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Exposure to virtual social interactions in the treatment of social anxiety disorder: A randomized controlled trial

Isabel L. Kampmann [a, *], Paul M.G. Emmelkamp [c, d], Dwi Hartanto [b], Willem-Paul Brinkman [b], Bonne J.H. Zijlstra [e], Nexhmedin Morina [a]

[a] Department of Clinical Psychology, University of Amsterdam, Weesperplein 4, 1018 XA, Amsterdam, The Netherlands
[b] Interactive Intelligence Group, Delft University of Technology, Mekelweg 4, 2628 CD, Delft, The Netherlands
[c] Netherlands Institute for Advanced Study, Meijboomlaan 1, 2242 PR, Wassenaar, The Netherlands
[d] King Abdulaziz University, Abdullah Sulayman, 22254, Jeddah, Saudi Arabia
[e] Department of Educational Sciences, University of Amsterdam, Nieuwe Achtergracht 127, 1018 WS, Amsterdam, The Netherlands

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ABSTRACT

This randomized controlled trial investigated the efficacy of a stand-alone virtual reality exposure intervention comprising verbal interaction with virtual humans to target heterogeneous social fears in participants with social anxiety disorder. Sixty participants (M_{age} = 36.9 years; 63.3% women) diagnosed with social anxiety disorder were randomly assigned to individual virtual reality exposure therapy (VRET), individual in vivo exposure therapy (iVET), or waiting-list. Multilevel regression analyses revealed that both treatment groups improved from pre-to postassessment on social anxiety symptoms, speech duration, perceived stress, and avoidant personality disorder related beliefs when compared to the waiting-list. Participants receiving iVET, but not VRET, improved on fear of negative evaluation, speech performance, general anxiety, depression, and quality of life relative to those on waiting-list. The iVET condition was further superior to the VRET condition regarding decreases in social anxiety symptoms at post- and follow-up assessments, and avoidant personality disorder related beliefs at follow-up. At follow-up, all improvements were significant for iVET. For VRET, only the effect for perceived stress was significant. VRET containing extensive verbal interaction without any cognitive components can effectively reduce complaints of generalized social anxiety disorder. Future technological and psychological improvements of virtual social interactions might further enhance the efficacy of VRET for social anxiety disorder.

Social anxiety disorder (SAD) is defined as the fear of one or more social situations in which one might behave embarrassingly and be negatively evaluated by others (DSM-V; American Psychiatric Association, 2013). SAD is one of the most common mental disorders in the US population, with an estimated lifetime prevalence of 12.1% (Ruscio et al., 2008). Individuals who suffer from SAD can experience a reduced quality of life and significant impairments in various areas of functioning, such as work and interpersonal relationships (Wittchen, Fuetsch, Sonntag, Müller, & Liebowitz, 2000). However, only about one third of individuals with SAD seek treatment (Ruscio et al., 2008).

The most researched treatment for SAD is cognitive behavior therapy (CBT). CBT aims at modifying maladaptive cognitions and behavior using both cognitive (e.g., cognitive restructuring) and behavioural (e.g., exposure) strategies (Hofmann & Smits, 2008; Mayo-Wilson et al., 2014). During exposure therapy, participants encounter feared stimuli in situations containing social interaction until anxiety decreases and/or anxiety-related expectancies are violated. Traditional exposure exercises are usually practiced during therapy and as homework assignments. Interestingly, a meta-analysis of treatment efficacy found exposure therapy alone to be comparable to cognitive therapy and that the combination of both was no more effective than either one delivered exclusively (Powers, Sigmarsson, & Emmelkamp, 2008).

A relatively new form of exposure therapy is Virtual Reality Exposure Therapy (VRET). During VRET, participants are confronted with computer-generated stimuli (e.g. virtual social interaction) that can elicit elevated subjective levels of social anxiety (Morina,

* Corresponding author.
E-mail address: i.l.kampmann@uva.nl (I.L. Kampmann).

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Brinkman, Hartanto, & Emmelkamp, 2014; Powers et al., 2013). Cumulative research suggests that VRET is effective in the treatment of several anxiety disorders (Meyerbröker & Emmelkamp, 2010; Morina, Ijntema, Meyerbröker, & Emmelkamp, 2015; Opriş et al., 2012; Parsons & Rizzo, 2008).

While VRET has been extensively studied in specific phobias, research on the efficacy of VRET in the treatment of SAD is still limited. Several studies suggest that VRET can reduce SAD symptoms (Anderson, Rothbaum, & Hodges, 2003; Anderson, Zimand, Hodges, & Rothbaum, 2005; Klinger et al., 2005). However, only three randomized controlled trials on the efficacy of VRET in SAD have been conducted (Anderson et al., 2013; Bouchard et al., 2015; Wallach, Safir, & Bar-Zvi, 2009). In the study by Wallach et al. (2009), VRET for public speaking anxiety, a specific social anxiety complaint, was combined with CBT and compared to CBT plus imagery exposure, and waiting-list. Results revealed that VRET plus CBT was effective in treating public speaking anxiety compared to waiting-list and as effective as CBT plus imagery exposure. However, participants in this study were not screened for a clinical diagnosis of SAD. Anderson et al. (2013) included participants with a SAD diagnosis and compared the efficacy of CBT plus VRET with CBT plus group exposure therapy. The authors reported that CBT plus VRET was as effective as CBT plus group exposure therapy. Nonetheless, the implications of the results of this study are rather limited by the inclusion of participants who had reported public speaking anxiety as their primary complaint and by the two different formats of treatment (i.e., individual vs. group).

In both the above trials, exposure exercises solely targeted public speaking-related anxiety and included only limited verbal interaction (i.e., answering questions). However, although fear of public speaking is the most common subtype of SAD, the majority of individuals with SAD report more than one fear (Ruscio et al., 2008), emphasizing the need for research on VRET targeting heterogeneous social fears. Moreover, a large number of feared social situations reported by individuals with SAD (e.g., talking to strangers or speaking up in a meeting) contain verbal interaction (Ruscio et al., 2008). As a consequence, incorporating extensive dialogues into VRET and thus going beyond answering a limited number of questions might improve the efficacy of VRET for SAD. In contrast to Anderson et al. (2013) and Wallach et al. (2009), Bouchard et al. (2015) included virtual scenarios in VRET targeting several social fears. They found individual CBT plus VRET to be effective compared to waiting-list and more effective than CBT plus in vivo exposure. However, all three studies investigated VRET in combination with CBT. Therefore, no conclusions can be drawn regarding the efficacy of VRET as stand-alone treatment and the possibility cannot be ruled out that the effects found were caused by CBT rather than VRET.

In summary, previous research on VRET is limited by investigating VRET only in combination with CBT, focussing mainly on fear of public speaking and including only limited verbal interaction. The incorporation of diverse virtual scenarios with social interaction that resembles real life interaction into VRET might more adequately target the idiosyncratic fears of participants with SAD. The aim of the present study was to single out the effects of pure VRET without any cognitive components and to adapt VRET to individuals with heterogeneous social fears by simulating social verbal interaction in a variety of virtual social situations believed to be relevant for treating individuals with SAD. In a randomized controlled trial, we examined the efficacy of VRET and in vivo exposure therapy (iVET) for adults with SAD and heterogeneous social fears. These active treatments were compared to a waiting-list control group. Both active treatments were administered in an individual format and were exposure-based only. It was hypothesized that relative to individuals in the waiting-list control group, participants in active conditions would report fewer social anxiety symptoms and would perform better on a behavioural assessment task at postassessment. Treatment gains were expected to be comparable for VRET and iVET at postassessment and 3-month follow-up.

1. Method

1.1. Participants

Participants were recruited via online and newspaper advertisements, the website of the ambulatory of the University of Amsterdam, and the project's website. Sixty participants (M_{age} = 36.9 years, age range: 18–65 years) meeting the criteria for a primary diagnosis of SAD according to the 4th edition of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2000) were included and randomly assigned to one of three conditions (20 participants each; see Fig. 1 for an overview of the randomization procedure and Table 1 for sample characteristics per condition). Exclusion criteria were a) psychotherapy for SAD in the past year; b) current use of tranquilizers or change in dosage of antidepressants in the past 6 weeks; c) a history of psychosis, current suicidal intentions, or current substance dependence; e) severe cognitive impairment; or f) insufficient command of the Dutch language. The average number of completed sessions was 8.50 (SD = 2.63) for VRET and 8.55 (SD = 2.68) for iVET. All participants received free treatment and a small monetary reward (22 Euro) for the completion of the follow-up assessment.

1.2. Measures

1.2.1. Screening and diagnostic measures

The Social Interaction Anxiety Scale (SIAS; Mattick & Clarke, 1998) was used for screening purposes before the in-person interview. The SIAS consists of 20 items assessing cognitive, affective, and behavioural responses to social interactions on a 5-point Likert scale. The SIAS possesses a high internal consistency and test-retest reliability (Cronbach's α = .93 and r = 0.92 respectively; Mattick & Clarke, 1998). Individuals scoring ≥29 were invited for an in-person diagnostic interview with a psychologist. We choose a slightly lower cut-off than reported in previous research to prevent false-negatives in this early stage of screening where the in-person intake was still to come (Heimberg, Mueller, Holt, Hope, & Liebowitz, 1992).

To assess the diagnosis of SAD and potential comorbidity, the Structured Clinical Interview for DSM-IV-TR Axis I Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 1994) was administered prior to inclusion. All assessors were psychologists with a master degree in clinical psychology. These assessors were blind to treatment condition and had received a SCID training in accordance with their individual level of expertise. The assessor at preassessment was in most cases a different person than the therapist (52/60). In a minority of cases (8/60), the assessor became also the patient's therapist after the assessment. Note, however, that these assessors were also blind to condition because condition allocation took place after the preassessment. The number of administered SCID-I modules depended on participants' responses to the SCID-I screening questions (covering substance use disorders, anxiety disorders, and eating disorders). The modules on social phobia, mood disorders, psychotic disorders, post-traumatic stress disorder, and somatoform disorders were assessed for all patients. The avoidant personality disorder section of the Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II; First, Gibbon, Spitzer, Williams, & Benjamin, 1997) was also administered