



## TREATMENT OF FLYING PHOBIA USING VIRTUAL REALITY EXPOSURE WITH OR WITHOUT COGNITIVE RESTRUCTURING: PARTICIPANTS' PREFERENCES

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**Abstract:** This study analyses participants' preferences regarding two exposure treatment modalities for Fear of Flying (FF): virtual reality exposure treatment (VRET) by itself or VRET plus cognitive restructuring (VRET+CR). An alternating treatment conditions design was established and a non-concurrent multiple baseline design across individuals (four participants) was used. Both conditions were equally effective and after the treatment all the participants took a flight. At the end of each session the participants were asked for their *opinion* on the condition they received. High mean scores were obtained in both conditions; non-significant differences between the two conditions were found. When the treatment was finished the participants were also asked for their *preferences* regarding both treatment conditions. All participants preferred VRET+CR, considered it more effective, recommended it more to others, and claimed this treatment was less aversive. These data contribute to the literature focused on the importance of taking into account patient preferences.

**Keywords:** Fear of flying; exposure; cognitive restructuring; virtual reality; preferences.

*Tratamiento de la fobia a volar usando la exposición de realidad virtual con o sin reestructuración cognitiva: Preferencias de los participantes*

**Resumen:** Este estudio analiza las preferencias de los participantes sobre dos modalidades de tratamiento para el miedo a volar (MV): Tratamiento de exposición mediante realidad virtual (VRET) o VRET más reestructuración cognitiva (VRET + CR). Se contrabalancearon las condiciones y se utilizó un diseño no concurrente de línea base múltiple (cuatro participantes). Ambas condiciones fueron igualmente eficaces y después del tratamiento, todos los participantes tomaron un vuelo. Al final de cada sesión se pidió a los participantes su opinión sobre la condición recibida. En las dos condiciones se obtuvieron puntuaciones altas, no encontrándose diferencias significativas entre ambas. Terminado el tratamiento también se preguntó por sus preferencias a los participantes con respecto a las condiciones. Todos los participantes prefirieron VRET + CR, considerándola más eficaz y recomendable, afirmando que este tratamiento era menos aversivo. Estos datos contribuyen a la literatura enfocada a la importancia de tomar en cuenta las preferencias del paciente.

**Palabras clave:** Miedo a volar; exposición; reestructuración cognitiva; realidad virtual; preferencias.

### INTRODUCTION

The most effective treatment for specific phobias, including fear of flying (FF) is in vivo exposure (IVE) (Barlow, Raffa, & Cohen,

2002). IVE has demonstrated efficacy in several studies, becoming the gold standard treatment for specific phobias (Choy, Fyer, & Lipsitz, 2007; Wolitzky-Taylor, Horowitz, Pow-

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ers, & Telch, 2008). However, some authors insist that there is room for improving this technique as not all individuals are helped by IVE (Blanchard et al., 2004; Marks, 1992). In fact, some people, when they are aware that IVE implies direct confrontation with the feared object or situation, may be apprehensive about accepting this technique: about 25 per cent of phobic patients refuse it due to fear of facing the feared object or situation (Marks, 1992), and a low treatment acceptance and high drop-out rates have been documented (Choy et al., 2007; García-Palacios, Botella, Hoffman, & Fabregat, 2007). Data from a study by Becker, Zayfert, & Anderson (2004) also confirm the limited use of exposure therapy. Exposure therapy has even been called “the cruelest cure” because it purposefully evokes distress in patients, and can even raise ethical concerns about the safety, tolerability, and indeed humaneness of exposure therapy (Olatunji, Deacon, & Abramowitz, 2009).

Furthermore, several added costs are involved in IVE treatment of FF because it means taking the patient on a flight. Conducting IVE slowly and gradually means that many difficulties and disadvantages arise. Not only can it seem very threatening to for the patient, but sometimes it can be quite “costly, embarrassing, dangerous or unfeasible” (Maatjes, 2005, p. 1).

In summary, in addition to efficacy, it is also important to pay attention to the variables implied in the effectiveness of exposure techniques. In fact, guidelines developed by the American Psychological Association Task Force on Promotion and Dissemination of Psychological Procedures (1995) differentiate between Axis I (internal validity or *efficacy*) and Axis II (clinical utility, external validity or *effectiveness*). The second axis is about effectiveness or clinical utility, and it concerns the applicability and feasibility of an intervention in clinical practice settings. The patient's satisfaction, credibility, acceptability and preferences are important factors to be included in the effectiveness axis. In recent years, clinical researchers have begun to focus on effectiveness and have underlined the importance of conducting this type of study (Nathan & Gorman, 2007).

In recent years, some studies have shown that it is possible to improve the effectiveness of the exposure technique. New ways of applying exposure techniques such as virtual reality exposure therapy (VRET) have received a great deal of attention and have become computer-based alternatives to standard IVE for the treatment of FF (Choy et al., 2007). Recent meta-analysis show VRET is effective for the treatment of several anxiety disorders, including FF (Oprish et al., 2012; Powers & Emmelkamp, 2008). Results confirm that VRET is an effective procedure for treating FF (Baños et al., 2002; Botella, Oasma, García-Palacios, Quero, & Baños, 2004; Krijn, Emmelkamp, Ólafsson, & Biemond, 2004; Tortella-Feliú et al., 2011), more effective than non-treatment, systematic desensitisation or exposure by imagination and as effective as IVE (Rothbaum, Anderson, Zimand, & Hodges, 2006; Wiederhold & Wiederhold, 2003).

One of the reasons for the development of VRET is its promise of increasing effectiveness and efficiency (e.g., by providing exposure scenarios from the therapist's office, saving therapist time, increasing the patient's access to therapy, ensuring confidentiality, increasing the patient's motivation for treatment, etc.) without compromising efficacy (Botella et al., 1998). Patient satisfaction, acceptability and preferences are important factors included in the effectiveness or clinical utility Axis. In recent years, researchers have begun to focus on effectiveness and have underlined the importance of obtaining data in this field (García-Palacios et al., 2007), and several studies have reported that patients were satisfied with VRET (Baños et al., 2009; Botella et al., 2007). In fact, in Richard and Gloster's (2007) survey, VRET was viewed as more acceptable, helpful, and ethical than traditional exposure-based therapies.

The question is whether it is possible to advance in this field of improving the effectiveness of VRET. In our opinion, a useful action would be to study the possible influence of cognitive restructuring (CR) when applying VRET. Misinformation about flying and catastrophic thoughts can play an important role in the treatment of FF. We have to underline that FF is a specific phobia, situational type, which is defined as an intense and irrational fear regarding

situations related to flying (DSM-IV, APA, 2000). CR is oriented to making the person more aware of their maladaptive automatic thoughts (Beck, 2005). In the case of FF, CR can help the patient to reevaluate the possibility of a plane accident. In the VRET field, two studies have analysed the possible utility of CR for the treatment of FF. Mühlberger, Wiedermann and Pauli (2003) studied the effects of adding VRET to CR. This study included three conditions: CR alone, CR plus VRET and a wait-list control group. The results showed that VRET enhanced the effects of CR for FF in the short term (the condition of CR plus VRET resulted in less anxiety than the other two conditions), but did not affect the long-term outcome. Krijn et al. (2007) compared the effectiveness of three treatments: bibliotherapy without therapist contact, individualised VRET, and CR. The results showed that both procedures, VRET and CR, were more effective than bibliotherapy, and there was no statistically significant difference between those two treatments. However, effect sizes were lower for VRET than for CR. These authors suggest that future research should focus on comparing the effectiveness of VRET versus VRET plus CR techniques. In a similar line, Meyerbröker and Emmelkamp (2010) insist that studying process variables such as therapeutic alliance and cognitions could contribute improving this field.

Our interest then is focused on the preferences of the participants regarding VRET and CR. An evaluation of the differential effectiveness of VRET with and without CR for the treatment of FF has not been carried out. For this reason, the first objective of this study is to analyse participants' opinion and preferences regarding two exposure modalities for the treatment of FF: VRET alone or VRET+CR. A second objective is to provide additional efficacy data about VRET for the treatment of FF.

## METHOD

### *Participants*

Four participants were included in the study. Their mean age was 36 ( $SD = 7.53$ ), ranging

from 27 to 45 years. Three of them were females and one male. The duration of the phobia (in years) ranged from 3 to 15 years, with a mean of 10.50 ( $SD = 5.45$ ). All had come to seek help at the Emotional Disorders Clinic at Jaime I University of Castellón (Spain). None of them had previously received psychological treatment for FF.

In order to be included in the study, each participant had to meet current DSM-IV-TR criteria for specific phobia (situational type), in particular FF (APA, 2000) and to have scores over four in phobic avoidance (on a scale of zero to eight). Exclusion criteria included age less than eighteen, undergoing current psychological treatment, any other current psychopathological disorder requiring immediate treatment, mental retardation, cardiovascular or respiratory illness, and current pregnancy.

Participant 1 (P1) was a 34-year-old married woman who worked as a postwoman. Her FF began ten years ago when she boarded her first plane. She remembers experiencing her first flight without significant difficulty though feeling moderate fear. From that moment on her fear worsened, especially from the perspective of being a mother. At the present time she reports extreme fear, particularly when she is inside the plane and there is turbulence. Her main negative thoughts concern experiencing turbulence during the flight and that the plane will crash. She is especially scared of long flights. The participant reports that since the start of her fear she has always taken flights with her husband, never alone. On recent flights, the participant has taken a tranquiliser, but she states that it did not take effect. In the last year, the participant has not boarded a plane. She rated the interference of this problem in her life as a 6 on a 0-8 scale (ADIS-IV, DiNardo, Brown, & Barlow, 1994). Her husband loves flying and travel but due to the participant's problem they cannot fly frequently. At the present time the participant does not describe any other psychological problem.

Participant 2 (P2) was a forty-five-year-old single man who works in banking. His FF began fifteen years ago during his first flight. That was a long flight during which he felt severe anxiety. On ensuing flights, the patient stated he felt

intense anxiety too, which bears no relation at the present time to flight duration. He describes feeling abdominal pain, a dry mouth and being on edge throughout any flight. He states that he always thinks something bad when he has to take a plane. Specifically, his main negative thought regarding flight is the idea of suffering an accident and dying. On recent flights this participant usually drinks a lot of alcohol to avoid the physical sensations caused by the flight. At the present time he avoids any situation that requires taking a flight. If he needs to travel he always tries to find an alternative solution to taking a plane, such as the train. The participant has not flown in the last year due to his fear. He rated the interference of this problem in his life as a 6 on a 0-8 scale (ADIS-IV; DiNardo et al., 1994). During the initial assessment a phobia of storms was detected, and in 2005 he suffered diverse, constant concerns for his life and requested psychological attention. Since then he has been taking antidepressant medication daily.

Participant 3 (P3) was a twenty-seven-year-old married woman who works as a chemist. When she was seventeen years old she took her first flight. The participant does not remember feeling anxiety on this flight, which she describes as a normal flight. She thinks that her FF began three years ago when she began to feel moderate anxiety on some flights. She especially remembers a London trip during which she experienced strong turbulence and felt intense fear. Since then, on all such trips the participant takes anxiolytic medication to face her fear. This fear became worse in the last year on her honeymoon. During this trip, the patient took a total of eight flights. She felt extreme anxiety during all these flights and always had to take anxiolytic medication to cope with the situation. Since then, she has taken no other flight. She especially fears flights over the sea and states that she experiences intense anxiety when she hears about plane crashes. Her main catastrophic thought regarding taking a plane is of suffering an accident and dying. When she has to take a plane, the participant needs to say goodbye to all the significant people in her life, in case she has an accident. She rated the interference of the problem in her life as a 7 on a 0-8 scale

(ADIS-IV, DiNardo et al., 1994). At the current time the participant does not refer to suffering any other psychological problem.

Participant 4 (P4) was a thirty-eight-year-old married woman who works as housewife. When she was eighteen, she took her first flight. The participant did not remember feeling anxiety on this flight. Regarding the start of her FF, she states that it began when she was twenty-three years old. The participant remembers feeling intense fear during a flight in which the emergency lights had to be switched on. From that moment the participant says her fear got worse. On a usual flight, she describes holding her breath, feeling abdominal pain and closing her eyes. Also, she always tries to travel in an aisle seat. She feels especially intense fear when her two daughters have to travel with her and her husband. Her main catastrophic thought regarding taking a plane is having an accident and dying. She is especially scared of and avoids long flights. At the moment of the initial screening, the patient completely avoided having to take any plane, not having flown at all in the last year. She rates the interference of this problem in her life as a 6 on a 0-8 scale (ADIS-IV; DiNardo et al., 1994). A significant datum is that the participant completely avoids travelling to the USA to visit her sister because of her FF. Though she would like to do this, she feels completely unable to undertake a long-haul flight. In addition, she has the opportunity of travelling with her husband due to his job, but she avoids these trips completely, once again due to her FF. Nowadays, the participant describes having certain hypochondriac fears. Furthermore, six years ago she was diagnosed with social anxiety.

### *Design and experimental conditions*

An alternating treatment conditions design (Barlow y Hayes, 1979) was used for this study. Two experimental conditions were considered, VRET and VRET plus cognitive restructuring (VRET+CR). Treatment conditions would change alternatively in a randomly and counter-balanced order over a total of six treatment sessions. All the participants received a total of three

sessions of VRET condition and another three sessions of VRET+CR condition. Furthermore, a requirement was established that no more than two consecutive sessions of the same treatment condition would be applied. In addition, a non-concurrent multiple baseline design across individuals was established (Hersen & Barlow, 1976). Four baseline periods were established: eight, eleven, fourteen and seventeen days.

All participants were randomly assigned to the different baselines. During baseline periods, participants recorded their degree of fear, avoidance and belief in catastrophic thoughts, regarding the main target-behaviour related to FF. When the baseline period was over the participants were randomly assigned to both treatment conditions as well. All participants received a total of three sessions of VRET, and another three sessions of VRET+CR. Table 1 shows the design included in the study.

### Measures

*Anxiety Disorders Interview Schedule for DSM-IV* (ADIS-IV; DiNardo et al., 1994). This interview was used to determine the diagnostic status of the participants. Specifically, the section on specific phobias of the Anxiety Disorders Interview Schedule for DMS-IV was used. This instrument also includes other relevant clinical measures, enabling the therapist to quantify levels of fear, avoidance, and interference on a scale of 0 to 8 (0 = no fear, avoidance or interference, 8 = extreme fear, avoidance or interference). ADIS-IV is an excellent interview for assessing anxiety disorder; it has proven adequate psychometric properties according to Anthony, Orsillo, and Roemer (2001).

*Target behaviours*, adapted from Marks and Mathews (1979). Participants assessed their fear,

avoidance and belief in catastrophic thoughts from 0 ("No fear at all", "I never avoid", "I don't believe it") to 10 ("Severe fear", "I always avoid" "I absolutely believe it") regarding different scenarios related to taking a plane before and after each specific exposure session.

*Subjective Units of Discomfort Scale* (Wolpe, 1969). During the session, participants rated their levels of anxiety on a scale from 0 ("No anxiety") to 10 ("Extreme anxiety").

*Session Opinion Questionnaire*. In order to obtain data regarding participants' satisfaction and their opinion on the treatment modality applied in each session, we adapted the Borkovec and Nau (1972) questionnaire. The questions concerned how logical the treatment session seemed ("To what extent does today's session seem logical to you?"), satisfaction ("To what extent are you satisfied with the session received today?"), usefulness ("To what extent do you think that today's session was useful in your case?") and aversion or discomfort felt in this specific session ("To what extent was today's session aversive for you?"). A 0-10 point Likert scale (from "Not at all" to "Very much") was used to respond to all questions. This scale has been adapted and used in some previous studies in our research group (Baños et al., 2009; Tortella-Feliu et al., 2011).

*Assessment of the use of cognitive restructuring during the VRET session*. At the end of each session participants were asked a question in order to verify whether they had used some sort of self-applied cognitive restructuring (not directed by a therapist) during the exposure session. The question was required only in the VRET condition sessions.

*Treatment Preferences Questionnaire*. This instrument was elaborated specifically for this study. It consists of several dichotomous questions about treatment preferences, to be answered

Table 1. Alternating treatment conditions design used in the study

	S1	S2	S3	S4	S5	S6
P1-Baseline 8 days	A	B	A	A	B	B
P2-Baseline 11 days	B	A	B	A	B	A
P3-Baseline 14 days	A	A	B	A	B	B
P4-Baseline 17 days	A	B	A	B	B	A

Note: S = Session; P = Participant; A = Experimental condition "VRET+CR"; B = Experimental condition "VRET".

by participants once the treatment was finished and then both conditions included into the study (VRET or VRET+CR) were presented. The questions addressed the following aspects: (1) Preference (“If you could have chosen between the two treatment modalities, *which one would you have chosen?*”); (2) Subjective effectiveness (“Which one of these two treatment modalities do you think would have been the *most effective* in helping you overcome your problem?”); (3) Recommendation (“Which one of these two treatment modalities would you *recommend* to a friend with the same problem you have?”) and (4) Subjective aversion or discomfort (“Which one of these two treatment modalities do you think would have been the *most aversive* to you”). Questions were composed of two response options in accordance with the two treatment conditions: a) *Virtual reality exposure treatment*, b) *virtual reality exposure treatment plus cognitive restructuring*. An additional fifth open question was asked of the participants who could add any qualitative information regarding their preferences. They were asked specifically: “Briefly explain the reasons for your choice”.

### Therapists

The assessment and treatment phase was carried out by therapists specialising in clinical psychology with at least master’s-level studies. The therapists had received specific training regarding the treatment of anxiety disorders and new technologies, and had previous experience in the field.

### Virtual Reality System

The *Virtual Flight* software (Baños et al., 2002; Botella et al., 2004) was used to provide exposure to three virtual scenarios in the study: the room, the airport, and the plane. The software includes three VR scenarios: the room, the airport, and the plane.

The system provides visual and acoustic elements related to the fear situations. A detailed description of the virtual environments and of this system can be found in Baños et al. (2002) and Botella et al. (2004).

### Treatment

The main components of the treatment were psychoeducation on FF, VR exposure using the *Virtual Flight* software, and cognitive restructuring. In the first session, an initial explanation regarding the manifestations of phobic disorders and the maintenance of FF was given to all the participants. The role of avoidance was emphasised and the definition and rationale of exposure therapy using virtual reality, specifically, *Virtual Flight*, was discussed. A five-page booklet containing these explanations was given to all the participants. Then, treatment was conducted under the corresponding experimental conditions following the counterbalanced design.

*VRET session without cognitive restructuring (VRET)*: in these sessions the therapist accompanied the participants throughout the session, adding a description of the virtual environments in which participants were immersed. The main goal of this exposure session was to remain with the participant in the situation until a significant decrease in subjective anxiety was achieved. Approximately every five minutes the therapist asked the participants to rate their anxiety levels using the subjective units of discomfort scale (Wolpe, 1969). Virtual exposure to the different scenarios was done, progressing from the easiest to the most difficult situations (according to the participant hierarchy established by the therapist with the patient in the first session).

*VRET session plus cognitive restructuring (VRET+CR)*: The VRET was applied in a similar way to that described above, but therapists asked the participants to verbalise the catastrophic thoughts and feelings experienced during exposure. The therapists helped the participants to challenge the dysfunctional beliefs associated with FF.

### Procedure

All participants were screened in a personal interview to determine their diagnostic status and to quantify the degree of fear, avoidance, and interference associated with their FF using

the ADIS-IV (DiNardo et al., 1994) to determine their diagnostic status. If the participants met the inclusion criteria for taking part in the study, they accepted treatment and signed the informed consent form. Then the participants were randomly assigned to the different baseline periods and experimental conditions. As soon as they completed their baseline, their respective treatments started. The treatments were conducted under the corresponding experimental conditions following the counterbalanced design. The participants were exposed to the virtual environments and cognitive restructuring was incorporated into the specific condition which included it. Treatment in both conditions consisted of a maximum of six sessions at the rate of one session a week. The length of each session was established at sixty minutes, with the exception of the initial session for both treatment conditions and the first session of VRET+CR condition, which lasted around ninety minutes due to also introducing psychoeducation (PS) regarding FF, avoidance and exposure; and explanations concerning the role of the catastrophic thoughts (ABC) respectively. The fear hierarchy was based on exposure scenarios included in the *Virtual Flight* software. The order of presentation of each virtual environment was established depending on each participant's exposure hierarchy, which was previously determined with the therapist. It was very similar, however, for all four participants. All participants chose the same order of stimuli presentation.

Therefore, as participants progressed through the exposure sessions to each situation related to FF, the anxiety level was higher. To control for procedural fidelity, detailed session-by-session therapist manuals were used. In all sessions participants were asked about their degree of fear, avoidance and belief in catastrophic thoughts, regarding the main target-behaviour related to FF.

Furthermore, at the end of each treatment session the *Treatment Opinion Questionnaire* was applied in order to record the participants' opinion on the treatment condition received. Patients did not receive any homework, and practicing in vivo exposure between sessions was not encouraged. During VR exposure ses-

sions patients were not specifically precluded from using cognitive restructuring, but they were asked to verify whether they had used some sort of self-applied cognitive restructuring (not directed by a therapist) during this session.

When the treatment finished, the *Treatment Preference Questionnaire* was applied by the therapist in order to ascertain the opinion of the participants regarding both treatment modalities. A brief explanation about exposure treatment and about the two modalities of applying the treatment (VRET or VRET+CR) was given to the participants by the therapist. Afterwards, the participants answered four questions about the treatments, regarding preferences, subjective effectiveness, recommendation, and subjective aversion.

The participants were encouraged to take a flight on their own without any therapeutic help in the ensuing fifteen days. Post-treatment interviews were established to determine diagnostic status; the present degree of fear, avoidance, belief in catastrophic thoughts, interference associated with FF; and the therapist's rating of severity.

### *Statistical analysis*

C statistical analysis was used in order to obtain quantitative information on trends for fear, avoidance, and degree of belief scores in the main target behaviour during the baseline period, and to evaluate the effects of the treatment. The Wilcoxon test was used to assess the differences in the opinions given by the participants regarding the two experimental conditions included in the study.

## RESULTS

### *Observational changes in target behaviour*

Following the recommendation given by some authors regarding the alternating treatment design (Hersen & Barlow, 1976), the results will first be presented graphically in order to analyse the data in a visual, observational manner.

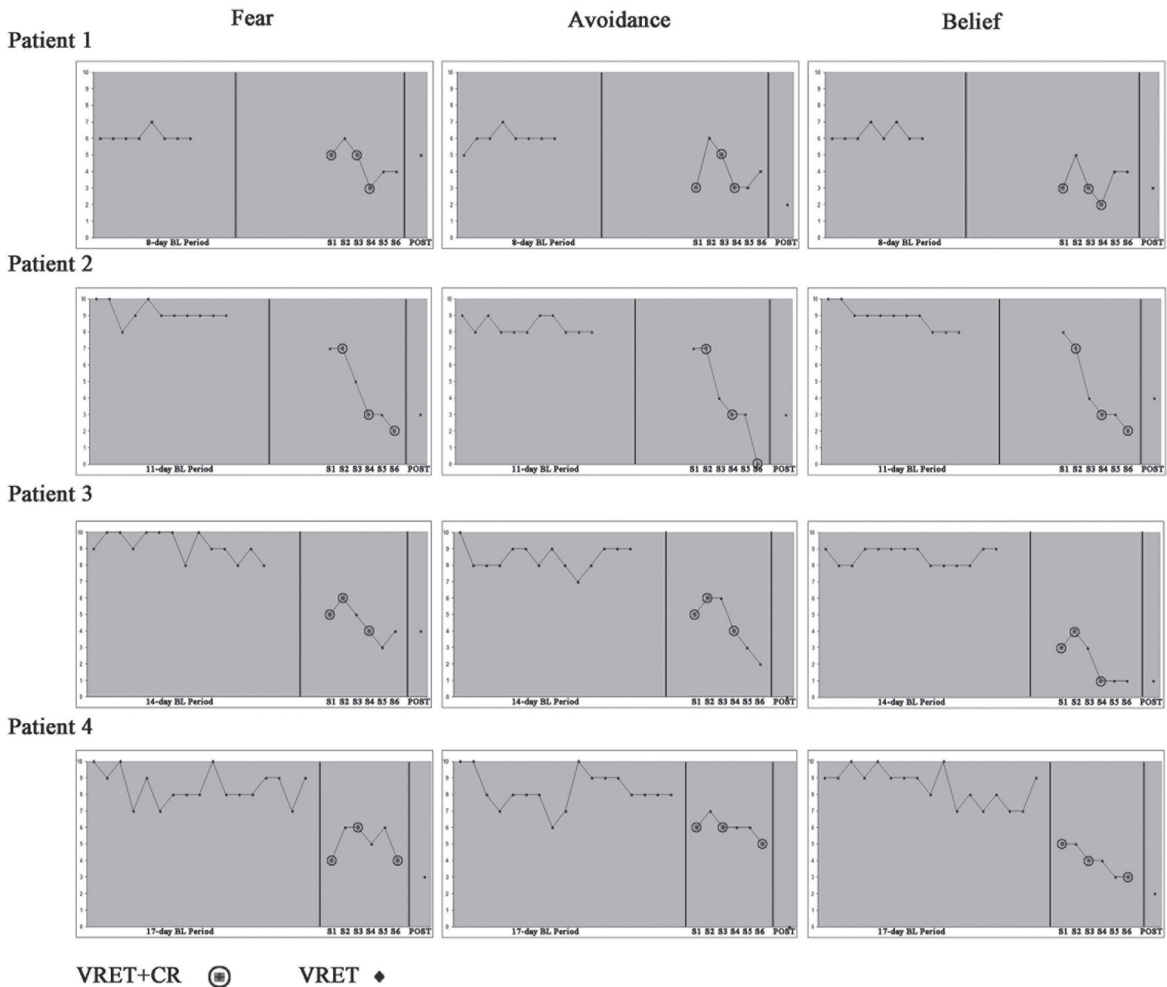


Figure 1. Ratings in fear, avoidance and belief in catastrophic thoughts regarding the target behaviors for the patients assigned to the different baseline periods throughout the different phases of the study.

In the Figure 1, the scores of fear, avoidance and belief in catastrophic thoughts regarding the target behaviours throughout the process are shown, including the baseline period, the six treatment sessions (for both experimental conditions: VRET and VRET+CR) and post-treatment. As Figure 1 shows, the ratings during the baseline period do not change under all baseline conditions. The introduction and practice of VRET and VRET+CR signifies an important reduction in fear, avoidance and belief in catastrophic thoughts related to FF in all the participants throughout the treatment sessions, even when the stimuli of the fear hierarchy were more and more threatening based on exposure scenarios included in the *Virtual Flight*.

*C-statistical analyses*

In order to examine the stability of the baseline data regarding fear, avoidance and belief in catastrophic thoughts, C-statistic analysis was used. As Table 2 shows, the data obtained along baseline scores were horizontally stable for all measures except in participants 2 and 3 concerning belief in catastrophic thoughts and in participant 4 concerning avoidance. In the case of participants 2 and 4, a statistically significant trend in the positive direction (indicating symptom improvement) was found ( $p < .01$  and  $p < .05$  respectively). In the case of participant 3, the baseline data indicated a statistically significant trend but in a negative direction, indicating a trend towards worse outcomes ( $p < .05$ ).



On the other hand, because the design involved observation of the individual several times, C-statistical analysis was also used to assess the changes that occurred between baseline and the sixth treatment session (final session) assessment periods. In Table 2 the data reveal statistically significant trends in the positive direction for fear, avoidance and belief in catastrophic thoughts regarding the main target behaviour ( $p < .01$ ) between these periods for all participants, indicating improving outcomes.

*To take a flight after the end of the treatment*

At the conclusion of the treatment, patients were encouraged to take a flight on their own, and 100 per cent of the participants included in the study took such a flight.

*Diagnostic status interference and severity*

After treatment none of the participants met the criteria for FF.

*Session opinion given by the participants about both experimental conditions*

Regarding the participants' opinion of each treatment session received, Table 3 shows the mean for both: VRET and VRET+CS session opinion among the four participants. As seen in the table, in general the opinion of the participants was very good (the participants valued all the sessions as logical, satisfactory and useful), and it is slightly higher for the VRET+CR condition. However, Wilcoxon statistical analysis showed no significant differences. Regarding the aversive qualities of the exposure experience, participants valued both experimental conditions in the same way.

*Use of cognitive restructuring during the VRET session*

Regarding the question included to evaluate whether the participants had used some kind of self-applied cognitive restructuring during the VRET condition sessions, 100 per cent of participants answered affirmatively.

Table 2. C-Statistic results for main target-behaviour between baseline and sixth session periods

Participant	Measures	C-Statistic	Trend	Direction	C-Statistic	Trend	Direction
		BL			BL – Sixth session		
P1	Fear	-0.14	Horizontally stable		0.68**	Trend evident	Positive
	Avoidance	0.25	Horizontally stable		0.43**	Trend evident	Positive
	Belief	-0.33	Horizontally stable		0.61**	Trend evident	Positive
P2	Fear	0.04	Horizontally stable		0.91**	Trend evident	Positive
	Avoidance	0.02	Horizontally stable		0.89**	Trend evident	Positive
	Belief	0.80**	Trend evident	Positive	0.94**	Trend evident	Positive
P3	Fear	0.10	Horizontally stable		0.86**	Trend evident	Positive
	Avoidance	0.27	Horizontally stable		0.82**	Trend evident	Positive
	Belief	0.42*	Trend evident	Negative	0.88**	Trend evident	Positive
P4	Fear	-0.14	Horizontally stable		0.52**	Trend evident	Positive
	Avoidance	0.44*	Trend evident	Positive	0.68**	Trend evident	Positive
	Belief	0.29	Horizontally stable		0.81**	Trend evident	Positive

Trend in the positive direction: change toward improved outcome. Trend in the negative direction: change toward worse outcome. BL: Baseline; P: Participant; \*  $p < .05$ ; \*\*  $p < .01$ .

Table 3. Mean and standard deviation of the *Session Opinion Questionnaire*

Items	VRET mean and SD				VRET + RC mean and SD			
	S1	S2	S3	TOTAL	S1	S2	S3	TOTAL
Logical	8 (2.83)	8.75 (1.50)	9.25 (1.50)	8.67 (1.89)	8 (1.41)	9 (1.16)	9.75 (0.50)	8.92 (0.96)
Satisfaction	8 (2.83)	8 (1.41)	9.25 (0.96)	8.42 (1.52)	8 (1.63)	9 (0.82)	9.5 (0.58)	8.83 (0.96)
Usefulness	8 (2.83)	8.5 (1.29)	9 (0.82)	8.50 (1.55)	7.75 (1.26)	9.25 (0.96)	9.5 (0.58)	8.83 (0.88)
Aversive qualities	2.5 (2.52)	4 (2.31)	2 (1.63)	2.83 (2.00)	3.25 (2.75)	3 (3.56)	2.25 (1.71)	2.83 (1.64)

S: Session; SD: Standard deviation

### Participants' preference

The results show that when participants were asked about both modalities of treatment, all of them considered VRET+CR more effective, preferable, and the one they would recommend to other significant people. In the item concerning aversive qualities of the experience, all the participants answered that VRET+CR was less aversive than VRET alone. Furthermore, through an open question, participants were asked to give a brief explanation concerning their selection. Table 4 presents some reasons participants gave to justify their choice.

Table 4. Qualitative information given by participants regarding their preference

Participant	Arguments
P1	<ul style="list-style-type: none"> <li>- Only by using cognitive restructuring did I feel that my anxiety lessened.</li> <li>- It is necessary for the therapist to discuss negative beliefs.</li> <li>- Cognitive restructuring is more recommendable than the other.</li> </ul>
P2	<ul style="list-style-type: none"> <li>- The component which most pleased me was cognitive restructuring.</li> <li>- Cognitive restructuring is fundamental and in my opinion is more effective.</li> <li>- Single exposure is more aversive because people suffer more; it is more aggressive.</li> </ul>
P3	<ul style="list-style-type: none"> <li>- To argue against the negative thoughts is more efficacious; this helps you to learn and self-applied it later.</li> <li>- During exposure to the condition, thoughts come into your head and you don't have any arguments to fight against these negative beliefs.</li> </ul>
P4	<ul style="list-style-type: none"> <li>- Cognitive restructuring gave me ideas which I had never had before.</li> <li>- The narrative the therapist supplied and the change in my thoughts was the part of treatment which most helped me to get over my problem.</li> </ul>

## DISCUSSION

The main objective of this study was to study participants' *opinions* and *preferences* regarding both treatment conditions (VRET and VRET+CR). That is, we were interested in collecting data on Axis II (clinical utility, external validity or *effectiveness*) of the template for evidence-based treatments (Nathan & Gorman, 2007).

Regarding participants' *opinion* on both treatment conditions, the scores were very high, and all of the participants were satisfied and

considered them very useful. When the participants were asked at the end of each session for their opinion on the specific experimental condition they received, high mean scores for logical purpose, satisfaction and usefulness were obtained in both conditions; however, non-significant differences were found. Regarding the aversive qualities of the session, the same mean scores were obtained for VRET and for VRET+CR. So we can conclude that the treatment was very well accepted.

With reference to the participants' *preferences*, when they were asked to choose between one of two treatment modalities after treatment, the data show that VRET+CR was the modality considered more subjectively effective as valued by the participants: all of them preferred VRET+CR, considered it more effective, would recommend it to other significant people (family and friends); and they also chose this condition as less aversive.

Patient opinions and preferences are increasingly being taken into account in clinical psychology decision-making (Howard & Jenson, 2003). Furthermore, regarding the aims of the present study, gathering these views is of great interest, since we are considering two ways of applying a treatment (VRET and VRET+CR), and in both cases technology is used, which can be a disturbing factor in the treatment process.

Proponents of guidelines have often recommended that a patient's preference be included on a guidelines development panel, but there is a growing call for more specific inclusion of patient preferences in clinical practical guidelines (Howard & Jenson, 2003). We believe that our data contribute to the literature on the importance of taking into account the patient preferences and can improve therapist decision-making by providing information on appropriate indications for specific interventions; in this case, using virtual reality VRET enhanced by cognitive restructuring. More data are still needed, but paying attention to participants' treatment preferences helps increase the clinical utility of computer-based treatment procedures.

The results confirm that VRET with or without cognitive restructuring was effective for the treatment of FF, support the findings of previous research using this same software (Baños et al.,

2002; Botella et al., 2004; Tortella-Feliu et al., 2011) and confirms the conclusion on the potential for technological adjuncts to enhance current psychological treatments (Clough & Casey, 2011a,b; Soto-Pérez, Franco, Monardes, & Jiménez, 2010; Titov, Dear, Johnston, & Terides, 2012).

When statistical analyses were carried out, the results reflect overall improvement in all participants after the six sessions of the treatment, the scores revealed a significant decrease from pre-testing to post-testing ( $p < .01$ ). However, the treatment conditions did not differ significantly from each other. An important datum concerning the overall efficacy of the treatment was the fact that none of the participants had taken a flight in the previous year due to their fear; after the treatment, all four participants took a flight.

To the best of our knowledge, this is the first study that has focused on the opinion and preferences of participants regarding the use of VRET (with or without cognitive restructuring) in which participants were asked about their preferences concerning the two treatment modalities, after receiving both. To verify participants' direct preference could signify an important contribution towards reducing the high, documented dropout rate concerning specific phobia (Choy et al., 2007; García-Palacios et al., 2007). Several years ago, the positive opinion of participants when they were given rational thinking strategies concerning FF was also underlined (Borril & Iljon, 1996). Furthermore, our data support the use of CR for enhancing VRET in the treatment of FF. So a simple piece of advice would be to use cognitive restructuring strategies when conducting VRET. As stated by Spring (2007), clinicians need additional skills to act as synthesisers, and consumers of research evidence, and an important point is engaging patients in shared decision-making.

This study has some limitations. Firstly, the sample was small. The reason for choosing a multiple baseline design was to analyse participants' opinions and preferences concerning VRET and VRET+CR in a greater degree of clinical detail than is found in other studies. There exists evidence about the efficacy of VRET for the treatment of FF compared to control conditions, and we were interested in a

more clinical approach, namely, to observe the participants' opinion regarding both treatment modalities over several sessions, and a single-case baseline design could show this information.

Furthermore, the possibility that participants used cognitive restructuring during the VRET sessions could be considered a limitation of this work, and three participants started out with a VRET+CR session (in the design we did not alternate both conditions following an A-B-A-B structure as an initial treatment condition among P1-P2-P3-P4 participants). In this regard, we included a question so as to discover whether the participants used some kind of cognitive restructuring (non-directed by the therapist) during the exposure session. All the participants answered affirmatively when they were asked whether they had used some kind of self-applied cognitive restructuring during all the exposure sessions. Therefore, it is possible that, though the therapist does not implement CR actively in the VRET sessions, the patient completes this task on their own. Going even further, the question is: whether, during psychoeducation, the significance of catastrophic irrational thoughts in FF was explained to the participants, it might simply enable patients to begin to see these thoughts from another perspective. Another possibility is to consider exposure therapy as a form of cognitive intervention that specifically changes the expectation of harm (Hofmann, 2008a,b). As Hofmann stated: "Nevertheless, there is sufficient evidence to conclude that extinction learning and exposure therapy are not simply automatic, unconscious, and low-level processes. Instead, higher-order cognitive processes that modulate harm expectancy and the perception of control are closely linked to extinction learning and exposure therapy. Therefore, although often attempted in treatment component analyses, I will conclude that it is impossible to conduct successful exposure therapy without also changing these cognitive processes (p. 204)".

This work has some strength. The design enables us to monitor the change in fear, avoidance and beliefs during the baseline and treatment sessions. In addition, the alternating treatment design over subjects enabled direct

comparison of the experimental conditions by the same subject. Lastly, a specific protocol was used in order to apply all the procedures in the same way, emphasising that the length of the sessions and the instructions were the same for both treatment conditions (Baños, Botella, & Perpiñá, 2002).

In summary, to know participants' opinion and preference can contribute to the literature on VRET and FF treatment, in any case; however, it is essential to continue working to increase motivation and adherence in order to reduce the number of people suffering from a specific phobia who never seek treatment to solve their problem (Essau, Conradt, & Petermann, 2000; Moriana Martinez, 2011).

## REFERENCES

- American Psychiatric Association. (2000). *Diagnostic and statistical manual for mental disorders* (4th ed.). Washington, DC: Author.
- Anthony, M.M., Orsillo, S.M., & Roemer, L. (2001). *Practitioner's Guide to Empirically Based Measures of Anxiety*. New York: Plenum.
- Baños, R.M., Botella, C., & Perpiñá, C. (2002). *Fear of flying: Virtual reality treatment manual*. Valencia: Promolibro.
- Baños, R.M., Botella, C., Guillén, V., García-Palacios, A., Quero, S., Bretón-López, J., & Alcañiz, M. (2009). An adaptive display to treat stress-related disorders: the EMMA's world. *British Journal of Guidance and Counselling*, 37, 347-356.
- Baños, R.M., Botella, C., Perpiñá, C., Alcañiz, M., Lozano, J.A., Osmá, J., & Gallardo, M. (2002). Virtual reality treatment of flying phobia. *IEEE - Transactions on Information Technology in BioMedicine*, 6, 206-212.
- Barlow, D.H., & Hayes, S.C. (1979). Alternating treatment design: One strategy for comparing the effects of two treatments in a single subject. *Journal of Applied Behavior Analysis*, 12, 199-210.
- Barlow, D.H., Raffa, S.D., & Cohen, E.M. (2002). Psychosocial treatments for panic disorders, phobias, and generalized anxiety disorder. In P.E. Nathan and J.M. Gorman (Eds.), *A guide to treatments that work* (2nd ed., pp. 301-335). London: Oxford University Press.
- Beck, A.T. (2005). The current state of cognitive therapy. *Archives of General Psychiatry*, 62, 953-959.
- Becker, C.B., Zayfert, C., & Anderson, E. (2004). A Survey of Psychologists' Attitudes Towards and Utilization of Exposure Therapy for PTSD. *Behaviour Research and Therapy*, 42, 277-292.
- Blanchard, E.B., Hickling, E.J., Malta, L.S., Freidenberg, B.M., Canna, M.A., Kuhn, E., & Galovski, T.E. (2004). One- and two-year prospective follow-up of cognitive behavior therapy or supportive psychotherapy. *Behaviour Research and Therapy*, 42, 745-759. doi:10.1016/S0005-7967(03)00201-8.
- Borkovec, T.D., & Nau, S.D. (1972). Credibility of analogue therapy rationales. *Journal of Behavior Therapy and Experimental Psychiatry*, 3, 257-260. doi: 10.1016/0005-7916(72)90045-6.
- Borriol, J., & Iljon, E. (1996). Understanding Cognitive Change: A qualitative study of the impact of Cognitive-Behavioural therapy on Fear of Flying. *Clinical Psychology and Psychotherapy*, 3, 62-74.
- Botella, C., Baños, R.M., Perpiñá, C., Villa, H., Alcañiz, M., & Rey, A. (1998). Virtual reality treatment of claustrophobia: A case report. *Behaviour Research and Therapy*, 36, 239-246.
- Botella, C., García-Palacios, A., Villa, H., Baños, R.M., Quero, S., Alcañiz, M., & Riva, G. (2007). Virtual reality exposure in the treatment of panic disorder and agoraphobia: A controlled study. *Clinical Psychology and Psychotherapy*, 14, 164-175.
- Botella, C., Osmá, J., García-Palacios, A., Quero, S., & Baños, R.M. (2004). Treatment of flying phobia using virtual reality: Data from a 1-year follow-up using multiple baseline design. *Clinical Psychology and Psychotherapy*, 11, 311-323.
- Botella, C., Quero, S., Baños, R.M., García-Palacios, A., Bretón-López, J., Alcañiz, M., & Fabregat, S. (2008). Telepsychology and self-help: The treatment of phobias using the Internet. *CyberPsychology and Behavior*, 11, 659-664.
- Choy, Y., Fyer, A., & Lipsitz, J. D. (2007). Treatment of specific phobia in adults. *Clinical Psychology Review*, 27, 266-286.
- Clough, A., & Casey, L. M. (2011a). Technological Adjuncts to Enhance Current Psychotherapy Practices: a Review. *Clinical Psychology Review*, 31, 279-292.
- Clough, A., & Casey, L. M. (2011b). Technological Adjuncts to Increase Adherence to Therapy: a Review. *Clinical Psychology Review*, 31, 697-710.
- DiNardo, P.A., Brown, T.A., & Barlow, D.H. (1994). *Anxiety disorders interview schedule for DSM-IV: Lifetime version (ADIS-IV-L)*. New York: Graywind Publications.
- Essau, C., Conradt, J., & Petermann, F. (2000). Frequency, comorbidity and psychosocial impairment of specific phobia in adolescents. *Journal of Clinical Child Psychology*, 29, 221-231.
- García-Palacios, A., Botella, C., Hoffman, H., & Fabregat, S. (2007). Comparing acceptance and refusal rates of virtual reality exposure vs. in vivo exposure by patients with specific phobias. *CyberPsychology & Behavior*, 10, 722-724.

- Hersen, M., & Barlow, D.H. (1976). *Single case experimental design: Strategies for studying behavior change*. New York: Pergamon Press.
- Hofmann, S. (2008a). Cognitive processes during fear acquisition and extinction in animals and humans: Implications for exposure therapy of anxiety disorders. *Clinical Psychology Review, 28*, 200-211.
- Hofmann, S. (2008b). Common misconceptions about cognitive mediation of treatment change: A commentary to Longmore and Worrell (2007). *Clinical Psychology Review, 28*, 67-70.
- Howard, M.O., & Jenson, J.M. (2003). *Developing practice guidelines for social work intervention. Issues, methods and research agenda*. Columbia University Press. New York.
- Kazdin, A. (2008). Evidence-Based Treatment and Practice. New opportunities to bridge clinical research and practice, enhance the knowledge base, and improve patient care. *American Psychologist, 63*, 146-159. doi: 10.1037/0003-066X.63.3.146.
- Krijn, M., Emmelkamp, P.M.G., Ólafsson, R.P., & Biemond, R. (2004). Virtual reality exposure therapy of anxiety disorders: a review. *Clinical Psychology Review, 24*, 259-281.
- Krijn, M., Emmelkamp, P.M.G., Ólafsson, R.P., Bouwman, M., Van Gerwen, L.J., Spinhoven, P., Schuemie, M.J., & Vam Der Mast, Ch. A. (2007). Fear of flying treatment methods: Virtual Reality Exposure vs. Cognitive Behavioral Therapy. *Aviation, Space, and Environmental Medicine, 78*, 121-128.
- Maatjes, N.C. (2005). *The treatment of phobias using virtual reality*. 3<sup>rd</sup> Twente Student Conference on IT, Enschede, June.
- Marks, I. (1992). Tratamiento de exposición en la agorafobia y el pánico. In E. Echeburua (Ed.), *Avances en el tratamiento psicológico de los trastornos de ansiedad*. Madrid: Pirámide.
- Marks, I.M., & Mathews, A.M. (1979). Brief standard self-rating for phobic patients. *Behaviour Research and Therapy, 17*, 263-267.
- Marks, I., & O'Sullivan, G. (1988). Drugs and psychological treatments for agoraphobia/panic and obsessive-compulsive disorders: A review. *British Journal of Psychiatry, 153*, 650-658.
- Meyerbröker, K., & Emmelkamp, P.M.G. (2010). Virtual Reality Exposure Therapy in Anxiety Disorders: A systematic Review of Process-and-Outcomes Studies. *Depression and Anxiety, 27*, 933-944.
- Moriana, J.A., y Martínez, V.A. (2011). La psicología basada en la evidencia y el diseño y evaluación de tratamientos psicológicos eficaces. *Revista de Psicopatología y Psicología Clínica, 16*, 81-100.
- Mühlberger, A., Wiedermann, G., & Pauli, P. (2003). Efficacy of a one-session virtual reality exposure treatment for fear of flying. *Psychotherapy Research, 13*, 323-336.
- Nathan, P.E., & Gorman, J.M. (2007). *A guide to treatments that work* (3<sup>rd</sup> ed.). New York: Oxford.
- Olatunji, B., Deacon, B.J., & Abramowitz, J.S. (2009). The Cruellest Cure? Ethical Issues in the Implementation of Exposure-Based Treatments. *Cognitive and Behavioral Practice, 16*, 172-180.
- Oprış, D., Pinteá, S., García-Palacios, A., Botella, C., Szamosközi, S., & David, D. (2012). Virtual reality exposure therapy in anxiety disorders: a quantitative meta-analysis. *Depression and Anxiety, 29*, 85-93.
- Powers, M.B., & Emmelkamp, P.M.G. (2008). Virtual reality exposure therapy for anxiety disorders: A meta-analysis. *Journal of Anxiety Disorders, 22*, 561-569. doi: 10.1016/j.janxdis.2007.04.006.
- Richard, D.C.S., & Gloster, A.T. (2007). Exposure therapy has a public relations problem: A dearth of litigation amid a wealth of concern. In D.C.S. Richard and D. Lauterbach (Eds.), *Comprehensive handbook of the exposure therapies* (pp. 409-425). New York: Academic Press.
- Rothbaum, B.O., Anderson, P., Zimand, E., Hodges, L., Lang, D., & Wilson, J. (2006). Virtual reality exposure therapy and standard (in vivo) exposure therapy in the treatment of fear of flying. *Behavior Therapy, 37*, 80-90.
- Soto-Pérez, F., Franco, M., Monardes, C., y Jiménez, F. (2010). Internet y psicología clínica: Revisión de las ciberterapias. *Revista de Psicopatología y Psicología Clínica, 15*, 199-2016.
- Spring, B. (2007). Evidence-based practice in clinical psychology: What It is, why it matters; what you need to know. *Journal of Clinical Psychology, 63*, 611-631. doi: 10.1002/jclp.20373.
- Task Force on Promotion and Dissemination of Psychological Procedures (1995). Training in and dissemination of empirically validated treatments: Report and recommendations. *The Clinical Psychologist, 48*, 3 - 23.
- Titov, N., Dear, B. F., Johnson, L., & Terides, M. (2012). Transdiagnostic internet treatment for anxiety and depression. *Revista de Psicopatología y Psicología Clínica, 17*, 237-260.
- Tortella-Feliu, M., Botella, C., Llabrés, J., Bretón-López, J., Riera del Amo, A., Baños, R.M., & Gelabert, J.M. (2011). Virtual reality versus computer-aided exposure treatments for fear of flying. *Behavior Modification, 35*, 3-30.
- Wiederhold, B.K., & Wiederhold, M.D. (2003). Three-year-follow-up for virtual reality exposure for fear of flying. *Cyberpsychology & Behavior, 6*, 441-445.
- Wolitzky-Taylor, K.B., Horowitz, J.D., Powers, M.B., & Telch, M.J. (2008). Psychological approaches in the treatment of specific phobias: A meta-analysis. *Clinical Psychology Review, 28*, 1021-1037.
- Wolpe, J. (1969). *The practice of behavior therapy*. New York: Pergamon Press.