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Virtual reality compared with *in vivo* exposure in the treatment of social anxiety disorder

The paper by Bouchard *et al*[1] builds upon many facets of methodological deficiencies in previous literature on the issue of the utility of virtual reality therapies in managing social anxiety disorder (SAD).

Positive critique: the study used multiple scales for assessing the various facets of SAD and therapy that usually are lacking in studies using psychotherapies (in particular virtual reality/computer-stimulated therapies). These included measures for assessing burden, challenges and the costs of conducting the exposure; measures to assess how feasible it was for the therapist to perform the therapy; and scales to assess unwanted negative side-effects induced by immersions in virtual reality (cybersickness). The study made the sample more comparable with a real-world setting by including patients with other comorbidities, such as depression, generalised anxiety disorder, panic attacks and substance use, which increases the generalisability of their findings. It also describes the cognitive–behavioural therapy (CBT) used in detail, which usually is lacking in psychotherapy studies.

The study also reports on follow-up at 6 months, with gains maintained. Moreover, it used both performance and non-performance social situations in the treatment of SAD with virtual reality thereby increasing the importance of findings.

Negative critique: the findings are based only on self-reports (as acknowledged by the authors too) restricting its firm conclusions. Information regarding the randomisation process is not mentioned, although the authors do mention that both the therapists and patients did not know which group they were in until the first therapy session.

A possible bias could have arisen because, in individuals receiving *in virtuo* CBT, after the first seven sessions of cognitive therapy they would have gone out into the real world and may have experienced real *in vivo* exposures that might create bias in outcomes by rendering the differences attributable not just solely on the basis of *in virtuo* exposure.

The researchers used individuals on a waiting list as controls, which has been reported in the psychotherapy literature to act not as a placebo but rather as a nocebo.[2] The effect size using a waiting list has been reported to be greater compared with that when using a placebo. Psychological placebo is associated with a significantly greater reduction in symptoms than placement on a waiting list, possibly because of the effects of anticipation, hope or faith. Also, there was no independent, masked investigator to assess the outcome.

Another facet of consideration in such psychotherapeutic studies is the recognition of the Solomon 4-group design effect as assessments may interact with interventions to either strengthen or weaken the observed effects producing biased estimates of effects.[3] Overall, the study paves the way towards a strengthening of the evidence towards utility of virtual reality applications in psychiatric conditions for a positive outcome.

1 Bouchard S, Dumoulin S, Robillard G, Guitard T, Klinger É, Forget H, et al. Virtual reality compared with *in vivo* exposure in the treatment of social anxiety disorder: a three-arm randomised controlled trial. *Br J Psychiatry* 2017; **210**: 276–83.

2 Hart T, Fann JR, Novack TA. The dilemma of the control condition in experience-based cognitive and behavioural treatment research. *Neuropsychol Rehabil* 2008; **18**: 1–21.

3 McCambridge J, Butor-Bhavsar K, Witton J, Elbourne D. Can research assessments themselves cause bias in behaviour change trials? A systematic review of evidence from Solomon 4-group studies. *PLoS One* 2011; **6**: e25223.

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Author's reply: First, we want to thank Verma & Verma for their review and also comment that the use of only self-report is not 'acknowledged by the authors'. Patient's performance in delivering an impromptu speech was recorded and rated by independent assessors. Results on the behavioural assessment task support the results from the self-reports.

To clarify the randomisation procedure that was used, as stated in the article, we used a table of random numbers. Following the procedures and table from Kirk,[1] before starting recruitment we created a list of which condition participants would be randomly assigned to. When a participant met the selection criteria, he or she was assigned to the next available slot on the list, with the numbers 1, 2 or 3 corresponding to the experimental conditions.

As for the potential effect of self-exposure at home, it is indeed a potential limitation of the study. Care was taken to limit self-exposure with anti-*in-vivo* exposure instructions given to participants in the *in virtuo* condition and no homework given to all participants. Self-exposure, intended or unintended by participants, remains a possibility. But it is doubtful the success of *in virtuo* exposure, especially when it was superior to *in vivo*, could be attributed to this limitation.

Verma & Verma mentioned relevant limitations associated with the use of a waiting list compared with a placebo control condition. But when designing a clinical study, these limitations must be carefully weighed against ethical and practical considerations, especially when a gold-standard control condition is also included in the research design. Using Solomon's 4-group design is indeed a very effective solution to control for the effect of assessment.

In conclusion, it is interesting to highlight one of the findings of the study that might have not caught the attention of Verma & Verma. When it comes to cost-effectiveness, our results showed that using virtual reality to conduct exposure was at least as effective as *in vivo*, and more effective on some measures such as the Liebowitz Social Anxiety Scale, but also less costly in terms of efforts and financial burden based on the Specific Work for Exposure Applied in Therapy scale.

1 Kirk RE. *Experimental Design (2nd edn)*. Brooks/Cole Publishing, 1982.

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