Corey Lyon, DO, at corey.lyon@cuanschutz.edu. Reprints are not available from the authors.

References

1. Wechsler TF, Kümpers F, Mühlberger A. Inferiority or even superiority of virtual reality exposure therapy in phobias?—A systematic review and quantitative meta-analysis on randomized controlled trials specifically comparing the efficacy of virtual reality exposure to gold standard *in vivo* exposure in agoraphobia, specific phobia, and social phobia. *Front Psychol*. 2019;10:1758.
2. Opriş D, Pintea S, García-Palacios A, et al. Virtual reality exposure therapy in anxiety disorders: a quantitative meta-analysis. *Depress Anxiety*. 2012;29(2):85-93.
3. Wang TC, Tsai CL, Tang TW, et al. The effect of cycling through a projection-based virtual environment system on generalized anxiety disorder. *J Clin Med*. 2019;8(7):973.
4. Repetto C, Gaggioli A, Pallavicini F, et al. Virtual reality and mobile phones in the treatment of generalized anxiety disorders: a phase-2 clinical trial. *Pers Ubiquit Comput*. 2011;17(2):253-260.
5. Gorini A, Pallavicini F, Algeri D, et al. Virtual reality in the treatment of generalized anxiety disorders. *Stud Health Technol Inform*. 2010;154:39-43. ■