PATIENTS' PREFERENCES REGARDING THREE COMPUTER-BASED EXPOSURE TREATMENTS FOR FEAR OF FLYING

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Abstract

This study analyses participants' preferences regarding three computer-aided exposure treatments for fear of flying (FF): virtual reality exposure treatment assisted by a therapist (VRET), computer-aided exposure with a therapist present throughout exposure sessions (CAE-T), and self-administered computer-aided exposure (CAE-SA). Sixty participants with FF were randomly assigned to one of these treatments. At the end of a treatment, a demonstration of the other two treatment options was given and patients were asked to rate their preferences. At post-treatment, assessment data on treatment preferences were obtained from 48 participants (CAE-T *n*= 14; CAE-SA *n*= 16, and VRET *n*= 18). Participants favoured VRET as the most effective, the most recommended, but also they valued it as the most aversive. Attending to the specific treatment condition received by the participants, results showed that in VRET and CAE-T, participants assessed their own treatment as more preferred, more efficacious and more recommendable. Results suggest relevant features regarding the efficiency of computer-based treatments, and offer insights into improving computer-aided psychological interventions.
KEY WORDS: *Computer assisted treatment, exposure therapy, preferences, fear of flying*.

Resumen

Este estudio analiza las preferencias de los participantes sobre tres tratamientos de exposición basados en ordenador para el miedo a volar (MV): tratamiento de exposición mediante realidad virtual asistido por un terapeuta (RV), tratamiento de exposición asistido por ordenador con un terapeuta durante la exposición (CAFT-T) y tratamiento de exposición asistido por ordenador autoaplicado (CAFT-A). 60 participantes con MV fueron asignados aleatoriamente a uno de estos tratamientos. Al final del tratamiento, los participantes veían una

demostración de las otras dos opciones y valoraban sus preferencias. En el post-tratamiento, la evaluación de las preferencias se obtuvo para 48 participantes (CAFT-T *n*= 14; CAFT-A *n*= 16 y RV *n*= 18). Los participantes valoraron la RV como la más eficaz, más recomendada, pero también como la más aversiva. Atendiendo a la condición de tratamiento recibida, en las condiciones RV y CAFT-T los participantes valoraron su propio tratamiento como el más preferido, más eficaz y más recomendable. Los resultados sugieren aspectos relevantes sobre la eficiencia de los tratamientos basados en ordenador y ofrecen ideas para mejorar las intervenciones psicológicas asistidas por ordenador.

PALABRAS CLAVE: *tratamiento asistido por ordenador, terapia de exposición, preferencias, miedo a volar*.

Introduction

Exposure therapy has proven to be efficacious in treating phobias, including fear of flying (FF) (Nathan & Gorman, 2002, 2007). Also, data from two meta-analyses (Opriş et al., 2012; Powers & Emmelkamp, 2008) and several studies focused on FF show that exposure is an effective intervention for FF when performed through virtual reality (Baños et al., 2002; Brinkman, van der Mast, Sandino, Gunawan, & Emmelkamp, 2010; Krijn et al., 2007; Maltby, Irving, Michael, & George, 2002; Mühlberger, Weik, Pauli, & Wiedemann, 2006; Rothbaum et al., 2006; Rothbaum, Hodges, Smith, Lee, & Price, 2000; Rus-Calafell, Gutiérrez-Maldonado, Botella, & Baños, 2013; Tortella-Feliu et al., 2011; Wiederhold, Wiederhold, Jang, Gevirtz, & Kim, 2002). In this same way, computer-assisted treatments have also proven to be effective for FF (Bornas, Fullana, Tortella-Feliu, Llabrés, & García de la Banda, 2001; Bornas, Tortella-Feliu, & Llabrés, 2006). However, researchers have yet to assess other important aspects regarding effectiveness, such as treatment motivation and adherence (Choy, Fyer, & Lipsitz, 2007). This motivation and adherence to the psychological treatment can be related to the preferences of the patient for the treatment used. In fact, guidelines developed by the American Psychological Association (Task Force on Promotion and Dissemination of Psychological Procedures, 1995) and their subsequent revisions (Chambless et al., 1998; Chambless & Hollon, 1998; Nathan & Gorman, 2002, 2007) 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. Patients' satisfaction, credibility, acceptability and preferences are important factors included in the effectiveness axis. In the last few years, clinical researchers have begun to focus on effectiveness and have underlined the importance of conducting this kind of study (Nathan & Gorman, 2002, 2007; Norton, 2012).

Most people who suffer phobias never seek treatment (Magee, Eaton, Wittchen, McGonagle, & Kessler, 1996). Moreover, of those who do seek treatment, approximately 25% either refuse exposure therapy after learning what it entails or terminate the therapy (García-Palacios, Botella, Hoffman, Villa, & Fabregat, 2004; García-Palacios, Hoffman, Kwong, Tsai, & Botella, 2001; Marks,

1992; Titov, Dear, Johnston, & Terides, 2012). Choy et al. (2007) report a dropout rate ranging from 0% to 45% for *in vivo* exposure used to treat specific phobias in adults. For this reason, it seems reasonable to address research efforts to facilitate accessibility to treatments and also to study factors that could enhance treatment acceptability and adherence.

The increasing development of both virtual reality and computer-aided psychotherapy is due to its promise of increasing effectiveness and efficiency (e.g., by providing exposure scenarios from the therapist office, saving therapist time, increasing patients' access to therapy, allowing for home access, ensuring confidentiality, and increasing his/her motivation for treatment, etc.) without compromising efficacy (Andersson, 2009; Botella et al., 2004; Cuijpers, Marks, van Straten, Cavanagh, & Andersson, 2009; Marks & Cavanagh, 2009; Marks, Cavanagh, & Gega, 2007a, 2007b; McCrone et al., 2007). While some research has been devoted to the clinical utility of computer-aided treatments (Marks et al., 2007a, 2007b), very few studies have addressed the overall effectiveness of virtual reality programs. Some important elements of effectiveness have already been assessed, including satisfaction, credibility and acceptability. For example, several studies in the anxiety disorders field have reported that patients were satisfied with computer-aided (Botella et al., 2008; Carlbring, Ekselius, & Andersson, 2003; Carlbring et al., 2007; Carlbring et al., 2005; Kenardy et al., 2003; Kenwright, Marks, Gega, & Mataix-Cols, 2004) or virtual reality exposure (Baños et al., 2009; Botella et al., 2009). In spite of these, Newman, Szkodny, Llera, and Przeworski (2011), in their review of technology-based self-help and minimal contact interventions for anxiety and depression, concluded that self-administered interventions are most effective for motivated clients and that there is "a pattern of lower compliance when technologies are used at home in conjunction with little or no human contact" (p. 100).

Attending to the patient's treatment preferences regarding different types of treatments increasing the effectiveness of a clinical intervention can also be relevant. Some preliminary data from a non-clinical sample of undergraduates scoring high in fear of spiders (García-Palacios et al., 2004) and from 150 patients with different phobias (García-Palacios et al., 2001) showed that virtual reality exposures were not only acceptable but also strongly preferred over *in vivo* exposure therapy.

To our knowledge, no studies have been conducted that directly compare patient preferences for different computer-based systems for treating FF and only one study has compared computer-aided treatments in terms of efficacy and previous expectations (Tortella-Feliu et al., 2011). In this study, the efficacy ratings of three computer-based exposure treatments for fear of flying were analysed: virtual reality exposure therapy (VRET), including cognitive restructuring with a therapist's assistance throughout the treatment; computer-aided exposure, also with a therapist's assistance throughout the treatment (CAE-T); and self-administered computer-aided exposure (CAE-SA). The three interventions proved equally effective, with large within-group effect sizes in all of them, in reducing fear of flying at post-treatment and at one-year follow-up. Treatment expectations, credibility and satisfaction were high for all treatment conditions, but

participants in VRET had greater expectations regarding the treatment before starting it; they were also more satisfied with the intervention at post-treatment and valued this treatment as the most aversive (probably because of the realism and interactive qualities of the system), compared to the CAE groups. These differences disappeared at follow-up. However, data about preferences among the three different treatment conditions were not reported and the study focused on assessing the previous expectations before the psychological treatment started. This way, participants just knew their own treatment, without having the possibility of comparing their preferences regarding other possible treatments.

Considering that the patients' preferences could be relevant for enhancing treatment acceptability and adherence, both important factors for clinical utility, the aim of the current study is to compare their preferences regarding the three computer-based exposure treatments after receiving the specific treatment (applied in their experimental condition) and being informed about the two other treatment possibilities, allowing us to evaluate patients' preferences not only for the type of technology used but also for variety of degrees of therapist involvement.

Method

Participants

Sixty participants who met current criteria (APA, 1994) for specific phobia (situational) were randomly assigned to one of the three exposure treatment conditions: computer-aided exposure treatment assisted by a therapist (CAE-T) (*n*= 20), self-administered computer-aided exposure (CAE-SA) (*n*= 21) and virtual reality exposure treatment (VRET) (*n*= 19). The clinician rated the severity of the patient's phobia on a 0 to 8 scale (Öst, Stridh, & Wolf, 1998), where 0= *symptom free* and 8= *extremely severe and disabling.* There were no significant differences between the conditions in terms of severity of the phobia. Four participants dropped out (1 VRET, 1 CAE-T and 2 CAE-SA) and three participants who completed the treatment, one at each intervention group, did not attend the two-week post-treatment assessment session. At post-treatment, assessment data on treatment preferences were obtained from 48 participants (CAE-T *n*= 14, CAE-SA *n*= 16 and VRET *n*= 18) (mean age 37.63, *SD*= 10.83; range 22 - 61). A full description of the participants' characteristics and procedures can be found in Tortella-Feliu et al. (2011).

Instruments

a) "Anxiety Disorders Interview Schedule for DSM-IV" (ADIS-IV; Brown, DiNardo, & Barlow, 1994) was used at pre and post-treatment to determine diagnostic status. Specifically, the section on specific phobias of the Anxiety Disorders Interview Schedule for DMS-IV was used. ADIS-IV is an excellent interview for assessing anxiety disorders; it has proven adequate psychometric properties (Anthony, Orsillo, & Roemer, 2001). This instrument has demonstrated

interrater reliability from satisfactory to excellent when administered by expert clinicians who are familiar with the DSM diagnostic criteria (DiNardo, Moras, Barlow, Rapee, & Brown, 1993).

b) "Fear of Flying Questionnaire" (FFQ; Bornas, Tortella-Feliu, García de la Banda, Fullana, & Llabrés, 1999). The FFQ is a 30-item self-report instrument describing situations related to flying: anxiety during flight, anxiety experienced getting on the plane, and anxiety experienced by the observation of neutral or unpleasant flying-related situations. For each item, respondents rated their degree of discomfort associated with the situation on a scale of 1 ("not at all") to 9 ("very much"). Scores ranged from 30 to 270. As reported by Bornas et al. (1999), internal consistency was .97 and retest reliability (15-day retest period) was .92.

c) "Treatment Preferences Questionnaire". This instrument was specifically elaborated for this study. It consists of four questions about treatment preferences, to be answered by participants once all treatment conditions included in the study were presented. The questions addressed the following aspects: (1) Preference ("If you could have chosen among the three treatments, *which one would you have chosen?*"; (2) Subjective effectiveness ("Which one of these three treatments do you think would have been the *most effective* in helping you overcome your problem?"; 3) Recommendation ("Which one of these three treatments would you *recommend* to a friend with the same problem you have?") and (4) Subjective aversion ("Which one of these three treatments do you think would have been the *most aversive*?"). Questions were composed of three response options in accordance with the three treatment conditions. The questionnaire is reproduced in the Appendix.

Procedure

For each treatment, a maximum of six one-hour, twice a week sessions was established. The duration of the treatment was shorter when the participant completed the last exposure to feared sequence or scenario before the sixth session. At the conclusion of the treatments, patients were encouraged to take a flight on their own within 15 days without any therapeutic help.

In the last session, the patients completed the post-assessment questionnaires and scheduled an interview every fortnight. At that time, participants were informed that they could also have been treated with two alternative computer-aided interventions instead of the one they received. Then, detailed information along with a demonstration of the other treatment options were provided to the participants using the alternative computer-aided system to show how it works through the taking-off and in-flight sequences for VRET or CAE. CAE-T and CAE-SA did not differ in the computer-aided system used, but only in the presence or absence of therapist assistance during exposure sessions (Figure 1). After this demonstration, participants were asked to fill out a questionnaire on treatment preference. The exact description given by therapists and the instructions to answer the preferences questionnaire are reproduced in the Appendix.

Figure 1
Computer-based programs included in the study

Self-administered computer-aided exposure
(CAE-SA)

Computer-aided exposure with a therapist
(CAE-T)

Virtual reality exposure treatment
assisted by a therapist (VRET)

Treatments

During the first session of all three treatment conditions, a 30-minute explanation was presented, with the factors contributing to the origin and maintenance of the fear of flying. Treatment rationale and structure were also provided. The goal was to briefly explain the following concepts: the role of avoidance in maintaining a phobia, other manifestations of phobic disorders (psychophysiological responses and cognitive concomitants), data about its prevalence, factors associated to the onset of the fear of flying, the definition of exposure therapy, and methods for planning graded exposure using computer-based programs. This explanation was identical for all three experimental conditions, except for the way the specific computer-based programs (VRET or CAE) work and how they would be used. A five-page booklet with explanations of fear of flying and treatment rationale was given to all participants. Before the exposure started, the patients became familiar with the computer programs and devices. Then, patients were asked about their satisfaction with the treatment rationale, with the treatment they were about to receive and their expectations for

possible treatment results. Finally, exposure was conducted in the initial session under the unique conditions for each treatment. A summarised description of each condition is described below. Tortella-Feliu et al. (2011) provide a full description of the treatment conditions.

a) "Virtual reality exposure treatment assisted by a therapist" (VRET). The virtual flight software was used to provide exposure to three virtual scenarios: packing at home, waiting for boarding at the airport terminal and sitting in the airplane while taking off and during the flight. A detailed description of the virtual environments can be found in Botella, Osma, García-Palacios, Quero, and Baños (2004). The software includes three VR scenarios: the room, the airport, and the plane. During exposure, the participant sat on a standard office chair and wore a 5DT HDM 800 immersive head-mounted display attached to a personal computer (Intel Core 2 Duo E6850, 3 GHz, 2 MB RAM; graphic engine ASUS Extreme AX300SE/T 128 MB). The virtual reality equipment was operated by the therapist. The main component of the treatment was VR exposure and cognitive restructuring. Therapists attended all VRET sessions, applying the VRET system, and guiding the use of cognitive strategies. Every 5 minutes the patients had to rate their anxiety levels and to verbalize the catastrophic thoughts and feelings experienced during exposure. The therapists challenged the dysfunctional beliefs associated to fear of flying.

b) Except for the first session (as described in the Procedure section), the following sessions were devoted to virtual exposure to the different scenarios, 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 along with data from the pretreatment assessment).

c) "Computer-aided exposure with a therapist" (CAE-T). CAE was conducted with CAFFT2 online software displayed on a personal computer (Pentium IV 2.80 GHz 512 MB RAM) connected to the Internet and with a 17-inch screen (graphic engine Radeon 7000 AGP 64 MB). The CAFFT2 automatically configured a display of photos and associated sounds according to the patient's fear hierarchy for flight-related situations (drawn from answers to the FFQ included in the program). Six sequences from 1 minute 51 seconds to 2 minutes 49 seconds were included: buying a ticket, packing at home, going to the airport and boarding, taking off, flying, landing, and hearing news about an aircraft accident. At the end of each sequence, the program requested fear ratings; based on the replies, the exposure continued with the same sequence or proceeded to the next one in the hierarchy. The CAFFT2 has already been fully described (Bornas et al., 2001; Rothbaum et al., 2000). Therapists attended all CAE-T sessions, although they were instructed not to intervene unless technical problems occurred. If patients asked about the treatment process, they were invited to use the program's online help system.

d) "Self-administered computer-aided exposure" (CAE-SA). The CAE was also conducted with CAFFT2 online as described for the CAE-T group. However, the CAE-SA treatment was essentially self-administered; face-to-face therapist support was only available during the first and last sessions. At the first session, the information and instructions to use the computer program were

the same as for CAE-T; however, the patients in this condition were also informed that they would undergo exposure alone with the computer. Additionally, they learned that their progress would be monitored; the online computer system allowed the therapist to know when the patient accessed the program, the duration of the sessions, the number of exposure trials completed, discomfort rates after each exposure and so on. A telephone number was provided to contact the therapist during the exposure sessions in case problems occurred with the computer or with the procedure. The therapists and users scheduled five additional days for one-hour exposure sessions with the computer at the university clinic. The first exposure trials started with a therapist to make sure the patients had completely understood the instructions. Then, the therapist left the clinic while the user was exposed to images and sounds. In the following sessions, the user simply asked the receptionist to access to the session room.

Data analysis

Data are analysed according to the items that form the instrument used to assess the treatment preferences of the participants. Chi-squared tests were performed to evaluate participants' preferences. When necessary, Bonferroni corrections were used. The total sample preferences are shown as well as the preferences for each of the treatment conditions the participants were assigned to.

Results

Treatment preferences

Out of the 48 participants included in the study, 60.40% would have chosen VRET, 29.20% would have chosen the CAE-T condition, and finally 10.40% of the participants would have chosen the CAE-SA condition (Figure 2). A chi-squared test was carried out that led to statistically significant differences, $\chi^2(2)= 18.37$, $p< .001$, in favour of VRET.

When analysing the percentages of the two most preferred treatments (VRET and CAE-T) statistically significant differences are found ($p< .05$) for VRET as the most preferred system. The two most chosen treatments (VRET and CAE-T) were directly compared, with alphas adjusted using Bonferroni corrections and significant differences remained favouring VRET.

As it can be seen in Figure 2, the treatment perceived as the most efficient was VR, versus the CAE-T system, which was second and the CAE-SA system, which was third. Differences among percentages are statistically significant, $\chi^2(2)= 12.5$, $p< .002$. When analyzing the percentages of the two treatments considered as more efficient (VRET and CAE-T), with alphas adjusted using Bonferroni corrections, we do not find statistically significant differences between them, $\chi^2(2)= 11.90$, $p= .018$.

The VR treatment is the most recommended one by the participants (Figure 2). The CAE-T system is second, and the CAE-SA the least recommended.

Differences found in these percentages are statistically significant, $\chi^2(2)= 15.5$, $p< .001$.

When analysing the differences between the percentages of the two most recommended treatments (VRET and CAE-T), we do not find statistically significant differences between them, $\chi^2(2)= 2.44$, $p= 0.656$.

As it can be seen in Figure 2 VRET was the condition assessed as the most aversive one, second was the CAE-SA, and finally the CAE-T. The differences between these percentages are statistically significant, $\chi^2(2)= 11.62$, $p< .003$. The treatment perceived as most aversive is VR versus the CAE-SA, chosen second, and finally the CAE-T.

The statistical analysis conducted to analyze the differences between the two most aversive treatments (VRET and CAE-SA) concludes with no statistically significant differences between them, $\chi^2(2)= 7.84$, $p= 0.098$.

Figure 2
Ratios of assessment of preference, subjective efficacy, recommendation and subjective aversion of the total sample
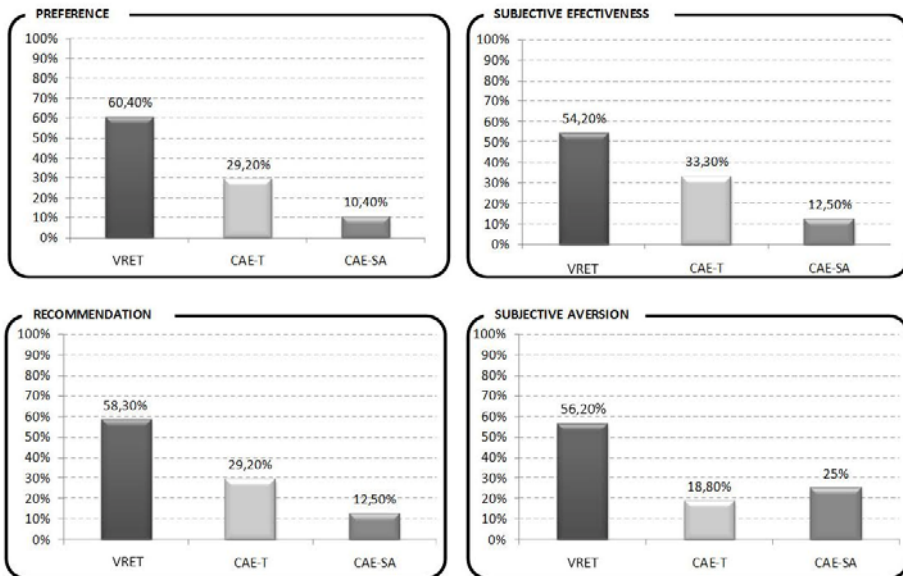

Preferences according to the treatment condition

Figure 3 shows that both those participants that had experienced the VRET and the CAE-T conditions show preferences for the same treatment they had received. They would choose the same one again, with percentages of re-election of 83.33% for VRET and 71.43% for CAE-T. Regarding those participants who had received the CAE-SA condition, they preferably chose the treatment applied through VRET, with a percentage of re-election of 62.50%.

The statistical analysis conducted with these data shows a significant Chi-squared, $\chi^2(4)= 26.34$, $p< .001$. The VRET condition was the one that obtained the highest preference percentages among the participants of this same condition and the CAE-SA, with the exception of the CAE-T condition, which was chosen as the second best option.

Figure 3
Ratios of treatment preference, subjective efficacy, recommendation and subjective aversion assessment by the participants according to the treatment condition they had received
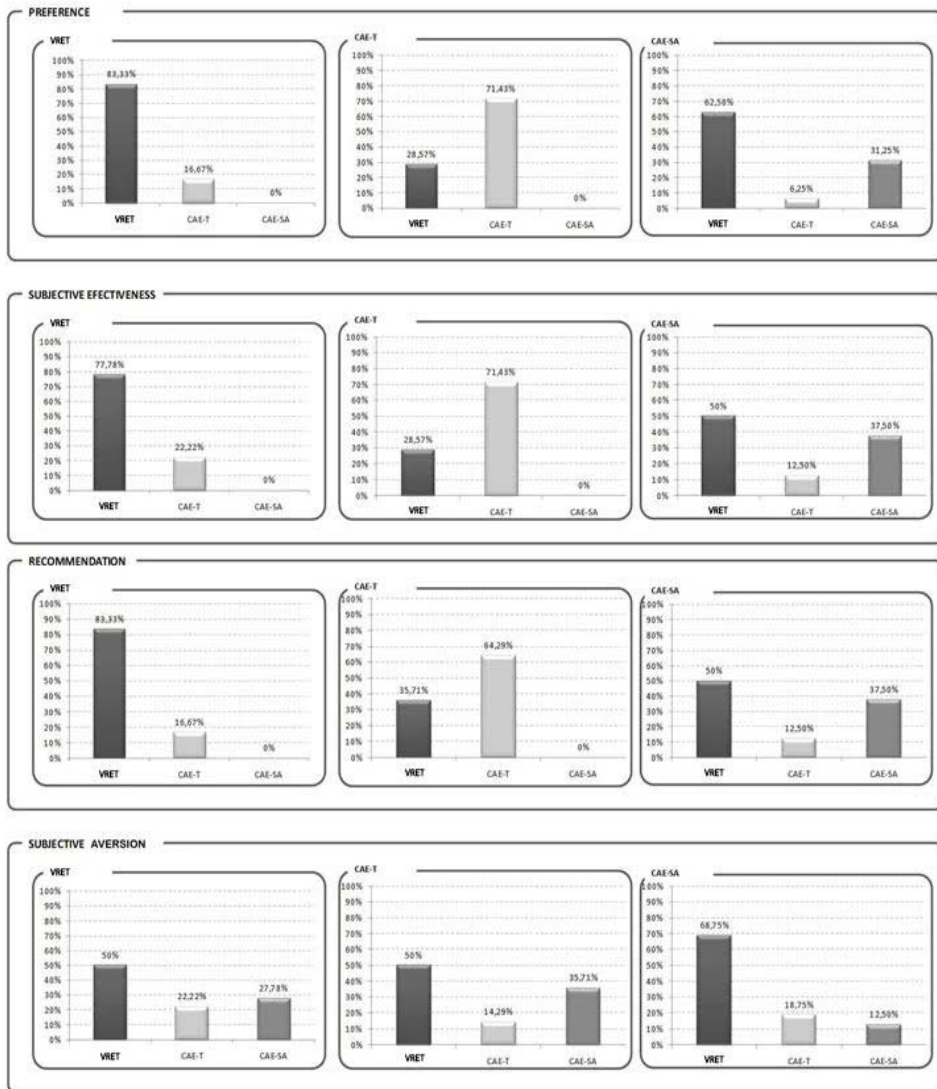
For the VRET and CAE-T conditions, there is a tendency among the participants to assess the treatment they were assigned to as the most efficient one. 77.78% of the participants assigned to the VRET condition and 71.43% of the CAE-T condition assessed their own treatment as the most efficient one. Out of those participants who had received the CAE-SA treatment, 50% assessed the VRET condition as the most efficient treatment. Differences between percentages are statistically significant, $\chi^2(4)= 24.44$, $p< .001$. The VRET condition was assessed as the most efficient treatment among those participants who had received this same treatment and the CAE-SA condition. For participants in the CAE-T treatment, the VRET condition was chosen as the second best option in terms of perceived effectiveness.

Analyzing the recommendation ratios according to the treatment condition the participants had received, those who had received the VRET and CAE-T condition would recommend the same treatment they had received, with percentages of 83.33% for VRET and 64.29% for CAE-T (Figure 3).

Regarding those participants who had received the CAE-SA condition, 50% would first recommend the treatment applied through VR, and as second option the one they received. Differences are statistically significant, $\chi^2(4)= 23.75$, $p= .001$. The VR treatment was the one with the highest recommendation ratios among participants in their own condition and the CAE-SA. Among the CAE-T participants, it was the second most recommended.

Looking at the experimental condition the participants have been assigned to and assessing whether they perceive as more aversive the treatment received or instead believe other exposition strategies would be more aversive (Figure 3), the data show that participants in all three treatment conditions assess the VRET condition as more aversive. Those participants who had received the VR and CAE-T treatments assessed the CAE-SA condition as the second most aversive one. Those assigned to that condition assessed the CAE-T as the second most aversive treatment. Differences are not statistically significant, $\chi^2(4)= 2.63$, $p= .62$.

Finally, in order to assess whether those "lucky" participants who had received a treatment condition that they would had chosen, had experimented better outcomes than the other "unlucky" participants who had been subjected to a treatment different to their preferred one, statistical analysis were taken. Having received the preferred treatment did not correlate with bigger pre-post changes on FFS scores, neither FFQ's. No one of the T-tests performed showed significant differences between "lucky" and "unlucky" participants.

Discussion

This study assesses participants' preferences regarding three computer-based exposure treatments currently available for FF. In a previous study (Tortella-Feliu et al., 2011), participants were assigned to one of the following treatment conditions: VRET, CAE-T and CAE-SA. Results showed the three treatment options were equally efficacious in reducing fear of flying. In the current study, the main purpose is to analyse the treatment preferences given by the participants, after receiving the specific treatment. This way, the participants, after receiving

treatment and then being informed about the characteristics of the other computer-aided options, were asked to assess each option and to express their preferences. Despite not having found high attrition rates in any of the treatments included in the study and published in a previous one (Tortella-Feliu et al., 2011), we believe that it is of central importance to address the preferences manifested by the participants in each treatment in order to progress in the study of the clinical utility, external validity or effectiveness.

Overall, participants preferred VRET over the other two treatment options. Furthermore, VRET was the treatment with more subjective effectiveness as valued by the participants, the most recommended treatment to other noteworthy people (family, friends, etc.), but also the most aversive one. However, when VRET and CAE-T, the second most valued treatment for the full sample, were directly compared, differences disappeared in terms of subjective effectiveness and recommendation to others. Therefore, and taking into account the data of Tortella-Feliu et al. (2011), a first conclusion is that although the three conditions were equally effective, participant preference was different. These facts should make us think about when it is convenient, and especially when it is ethical, to consider only pure data on efficacy, and when we should also pay attention to and consider the preferences of the participants. Obviously, as more data in the same line appear, it can be complicated to establish clinical decisions; undoubtedly, these decisions will involve ethical and cost-effective issues in order to avoid promoting apparent treatment validity over efficacy in the face of clients' satisfaction. Perhaps a useful study in this regard could be to show the data from all participants regarding efficacy and preferences and ask them to consider again what their decisions would be in light of the new information.

When the sample was divided, taking into account the treatment condition the participants received, results showed that for VRET and CAE-T, participant responses were quite oriented towards assessing their own treatment as more preferred, effective and recommendable to other noteworthy people. In general, both the VRET and CAE-T participants thought their treatment was the best, and they would choose it again if they had to. However, participants of the CAE-SA condition, despite their treatment's efficacy, would have chosen VRET. Therefore, the two conditions in which the therapist applied the treatment (VRET and CAE-T conditions) were the most valued, whereas the self-applied version was not so well assessed by the participants who were assigned to it. These are the very same data we obtained taking into account the assessment of efficacy and recommendation of the treatment to other noteworthy people. In both cases, participants in therapist-applied treatments considered their own treatment to be more effective and the one they would recommend to others. However, the patients who received the self-applied version believed the VRET treatment would be more effective and they would recommend it to a friend.

Previous literature supports the view that, without compromising efficacy, self-applied treatments work in a diversity of psychological treatments, including FF (Andersson, Nordgren, Buhrman, & Carlbring; Botella, Hofmann, & Moscovitz, 2004; Botella et al., 2008; Cuijpers & Riper, 2014; Gallego et al., 2014; Menchola, Arkowitz, & Burke, 2007; Quero et al., 2014; Tortella-Feliu et al., 2011). Some

advantages emphasized in these treatments include: a) shortening therapist time by facilitating routine interactive strategies; b) significantly reducing travel time, making it easier to reach individuals who live in remote areas; c) a flexible schedule that makes it easier to reach a higher number of people; d) increasing patients' access to therapy by allowing home access; e) ensuring confidentiality and minimising the stigma related to receiving mental health care; and f) increasing his/her motivation for treatment, while facilitating its dissemination (Andersson, 2009; Bachofen et al., 1999; Botella et al., 2010; Tortella-Feliu et al., 2011). However, one possible recommendation taking into account our results is the need to include in the self-applied treatments some important roles the therapist plays during the exposure time, such as offering support, guidance and reinforcement to the participant. Some previous works have tried to meet these needs using a virtual assistant that helps the person to confront difficult tasks or to overcome any problem during the treatment, obtaining good results (Botella et al., 2010; Botella et al., 2012). In any case, it is necessary to move forward within this research line by defining what sort of help and support by the therapist is needed to reach cooperation and involvement of the patient in the therapy, and also lessen any lack of motivation and prevent dropouts. In this type of work, the systems that provide and allow interaction, such as text messages using mobile devices and periods of direct communication between patient and therapist, can be of great help.

On the other hand, these results regarding the participants' preferences could also be related to the larger dropout rate of the self-applied treatments, although this was not the case among the participants in our study. This point is emphasized in some studies in which authors highlight a close relation between the treatment preferences and attrition and treatment response in the psychological treatment for post-traumatic stress disorder, PTSD (Tarrier, Liversidge, & Gregg, 2006) or generalised anxiety disorder treatment (Berg, Sandahl, & Clinton, 2008). It is obviously an important issue, as one fundamental problem to be solved within the self-applied treatment field is actually how to provide support to the patient in order to decrease the dropout rate (Andersson, 2010). Anyway, more research is needed on the optimal amount of therapist contact and support when using ICT-based exposure treatments for simple phobias (Baños et al., 2009).

Regarding the perceived aversiveness of the treatments, it seems that the straight self-applied dimension does not play the same role. In this case, participants assigned to the three conditions assessed the VRET condition as the most aversive. One possible explanation for this result is the capacity of the virtual environments to activate and elicit in a deep way the pathological fear structure (Foa & Kozak, 1986). This question may touch upon the reality judgment and sense of presence that VRET elicits during the exposure (Baños et al., 2004). Specifically, "Virtual Flight" includes some elements designed to increase the degree of reality judgment and to imitate the virtual environments in the feared situation, using the user's gender, weather conditions (good weather/bad weather), temporary moment of the flight (day or night), flight characteristic (turbulences or not) and music (relaxing versus disturbing). Perhaps, facing the flight situation in a more realistic way makes the participants judge this treatment

as more aversive. In any case, the results of the previous studies in which participants report on the aversive qualities of the system do not suggest the system's efficacy is in any way compromised (Tortella-Feliu et al., 2011). However, to continue paying attention to the aversiveness characteristics of a treatment is an ethical compromise in order to improve the effectiveness of the psychological interventions.

A related issue is the need to study the preferences of the clinicians when they do practise therapy. Previous studies support the utility of developing new ways of applying the treatments for some disorders, because traditional methods are too aversive for patients and even for the therapists, such as exposure for the treatment of PTSD (Becker, Zayfert, & Anderson, 2004; Orsillo & Batten, 2005). This is an open question that we understand deserves wider consideration in the future. Becker et al.'s study (Becker et al., 2004) revealed that a treatment that has proven its efficiency should not be applied when it is not well assessed or accepted by the clinician. On the other hand, it is possible to assist the therapist with part (or parts) of the treatment using new technologies, and this fact could in turn influence the therapist's preferences. In brief, taking into account the effectiveness of a treatment by attending to the preferences of both the participants and the clinicians opens new research lines in the field of psychological treatments (Clough & Casey, 2011a, 2011b). In this sense, some authors have recently begun to explore important factors regarding effectiveness, such as preferences and others as therapeutic alliance using new technologies (Botella et al., 2014; Wrzesien, Burkardt, Botella, & Alcañiz, 2012).

The main limitation of this present study relates to sample size: the number of participants in each treatment condition was quite small. However, the work provides useful and innovative data for the effectiveness framework of the psychological treatments, centred on one of the most common disorders, specifically a phobia. An important point of validity in this study was the detailed description and real demonstration of the alternative treatments included in the research in order to allow the participants to answer adequately questions about their preferences. It is important to emphasize that this study is intended as a starting point for future large-sample studies with long-term effectiveness data, which are greatly needed in this field.

To our best knowledge, this is the first study about treatment preferences comparing VRET with other forms of computer-based treatments (CAE-T and CAE-SA). Its primary objective is to contribute to the literature about the importance of efficacy variables, like participant preference, by asking participants directly about which treatment they would prefer given several choices. We still need more data about this. Paying attention to the treatment preferences of the participants can allow computer-based treatment procedures to increase their clinical utility. A system that is preferred by the patients can have a direct influence by increasing the adherence to the treatment and, through a positive influence on the therapy, improving outcomes like those shown in previous studies (Bachofen et al., 1999; Tarrier et al., 2006). Some studies state that a higher credibility of computer-based treatment appears to be related to better treatment outcomes than other factors like the severity of FF or the severity of overall psychopathology (Mühlberger et al.,

2006). Furthermore, in computer-aided psychotherapy research, data clearly indicate that, as in any kind of treatment, less satisfaction is associated with greater attrition (Marks et al., 2007a). In conclusion, patients' preferences are a relevant component of effectiveness, and effectiveness is an important axis for qualifying a psychological intervention as effective in treating a specific disorder like FF. At the moment, our data indicate no significant differences between "lucky" and "unlucky" participants, both had similar outcomes.

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Appendix
Treatment Preferences Questionnaire's Description

A brief explanation about exposure treatment and the three modalities of applying the treatment was given to the participants by the therapist:

*Nowadays, literature recommends using a technique called "**exposure** for the fear of flying treatment". This procedure consists of the person facing his or her feared situations in a **gradual and systematic** way, progressing from the easiest situations that provoke in them less anxiety, to those that are more difficult and anxious. The beginning of the exposure means that when facing the feared situation, the person will feel anxiety, but gradually he or she will **get used** to it and the anxiety will also decrease. The important thing here is to remain in the situation until the anxiety decreases. The treatment is carried out in different sessions. Next, we are going to show you a description of **three different** ways of applying this technique:*

1. ***Virtual reality exposure:*** *Lately, **virtual reality** has been used to apply the exposure technique for the fear of flying treatment. This technology allows the development of "**virtual worlds**" that represent the real world, so the person faces gradually those feared situations related to the fact of flying in a plane (airport, landing, taking off, flight), but within a virtual environment. That is to say, the person "**enters**" a computer-generated environment, which is "**copying**" those situations. The person, apart from perceiving (seeing, listening) the virtual world, can interact with it, moving through the different locations, or using the objects available there. Both patient and therapist will jointly decide what scenery and situations the patient will be exposed to throughout the treatment. The most particular characteristic of this treatment is the possibility the patient has to interact with the different virtual worlds.*

2. ***Exposure through a computer-assisted program with a therapist:*** *An alternative to carrying out exposure technique uses the **computer-assisted treatment, WITH the presence of a therapist**. Computer-Assisted Fear of Flying Treatment is a computer-based program for the treatment of fear of flying. This program uses **images or static real pictures**, related to **sounds**, for different situations related to the fact of flying in a plane (airport, taking off, flight, landing, etc.). These feared situations are introduced through a computer. The pictures and sounds and the sequence they are introduced to are programmed by the computer system, depending on the personalised evaluation of each patient. The therapist accompanies the patient and tries to sort out any possible questions while carrying out the treatment. The most particular characteristic of this treatment is that the patient is repeatedly exposed to brief series of images and real sounds (recorded at airports and on real planes).*

3. ***Fully self-applied computer-assisted program exposure:*** *A third alternative to carrying out the fear of flying exposure technique uses the **fully "self-applied" computer-assisted treatment**. Here, we also use the Computer-Assisted Fear of Flying Treatment, that is, the same program we just described in the previous point, but in a **completely self-administered** way. The person carries out the treatment by him/herself, following the guidelines the computer program defines, looking at pictures, and listening to different sounds, but **without the assistance of the therapist**. Something important that this exposure system shares with the Computer-Assisted Fear of Flying Treatment applied by a therapist is the realism of the images and the sounds in the program. However, the most singular characteristic of this fully self-applied treatment is that the patient can self-apply the treatment and undergo it at*

his/her own pace (without needing to have an appointment with a therapist, for example).

This description was followed by a demonstration of the other two exposure treatment options, which the patient did not receive in the study. Afterwards, the participants answered four questions about the treatments regarding preferences, subjective effectiveness, recommendation and subjective aversion:

1) Preferences: "If you could choose between the three kinds of treatment, *which one would you choose?"*
2) Subjective effectiveness: "Which of these three treatments do you consider could be the most *effective* to help you to overcome your problem?"
3) Subjective aversion: "Which of these three treatments do you consider could be most *more aversive*?"
4) Recommendation: "Which of these three treatments would you *recommend* to a friend in the case that he had the same problem you have?"

Questions were composed of three response options in accordance with the three treatment conditions:

a) *Virtual reality exposure, administered by a therapist.*
b) *Exposure through a computer-assisted program with a therapist.*
c) *Fully self-applied computer-assisted program exposure.*