Virtual Reality as Treatment for Fear of Flying: A Review of Recent Research

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Virtual reality exposure has recently emerged as an important tool for exposure therapy in the treatment of fear of flying. There have been numerous empirical studies that have evaluated the effectiveness of virtual reality exposure as compared to other treatments including in vivo exposure, progressive muscle relaxation, cognitive therapy, bibliotherapy, and supportive group therapy. The results of two case studies and eight outcome trials have indicated that virtual reality exposure is comparable or superior to these treatments. However, the best results, as indicated by a reduction in self reported anxiety and fear experienced during an actual flight, were obtained when virtual reality exposure is combined with cognitive interventions.

Virtual Reality (VR) has recently become an excellent means for conducting exposure therapy (Krijn, Emmelkamp, Olafsson, & Biemond, 2004). VR has been most extensively used and received the most empirical attention in the treatment of specific phobia: Fear of Flying, or flying phobia. Flying phobia is classified as the experience of an unreasonable and intense amount of anxiety when confronted with flying. As a result, flying is avoided or endured with intense anxiety such that it impedes on daily functioning, such as trips for business or visiting social contacts (Mogotsi, Kaminer, & Stein, 2000). Flying phobia is one of the more common forms of psychopathology with estimated prevalence rates falling from 10 to 40% for the population (Curtis, Magee, Eaton, Wittchen, & Kessler, 1998; Van Gerwen, Spinhoven, Diekstra, & Van Dyck, 2002). Of those with the disorder that are able to fly, approximately 20% are use substances such as alcohol or sedatives to endure the fear (Howard, Murphy, & Clarke, 1983).

There are several excellent cognitive behavioral approaches that are frequently used to treat the fear of flying, many of which include exposure (Rothbaum et al., 2006). Exposure involves presenting the feared stimulus in such a manner that the client's fear will habituate. Habituation is a significant reduction in the amount anxiety that is experienced when confronting the feared stimulus. This is obtained through repeatedly presenting the stimulus for a prolonged period of time in a controlled manner (Foa & Kozak, 1986). In exposure therapy, the stimulus can be presented in a variety of forms, with the most common being the presentation of the actual stimulus, called in vivo exposure (Linden, 1981).

Virtual Reality Exposure Therapy

In vivo exposure is considered the gold standard in the treatment for specific phobias (Barlow, 2002). Despite its effectiveness, it is difficult to conduct in vivo exposure for the treatment of fear of flying because it is not always logistically possible to control, prolong, and repeat exposure to aspects of flying. This is especially true in recent times due to the increased security and financial requirements associated with flying. Therefore, clinicians must turn alternative methods of presenting the stimulus, which can include using virtual reality as in virtual reality exposure (VRE) (Choy, Fyer, & Lipsitz, 2007; Pull, 2005).

VRE places the client in a virtual environment, a three dimensional computer generated representation of the feared stimulus that responds to the users actions. The virtual environment is most commonly presented through a Head-Mounted-Display (HMD), a helmet with headphones and screens to provide a first person perspective. There are body tracking devices within the HMD such that the environment responds to the user's body movements in real time. An alternative method of presenting the virtual environment is through a computer automated virtual environment (CAVE). CAVE systems project the virtual environment on the floor and walls of a compartment instead of using a helmet. Similar body tracking technology is used to allow the environment to respond to the user.

VRE has several advantages as a tool for exposure to flying. It allows the therapist to have greater control over the experience such that elements of the flight can be manipulated for maximum therapeutic gain that would otherwise be difficult (Rothbaum, Hodges, Kooper, & Opdyke, 1995). For example, take off can only occur twice during an exposure session to an actual flight and each take off has a finite duration. In contrast, the virtual environment permits the duration the take off to be extended until the client habituates to each stage of take off, and take off can be repeated. Another advantage of VRE is the privacy it provides to the client as treatment can be conducted within the therapist's office as opposed to a public location and risk public displays of

anxiety (Riva, 2003). Lastly, clients are more excited to use VR, which may increase the rates at which people seek treatment and treatment compliance (Garcia-Palacios, Hoffman, Kwong See, Tsai, & Botella, 2001). In one study, 14 of 15 waitlist participants selected VRE over in vivo when offered to chose between the treatments (Rothbaum, Hodges, Smith, Lee, & Price, 2000).

Review of Treatment Studies

The following is a review of the research demonstrating the effectiveness of VRE as a treatment for fear of flying (Table 1). The inclusion criteria for this review were as follows: 1) the use of a standardized treatment protocol, 2) a clinical sample in which the frequency of diagnoses for participants were clearly defined, 3) and the use of established measures of treatment outcome. Using these criteria, two case studies and eight outcome trials were identified.

Case Studies

Two case studies provided the first evidence that VRE was a viable option for treating flying phobia (North, North, & Coble, 1997; Rothbaum, Hodges, Watson, & Kessler, 1996). Both case studies used a HMD to present the virtual environment. Rothbaum et al. (1996) treated a 42 year old female who met criteria for specific phobia: situational type according to DSM-IV criteria (APA, 1995). The client received seven sessions of anxiety management techniques, consisting of breathing relaxation, bibliotherapy, thought-stopping, cognitive restructuring, and preparation for stressors. There was a six week interim between this part of treatment and VRE. VRE consisted of six sessions that lasted 35-45 minutes and exposed the client to takeoffs and landings under different weather conditions and turbulence. Treatment outcome was evaluated with a self report questionnaire and subjective unit of discomfort (SUDS) ratings. At the conclusion of treatment, the client showed a decline in self reported anxiety and was able to successfully complete an actual flight with minimal anxiety, an important behavioral indicator of treatment success.

North et al. (1997) conducted a similar study to that of Rothbaum et al (1996) with a 42 year old male with flying phobia. The treatment consisted of 5 sessions of VRE involving exposure to a virtual helicopter flight. The participant showed a steady decline in anxiety during therapy according to in session SUDs ratings. Also, the client successfully completed a non-mandatory post treatment flight. The two studies provided the foundation for VRE as a treatment of flying phobia. They followed a similar protocol in that they began with anxiety reducing techniques such as breathing relaxation before starting VRE. Despite using different virtual environments, a plane and a helicopter, both were participants showed significant improvement such that they were able to fly with minimal anxiety after treatment. This speaks to the efficacy of VRE as these participants were able to complete their feared behavior after treatment.

Clinical Outcome Trials

There have been eight outcome trials that have demonstrated the efficacy of VRE as a treatment for fear of flying. The first trial compared VRE to standard in vivo exposure (SE) and a wait list (WL) control condition (Rothbaum et al., 2000). Forty five participants diagnosed with specific phobia flying (n = 42) or panic disorder with a primary fear of flying (n = 3) were randomly assigned to one of the three treatment conditions (n =15 per group). Treatment was conducted according to a manualized protocol that consisted of 8 sessions (Rothbaum, Hodges, & Smith, 1999). The first four sessions of the SE and VRE groups consisted of cognitive interventions and relaxation training. The final four sessions differed between the treatment groups. The VRE group received four exposures to a virtual airplane through a HMD. The virtual environment was able to simulate taxiing, take off, flight, and landing under calm and turbulent weather conditions. The SE group was exposed to an actual airplane. Outcome was measured with two self report scales and SUDs ratings. The results indicated that participants in VRE and SE exposure conditions showed a significant decrease in fear from pretreatment to posttreatment, whereas the WL group did not show a significant change. Furthermore, the VRE and SE groups were not significantly different at the end of treatment. Participants of the two treatment groups were more likely to fly after treatment than the WL group, but this was not a mandatory part of the protocol. This provided the first evidence that VRE is comparable to the “gold standard” for flying fear, in vivo exposure, and was more effective than no treatment (Barlow, 2002). For the previously discussed study, one year follow up data was obtained for 24 participants of the original 30 assigned to the VRE and SE groups

Table 1.
Studies examining the efficacy of VRE

Authors	Type of Study	N	Self Report Outcome Measures	Treatment	Results	Posttreatment flight	Notes
Case Studies							
Rothbaum, et al. 1996	Case Study	1	FFI, SUDS	7 Sessions	FFI decreased by 50%	Yes	
North, North, Coble (1997)	Case Study	1	SUDS	5 Sessions	SUDS ratings decreased and person flew after treatment	Yes	
Outcome Studies							
Rothbaum, et al. 2000	RCT	45 (VRE = 15, In vivo = 15, WL = 15)	QAF, FFI, SUDs	8 sessions	VR and SE were superior to WL	Non-Mandatory	6 and 12 month follow up indicates maintaince of treatment gains
Rothbaum, et al. 2006	RCT	75 (VRE= 25, In vivo = 25, WL = 25)	QAF, FFI, SUDs	8 sessions	VR and SE were superior to WL	76% of VRE and SE participants completed a post treatment flight	6 and 12 month and after 9/11 follow up indicates maintaince of treatment gains
Maltby et al 2002	Treatment Comparison	43 (VRE = 20, Attention Placebo = 23)	FAS, FAM, SUDs	5 Sessions	VR and attention placebo both show significant decline during treatment. However, VRE has larger effect sizes.	65% of VRE and 57% of attention placebo groups completed post treatment flight	VRE and Attention Group had comparable levels of self reported anxiety at the 6 motnh follow up
Mulberger, et al. 2001	Treatment Comparison	30 (PMR =15, VRE = 15)	FFS, GFFQ, DES, AES, ASI, SCL, Heart Rate	1 session	VR comparable to PMR	Post Treatment flight conducted with VR. VRE group shows lower self reported anxiety as compared to PMR.	
Mulberger, et al. 2003	RCT	47 (VRE w/ motion simulation = 13, VRE w/o motion simulation = 13, Cognitive Therapy = 11, Waitlist = 10)	FFS, GFFQ, SUDs	1 session	VR is more effective that WL and Cognitive intervention at 6 months	None	
Mulberger, et al. 2006	Treamt	30 (accompanied at posttreatment flight = 15, unaccompanied at post treatment flight = 15)	FGSQ, ASI, DES, AES, FFS, GFFQ, SUDs,	1 session	VRE shows significant decreases at posttreatment	Yes	
Botella, et al 2004	Treatment Outcome	N = 6	AFS, DOBICT, SUDS, DES, FAS, FFQ, BDI, STAI, SUDs	7 sessions	VRE showed a significant decrease from pretreatment to posttreatment	All participants successfully completed a posttreatment flight	
Kirjn et al, 2007	Treatment Comparison	N = 64 (VRE = 29, Cognitive Therapy = 16, Bibliotherapy = 19)	FAS, FAM, CER, SUDs	4 sessions	VRE and CB showed significant declines, but VRE's effect size was small	None	Check Study

Note: FAS = Flight anxiety situations questionnaire, FAM = flight anxiety modality questionnaire, FFS = Fear of Flying Scale, GFFQ= General fear of flying questionnaire, DES = danger expectancy scale, AES = anxiety expectancy scale, ASI = anxiety sensitivity index, FGSQ = fear and general symptoms questionnaire, BDI = Beck Depression Inventory, STAI = State - Trait Anxiety Inventory, AFS = Avoidance and Fear Scale, DBCT = Degree of Belief in Catastrophic Thoughts, CER = Cognitive Emotion Regulation Questionnaire, SUDs = Subjective Unit of Discomfort

(Rothbaum, Hodges, Anderson, Price, & Smith, 2002). For all participants, there was a significant difference between pretreatment and 12 month follow up and no significant difference between posttreatment and 12 month follow up. The effect sizes were comparable across groups. Additionally, almost all of the participants (92% VRE, 91% SE) had flown during the year following treatment, suggesting treatment gains were maintained. Long term follow up data was obtained after the September 11th attacks to determine the effect of this flying related traumatic event (Anderson et al., 2006). Self report measures indicated that there was no significant change in fear of flying from posttreatment to post September 11th. The results from this trial and the follow up data support VRE as an effective intervention for flying phobia. Those that underwent this treatment obtained

comparable results to those receiving the current standard of care and maintained their treatment gains for several years. However, this study had limitations that would be addressed in future work. These included the use of cognitive interventions and the lack of a mandatory posttreatment flight. By having additional treatment components, the true effect of VRE on flying phobia may have been obscured. Also, a pretreatment flight was not a mandatory part of the study, which is thought to be an essential measure of treatment outcome (Ost, Brandberg, & Alm, 1997).

The second clinical trial conducted by this research team addressed the limitation of not including a posttreatment flight (Rothbaum et al., 2006). Seventy five participants that met DSM-IV criteria for fear of flying were randomized to one of three treatment conditions: waitlist (WL, n = 25), in vivio exposure (SE, n = 25), and VRE (n = 25). Similar to the previous study, a manualized treatment protocol and self report measures were used with a posttreatment flight being added as a behavioral outcome measure. Results indicated that the SE and VR groups declined significantly from pretreatment to posttreatment on all self report measures as compared to the WL group. There was no significant difference between the treatment groups at posttreatment. In regards to the posttreatment flight, the majority (76%) of the VR and SE groups were completed the task as compared to 20% of the WL group. The treatment gains for the SE and VRE groups were maintained through 6 and 12 month follow up with 22 of 32 VRE and 26 of the 34 SE participants no longer meeting criteria for flying phobia. These sample size increases reflect WL participants that were randomized to either VR or SE. This study provides additional support to suggest that treatment outcomes from VRE are sustainable and comparable to SE. The inclusion of the posttreatment flight indicates that VRE enabled participants to fly on an actual plane, demonstrating that the treatment can lead to behavioral changes outside the virtual environment. Limitations of this study include the use of a protocol that included other interventions. Also, VRE was only compared to one alternative treatment, whereas there are several methods used to treat specific phobia in addition to exposure therapies.

To determine the influence of nonspecific factors as a potential confound for the positive treatment effects, VRE was compared to an attention placebo treatment (Maltby, Kirsch, Mayers, & Allen, 2002). Forty three participants diagnosed with specific phobia: fear of flying were randomized to either an attention placebo group (n = 23) or VRE (n = 20). The attention placebo group involved meeting with other participants and a therapist in a group setting in which flying fears were discussed. The therapists provided support and encouragement to the client without using any specific interventions. VRE consisted of five sessions that involved anxiety management techniques and exposure to a virtual plane. Participants in both groups demonstrated a significant decrease in self reported fear of flying from pretreatment to posttreatment and comparable completion rates of a posttreatment flight. However, the effect size for the VRE group was substantially larger than that of the attention placebo group. At 6 month follow up, there were no significant differences in self reported flying fears between the treatment groups. The results suggest that although VRE may be an important element of treating flying phobia, having a supportive and encouraging environment may also be necessary.

There have been a series of studies evaluating the efficacy of a single session of VRE (Muhlberger, Herrmann, Wiedemann, Ellgring, & Pauli, 2001; Muhlberger, Weik, Pauli, & Wiedemann, 2006; Muhlberger, Wiedemann, & Pauli, 2003). This was inspired by prior work that has indicated a single treatment session of multiple in vivo exposures was sufficient at reducing symptoms of specific phobia (Ost, 1989; Ost et al., 1997).

The first of these studies compared VRE to Progressive Muscle Relaxation (PMR) (Muhlberger et al., 2001). PMR is commonly used to treat anxiety disorders and it presents an effective alternative for clients that are unable to tolerate the anxiety of exposure therapies (Barlow, 2002). Another novel element of this study was the use of the physiological measures of heart rate and skin conductance as indicators of outcome for the VRE group. Thirty participants were randomized to two treatment condition (nVRE = 15, nPMR = 15). Treatment for both groups consisted of a single three hour session. The VRE group received four exposures whereas the PMR group received two complete practices of PMR. Self reported anxiety significantly declined for both groups from pretreatment to posttreatment. However, those in the VRE group showed greater declines for fear of

flying as indicated by self report measures and SUDs ratings. The physiological measures indicated a significant decrease in arousal during the course of treatment for the VRE group. A posttreatment flight on a virtual plane was used as a behavioral outcome measure. During this flight, the VRE group reported lower anxiety than the PMR group. This study provides additional evidence that VRE is comparable to other commonly treatments for flying phobia. Furthermore, it shows that VRE can be successfully conducted in an abbreviated format.

A consistent weakness of the previously discussed studies has been the inclusion of cognitive techniques in the treatment protocols that may have obscured the effect of VRE as the active treatment component. To address this, Mulhberger et al. (2003) used a single session treatment to compare VRE plus cognitive therapy to a purely cognitive based intervention. A secondary hypothesis of this study was to assess the benefit of using motion simulation in the virtual environment. Motion simulation involves moving the participant's body to better mimic the experience of flying. For example, the participant would be placed in a reclined position during takeoff and then gradually be brought to an upright position during flight. This was thought to increase the immersion of the environment, which is theorized to be related to treatment outcome (Wiederhold & Wiederhold, 2005a). This study randomized 47 participants with flying phobia across four groups, VRE with motion simulation (nVREmo = 13), VRE without motion simulation (nVRE = 13), Cognitive therapy alone (nCog= 11), and a Waitlist Control (nWL= 10). The Cog group received a 60 minute therapy session that involved analyzing thoughts, feelings, bodily symptoms, catastrophic thoughts about flying. Both VRE groups received this cognitive intervention as well as four successive VR flights. The results indicated that the VRE groups reported significantly lower anxiety across all self report measures as compared to the cognitive therapy and waitlist groups at posttreatment and 6-month follow up. There was no significant difference amongst the VRE groups, suggesting that the use of motion simulation was not related to improved treatment outcome. This study provides the first evidence that cognitive interventions without VRE provide poorer treatment outcome, suggesting that VRE is a necessary aspect of treatment.

The final study to use a single treatment protocol for VRE examined the influence of having a therapist accompany a participant on the posttreatment flight (Muhlberger et al., 2006). Posttreatment flights are an important behavioral outcome measure, but may be considered an extension of treatment when the therapist accompanies the client. The presence of the therapist may encourage the client to be more willing to participate in the flight and experience less anxiety. To assess this, 30 participants diagnosed with flying phobia were given a single session of VRE and then randomized across two groups for the posttreatment flight, n = 15 accompanied by a therapist and n = 15 that flew alone. For the therapist accompanied group, the therapists were not allowed to communicate with the participant during the flight, preventing additional treatment from occurring. Congruent with prior studies, the results indicated that participants reported a significant decline in fear across all self report measures from pretreatment to posttreatment. There were more participants that flew accompanied (n = 13) than flew unaccompanied (n = 10), however a chi-square test indicated that his difference was not significant. There was no significant difference between the amount of anxiety experienced during the graduation flight for the groups. However, those that completed the posttreatment flight had significantly lower anxiety at 1 year follow up, regardless of group assignment. As such, it appears that having a therapist present at the posttreatment flight does not impact flying anxiety; however, attending a posttreatment flight was a predictor of overall treatment outcome.

In sum, these studies indicate that a single session of VRE is an effective and efficient means of treating flying fears. It appears that VRE is a necessary component of successful treatment. However, it is not necessary for the virtual environment to include motion sensation, which is important as including this element can require additional equipment. Finally, having the therapist attend the follow up flight does not appear to influence the attendance of or anxiety experienced during a graduation flight.

Significant improvements have been made to the virtual environments that have been used in VRE in recent years. The original environment consisted of a plane's interior and was only able to simulate events that took place during flight. Newer

iterations of this environment have been able to better capture the entire experience of flying by including aspects of the airport such as check in and baggage claim (Botella, Osma, Garcia-Palacios, Quero, & Banos, 2004; Maltby et al., 2002). Including these elements in the virtual environment has been shown to be related to an increase in the extent that participants feel immersed in the virtual environment (Price & Anderson, 2007). The first study to use this expanded environment enrolled six participants diagnosed with flying phobia in a seven session VRE treatment that concluded with a posttreatment flight (Botella et al., 2004). Treatment followed a strictly exposure based protocol with minimal cognitive interventions. Exposure involved having participants check their bags, board the aircraft, complete a flight, and retrieve their bags. All participants reported a decrease in anxiety on all treatment outcome measures as well as a decrease in SUDs ratings during the virtual flights. All participants completed a posttreatment flight on an actual plane with minimal anxiety. One year follow up data indicated a significant decrease from pretreatment scores, but no significant change from posttreatment scores. This provides additional evidence to the efficacy of VRE and speaks to the utility of the virtual environment. VRE can be adapted to incorporate additional feared aspects, which may be helpful if a client requires a highly specific experience for their exposures, such as a specific airport.

The most recent VRE outcome study compared the effectiveness of VRE to traditional cognitive therapy (CT), and bibliotherapy (BIB) (Krijn et al., 2007). Eight six participants diagnosed with flying phobia were randomized to the three conditions: nVRE = 29, nBIB = 19, and nCT = 16. Treatment protocols varied across groups. The VRE group received four sessions of exposure using a virtual environment that recreated the experiences of being in airport as well as flight. The use of cognitive interventions were minimized in an attempt to provide a purely exposure based treatment. The CT group received 2-4 sessions of cognitive therapy which included relaxation training and challenging irrational beliefs. The BIB group was given a book to read about fear of flying and was then randomized to one of the following groups after five weeks. Using a pre/post design, there was no significant change in self reported anxiety for the BIB group, but there was a significant decrease for the CT and VRE groups. Furthermore, there were no significant differences between VRE and CT at post treatment on the self report measures. However, the authors noted that the effect size of the VRE group was substantially smaller than that of prior studies that have combined cognitive interventions with exposure. This suggests that VRE in conjunction with cognitive interventions lead to the greatest benefit.

Presence

The majority of research provides strong support for the use of VRE as an efficient and effective means of treating flying phobia. This presents several new research questions, including understanding how a virtual stimulus elicits a fearful reaction. This is theorized to occur through the immersiveness of the virtual environment, which is referred to as presence. Presence is defined as the interpretation of a virtual stimulus as if it were real (Powers & Emmelkamp, In Press; Price & Anderson, 2007). Presence has been hypothesized to be the mechanism by which VR elicits anxiety (Banos et al., 2004; Huang & Alessi, 1999; Wiederhold & Wiederhold, 2005b). However, the relation between presence and anxiety is largely theoretical and has been explored in only a few empirical studies. Price & Anderson (2007) found support for presence as a mediator between pretreatment anxiety and in session anxiety for flying phobics, suggesting presence may serve as a conduit by which fear is experienced in the virtual environment. Several additional studies have found comparable results with other specific phobias (Regenbrecht, Schubert, & Friedmann, 1998; Schubert, Friedmann, & Regenbrecht, 2001). Many researchers also have suggested that experiencing greater presence in the virtual environment is related to stronger treatment outcomes (Rothbaum & Hodges, 1999; Wiederhold & Wiederhold, 2005b). There have been only two studies to evaluate this relation (Krijn, Emmelkamp, Biemond et al., 2004; Price & Anderson, 2007). The first evaluated the treatment response in 22 acrophobic participants that were randomly assigned to a high presence virtual environment (CAVE) or a low presence virtual environment (HMD). Treatment consisted of three individual sessions that lasted for one hour in four separate environments. Both treatment groups reported a similar, significant decrease in their fear of heights. The second study examined presence as a predictor of treatment outcome in a sample of 36 participants diagnosed with fear of flying. The results indicated that

presence was not related to changes in anxiety from pretreatment to posttreatment. The small amount of research on presence indicates that presence is related to the experience of anxiety, but is not associated with treatment outcome.

Discussion

The results of randomized trials and case studies indicate that VRE is an efficient and effective treatment for flying phobia. It offers several benefits beyond that of in vivo exposure in that the therapist has a greater control over the feared stimulus, it provides greater privacy for the client, it minimizes the addition of stressors associated with traveling to an airport, and the feared stimulus can be adapted with technological advances. VRE is comparable to several other treatments available for fear of flying including in vivo exposure, PMR, and traditional cognitive therapy. However, it is important to note that the studies that utilized a strictly VRE based protocol typically obtained weaker outcomes than those that incorporated cognitive elements. VRE may be a necessary element for successfully treating flying phobia, but stronger clinical outcomes may be obtained by including other treatment components such as cognitive interventions and having a supportive therapuetic environment.

Despite the benefits of VRE, it is important to consider the limitations of this treatment modality. Although the virtual environments does provide a great deal of flexibility, it may be difficult for a therapist to add new elements to the virtual environment. The help of an experienced computer support team that can update the program code for the virtual environments is required to adapt the stimulus. This may be unavailable to many therapists, limiting the extent that the environment can be adjusted for a specific client. Furthermore, the environments may not be able to adequately recreate all of the experiences involved with flying, such as waiting in lines and going through security. As such, it may be the case that participants may not fully habituate to these elements. Another limitation is the cost of the equipment needed for a virtual environment. A virtual reality set up requires a computer capable of running the software, two computer monitors, a HMD or CAVE, and a platform with the ability to vibrate in order to enhance the experience of takeoff and landing. This requires a significant financial investment on behalf of the therapist, which may be prohibitive to having this equipment. As VRE becomes an increasingly important means of treating psychopathology, it may become a necessary tool for a private practice. Until then, this treatment modality may be available to few therapists that have practices dedicated to treating specific disorders.

Overall, VRE appears to be a valid and appropriate means of treating fear of flying. The flexibility and utility of VR allows it to be adjusted to treat many disorders. There have been several preliminary studies investigating the utility of VRE in other anxiety disorders with promising results (Krijn, Emmelkamp, Olafsson et al., 2004). As this work continues to be done, VR will become a more commonly used tool in psychotherapy.

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