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COMPUTER-ASSISTED EXPOSURE TREATMENT FOR FLIGHT PHOBIA: A CONTROLLED STUDY

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This study examines the efficacy of computer-assisted exposure (CAE) treatment in helping to overcome flight phobia and analyzes the role of relaxation and information-related components in the reduction of fear. Fifty flight phobics were randomly assigned to 1 of 3 methods of treatment: (a) CAE; (b) a multicomponent method of treatment of information, relaxation, and CAE (IRCAE); and (c) waiting list control treatment. At the end of the treatment, an actual flight was chartered. The results showed that the first 2 methods of treatments were more effective than the waiting list control treatment. The CAE group showed the greatest reduction in fear. According to data from the IRCAE group, no reduction in flight phobia was observed after the information-relaxation phase. Follow-up data showed that improvements in anxiety self-assessment rates remained constant.

Despite the high clinical frequency of flight phobia and its personal and financial repercussions (Wilhelm & Roth, 1997; Van Gerwen, Spinhoven, Diekstra, & Van Dyck, 1997), well-structured treatment programs and controlled studies to evaluate the effects of such programs are scarce, especially when compared with other phobias, although systematic research on the topic has begun to increase.

One method of reducing fear of flying that has been most commonly used over the last 30 years is a combination of relaxation techniques and the provision of aeronautical data. Despite its extensive use, the real effectiveness of relaxation training still remains unclear. In Howard, Murphy, and Clarke's (1983) controlled study, relaxation treatment was equally effective as systematic desensitization, flooding, and implosion. In contrast, Denholtz and Mann (1975) found systematic desensitization to flight pictures to be more effective than either relaxation alone or exposure to flight film without relaxation. Moreover, in several controlled trials using relaxation as part of cognitive–behavioral treatments (Beckham, Vrana, May, Gustafson, & Smith,

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1990; Capafóns, Avero, Sosa, & López-Curbelo, 1999; Capafóns, Sosa, & Avero, 1997; Girodo & Roehl, 1978; Haug et al., 1987), these treatments were more effective than the control conditions. However, the role of each component (relaxation, aeronautical data, and exposure) cannot be established definitively (Walder, McCraken, Herbert, James, & Brewitt, 1987). Nevertheless, exposure is often claimed to be chiefly responsible for patient improvement.

Currently, in vivo exposure is the preferred method of treatment for any specific phobia. In vivo exposure to flying seems to be quite effective despite the scarcity of supporting data. Only one random trial evaluated the efficacy of in vivo exposure to flight phobia. Öst, Brandberg, and Alm (1997) compared one-session and five-session exposure treatments and found that short, intensive exposure was highly effective in overcoming flight phobia. However, this study did not compare exposure treatment to any other form of treatment; therefore, it cannot be used as evidence to support the theory that exposure is the only or the most effective therapeutic strategy for flight phobia.

Unlike other phobias, the difficulty and expense of in vivo flight exposure have daunted many researchers and therapists (Rothbaum, Hodges, Watson, Kessler, & Opdyke, 1996), and this may be one reason for the limited number of experimental studies evaluating the efficacy of this therapeutic strategy. These difficulties led researchers to attempt to simulate flight situations that cause fear in a way that is both realistic and vivid. Simulated exposures were first tried in the 1970s, using slide projectors, with promising results (Denholtz & Mann, 1975; Solyom, Shugar, Bryntwick, & Solyom, 1973). However, few studies were undertaken over the next 15 years to continue investigations into simulated exposures for the treatment of flight phobia. Practical problems, such as difficulties in integrating sound and image, therapist control of stimuli, recording of patients' self-assessed anxiety, and so on, may have limited the application of this exposure strategy. The rapid development of new technologies that can easily overcome the limitations of slide presentations has again led researchers to develop new simulated-exposure treatments. Other possible benefits of comprehensive simulated exposure programs include reducing therapist contact time, standardization of treatment, and widespread low-cost use (Newman, Consoli, & Taylor, 1997). In addition, simulated exposure might be useful for those patients who are reluctant to experience in vivo exposure therapy (an actual flight).

The newest technology used to simulate fear stimuli is virtual reality (VR; Glantz, Durlach, Barnett, & Aviles, 1996; North, North, & Coble, 1997). VR integrates real-time computer graphics, body tracking devices, visual displays, and other sensory input devices to immerse the participant in a computer-generated virtual environment (Rothbaum et al., 1996). As Glantz et al. (1996) indicated, the power to immerse the user in a multimodal simulated world derives not so much from the realism of the displays as from the fact that perception and action are integrated just as they are in the real world. In a number of case studies (e.g., Carlin, Hoffman, & Weghorst, 1997), VR has been used to assist in the treatment of a wide variety of conditions. More specifically, Rothbaum et al. (1996) presented a case study in which VR exposure was successfully used as a key component in the treatment of a flight phobic patient. It has been suggested, however, that in this case the contribution of VR to success was not definitively established, because the study combined anxiety management techniques and VR (Carlin et al., 1997).

Mühlberger, Herrmann, Wiedemann, Ellgring, and Pauli (2000) conducted the first controlled study on VR for the treatment of fear of flying. Using relaxation as a

control condition, one-session VR exposure effectively reduced flight phobia to a greater extent than relaxation training.

Another possibility for flight simulation is the use of computer programs. In this case, the computer-assisted programs are specific types of software aimed to confront patients, in a hierarchically structured way, with real images and sounds related to the fear stimuli presented on the screen of a personal computer. Contrary to VR, perception and action are not integrated. In this case, Newman et al. (1997) reviewed a number of studies in which computer technologies were successfully applied in the treatment of anxiety disorders. Coldwell et al. (1998) described a computerized exposure-based therapy program for the treatment of fear of dental injections that was effective in reducing this fear in a small sample. Currently, there are a number of advantages to computer-assisted therapy programs compared with VR. Computer technology is both more widely available and less expensive than VR, and, with the inclusion of sounds and a great variety of images, researchers can simulate preflight and in-flight conditions very realistically. It is relatively easy to divide computer programs into many components and to combine these components to meet the idiosyncratic needs of each patient. Computer programs can include treatment components other than exposure. Last, patients who have personal computers can apply the program at home. To date, only one case study (Bornas, Fullana, Tortella-Feliu, Llabrés, & García de la Banda, in press) investigates the effectiveness of computer-simulated exposure in the treatment of flight phobia.

The purposes of our study were twofold: (a) to evaluate, by means of a controlled group trial, the effectiveness of CAE for fear of flying and (b) to analyze the role of relaxation and information-related components in the reduction of fear of flying. The CAE treatment procedure, used on its own, was compared with (a) a more traditional fear of flying multicomponent program, including aeronautical data, arousal reduction techniques (i.e., controlled breathing and relaxation), and CAE (IRCAE) and (b) a waiting list control (WLC) treatment. During the IRCAE treatment, we also analyzed the contribution of relaxation and information-related components to the final outcome.

From previous research on exposure techniques, it was predicted that CAE treatment would be as effective as the multicomponent treatment in achieving clinically meaningful changes in flight phobics, and that both treatments would be more successful than control group treatment. We also hypothesized that CAE would be the critical component of IRCAE treatment.

Method

Participants

The patients had applied to participate in the study after having read an advertisement in a local newspaper. To be included in the study, candidates had to suffer from a specific type of flight phobia in accordance with the criteria of *Diagnostic and Statistical Manual of Mental Disorders* (fourth edition; American Psychiatric Association, 1994), agoraphobia, or a panic disorder with agoraphobia, with fear of flying as the most clinically relevant behavior pattern. To participate, other criteria also had to be met: Participants had to be older than 18 years, have no other psychological problems requiring immediate treatment, have no history of psychotic symptoms, and have no heart or lung disease; they also could not be taking any psychotropic medication or

receiving any other psychological treatment at the time. The participation requirements, such as attending therapeutic sessions twice a week and taking a short flight (50% of the cost to be met by the patient) after completing treatment if ready, were specified in a written consent form signed by each individual before treatment.

An interview and questionnaire concerning the criteria involved (described in the next section) were individually administered to select the participants for the study. Fifty people were selected among 68 applicants (mean age = 32.9 years, *SD* = 10.94). Three additional candidates who did not attend the first session, which dealt with the treatment rationale, were excluded. Thus, the final sample was composed of 37 women and 13 men. Twenty-seven (54%) were classified as complete avoiders because they had not taken a flight during the last 2 years. The mean avoidance time for these individuals was 7.29 years (*SD* = 6.38).

Instruments

Anxiety Disorders Interview Schedule (*Brown, Di Nardo, & Barlow, 1994*). This comprehensive, structured, diagnostic interview was designed to assess the history of occurrence of anxiety disorders. In addition, some extra questions were added to the specific phobias section to collect specific information on flying behavior, such as number of flights taken per year, avoidance degree, etiological factors related to fear of flying, main components of fear, and so on.

Fear of Flying Questionnaire-II (*FFQ-II; Bornas, Tortella-Feliu, García de la Banda, Fullana, & Llabrés, 1999*). This revised version of the Fear of Flying Questionnaire (FFQ; Bornas & Tortella-Feliu, 1995), which was used to measure the severity of fear of flying, is a 30-item self-assessment form in which the patient rates, on a scale of 1 to 9 (1 representing low anxiety, 9 representing high anxiety), the level of fear or discomfort during different flying-related situations. The possible range of scores for this FFQ version is 30 to 270. It consists of three subscales that assess (a) anxiety during the flight, (b) anxiety experienced before getting on the plane, and (c) anxiety caused by the observation of neutral or unpleasant situations related to flying. The questionnaire has sound psychometric properties. The test–retest reliability (*N* = 166, test–retest interval = 15 days) was .96, .97, and .92 for each of the subscales, respectively, and internal consistency was .97 for the whole questionnaire.

Procedure

The participants with a specific phobia (*N* = 46) were randomly assigned to one of three groups: two treatment groups (CAE and IRCAE) and one WLC group. Those with panic disorder or agoraphobia or both (*N* = 4) were randomly assigned to the CAE or IRCAE groups (*N* = 2 per group). The complete avoidance participants were also randomly assigned to CAE (*N* = 9), IRCAE (*N* = 10), and the WLC group (*N* = 8). For both treatment groups, the first session was spent reviewing the rationale and signing the aforementioned participation contract. This session was the only group session for both treatment groups; the others took the format of individual therapy sessions. Thereafter, 15 patients received individual CAE treatment, 18 received IRCAE treatment, and 17 remained in the WLC treatment.

Therapists. Four male therapists participated in the study. There were two therapists in each group, one of whom was an experienced researcher and the other a

doctoral student. The participants within each group were randomly assigned to one of the two therapists. All four therapists had at least 2 years of clinical experience in cognitive–behavior therapy and had been trained to use the treatment software for 3 months before the study. Direct intervention by the therapists was limited to the minimum advice necessary during exposure treatment. It was decided, before commencing, that the two more experienced therapists would be assigned to deal with relaxation procedures for the IRCAE group. One of them also took the role of the interviewer in the videotape used to provide aeronautical data.

Computer-Assisted Fear of Flying Treatment (CAFFT) program description. CAFFT was originally developed for use on a Macintosh computer, but now a PC-compatible version made with Toolbook® authoring software is also available. The rationale for CAFFT is as follows: Air travel can be conceptualized as a series of chronological events with critical moments. CAFFT divides air travel into four sequential stages: (a) preparation for travel, (b) preflight activities the day of the flight, (c) boarding the plane and take-off, and (d) descent and landing. Although most people with flight phobia usually experience anxiety during all aspects of air travel, most patients experience idiosyncratic patterns of anxiety intensity throughout the flight experience. That is, they fear certain critical moments more than others. CAFFT was designed to be adapted to patients according to their fear profile. The program creates a fear hierarchy, exposing patients to each stage of flying from their least-feared stage to their most-feared stage. Each stage of the flight consists of a chronological series of photographs (at home, at the airport, walking onto the plane, and so on) with matching sounds recorded in real settings. For example, the flight preparation sequence starts with three pictures of windows of three different travel agencies, together with appropriate background street noise. The next picture was taken inside one of the travel agencies, and the patient hears typical office sounds. This sequence continues with pictures showing an open suitcase on a bed, followed by the suitcase closed and ready near the door, and then the airport bus in the street. In addition to these four sequences, CAFFT also includes a fifth sequence of pictures and matching audio stimuli related to aircraft accidents. This fifth sequence was included in CAFFT because anxiety and apprehension about the possibility of the airplane crashing are thought to be a key component of many flight phobics' fear (Howard et al., 1983; Van Gerwen et al., 1997; Wilhelm & Roth, 1997). Exposure to this sequence does not seek to eliminate the instinctive, adaptive fear response to an actual plane crash but rather to reduce the extreme anxiety that some flight phobic patients experience when they simply contemplate the possibility of crashing or when they see a plane crash on television. A brief description of the sequential structure of CAFFT is given in Table 1.

CAFFT automatically configures patients' fear hierarchy based on their answers on the computerized FFQ-II version integrated into the program. Each item is associated with one of the five exposure sequences. CAFFT calculates the mean score for each stage of the flight and then orders the presentation of stages from the one with the lowest score to the one with the highest. After being shown all the photographs in sequence, patients rate their anxiety on a 1- to 9-point Likert scale. The program repeats the sequence until patients rate their anxiety as low (1 or 2). Once patients have become habituated, the program advances to the next sequence in patients' fear hierarchy. Patients are deemed to have completed the therapy after they have become habituated to all stages of a flight.

TABLE 1. Contents, Composition, and Duration of Each Exposure Sequence of the CAFFT

CAFFT exposure sequences	Sequence start	Sequence end	No. of pictures	Duration (min)
1	Going to a travel agency to buy the ticket	Packing at home	10	2.52
2	Going to the airport	Waiting for take-off inside the aircraft	16	4.15
3	Watching the safety demonstration inside the aircraft	Taking off and ascending	14	2.92
4	Announcing landing	Inside the airport terminal building	13	2.76
5	Aircraft accident[a]		12	5.96

Note. CAAFT = computer-assisted fear of flying treatment.
[a]This sequence does not have any particular chronological order.

Computer-Assisted Exposure (*CAE*). The CAFFT program was used to reduce fear of flying. Exposure sessions lasted 50 min and took place in a darkened room. Most of the individuals in this group received two therapy sessions each week. During exposure sessions, the patient sat 2 m in front of the projection screen (100 cm × 75 cm). There were three 2-m-high panels surrounding each patient to prevent distraction. The therapist sat to the right of and slightly behind patients to be able to observe without distracting them. Patients wore stereo earphones that provided audio cues (actual recorded sounds) consistent with the still images appearing on the screen. On Day 1, patients were given a brief rationale of the treatment and instructions about the functioning of the program. They then used the computer to enter their names and to fill in the FFQ-II.

Initially, exposure treatment was automatically administered by the program until the participants had been desensitized to the five sequences. The role of the therapist during this automatic phase was to observe reactions and to solve any problems that might arise during each session regarding management of the software (e.g., using the mouse, clicking the buttons on the screen). The mean duration of automatic exposure with CAFFT for the CAE and IRCAE groups was 3.06 sessions (*SD* = 1.29; range = 1–6 sessions). Afterward, the therapist might decide to repeat certain sequences more times to ensure that the patient did not feel anxiety. In the case of both treatment groups, the therapist-directed CAFFT stage lasted an average of 2.38 sessions (*SD* = 1.35; range = 1–5 sessions). At the end of the exposure sessions, each patient completed the FFQ-II again.

IRCAE. Information about different aspects of flying was given by means of a 40–min videotaped interview with a veteran commercial airline pilot. The interviewer, who was one of the therapists in the IRCAE group, asked questions concerning how airplanes take off, what security measures are adopted before passengers board an airplane, and so on. We chose an interview format to make it easier for patients to pay attention to the technical explanations. After the session, each participant was given a brochure with a more detailed explanation of the topics the video had dealt with. A short relaxation technique was taught and practiced during the next four 1-hr sessions (two sessions each week), as is common practice in airlines' structured

fear of flying treatment programs (i.e., Rubio, Cabezuelo, & Castellano, 1996). The patients were instructed to practice relaxation between sessions at home with the help of an audiotape. At the end of the information and relaxation treatment phase, they were also asked whether they would take an actual flight a few days later.

At the sixth session, participants began the CAE treatment phase. CAE was applied as described previously. Participants were discouraged from suppressing anxiety with relaxation techniques during exposure sessions. They were instructed to use relaxation as a way to reduce anticipatory flight fear and as a means of suppressing highly uncomfortable sensations when getting anxious in these situations but not as a skill to be used during exposure. Because the first task that the patients did in front of the computer was complete the FFQ-II, their scores were used to measure the effects of the information and relaxation training on their flight phobia.

Posttreatment actual flight. Under the terms of the written participation contract, patients were asked to take an actual flight after completing the CAE treatment sessions if they felt ready. They would be responsible for paying 50% of the cost of the ticket (approximately $60/Euros). This flight was not intended to be part of the therapy. Taking a flight was planned as an additional final measure. Because there was no obligation to take the flight, we believed that if a large number of patients felt able to fly, it would indicate that the treatment had been successful. Also, for those who decided to go ahead, the in vivo flight would be a means of knowing whether an actual flight has any influence in further reducing fear. All participants were given the opportunity to do this a few days later depending on the availability of flights. We chartered a short flight: 30 min to the destination, 40 min in the airport, and 30 min to return to the point of departure. The patients flew in groups of 2, 3, or 4, and one therapist went with each group. The groups assembled at the police control point, so each patient had to get his or her boarding pass before meeting the other patients and the therapist. The patients had previously been instructed to avoid talking about the treatment to other people (other patients included). To make the situation more similar to that of flying alone, patients were not seated in the same row, and although they knew where the therapist was seated in the aircraft, they could not see him from their seats. Upon return to the point of departure, before leaving the airport, each patient completed the FFQ-II as well as a brief questionnaire, including danger expectancies and psychophysiological responses during the flight.

Follow-up. Six months after the treatment concluded, the CAE and IRCAE patients were called back to complete the questionnaires again and to be interviewed about the flights they had taken during this period. They were also exposed to the CAFFT sequences to assess subjective discomfort. The WLC patients were not assessed at follow-up because they had already entered the treatment program.

Results

Three analyses were conducted. The first compared the number of patients in each group who took a flight after treatment and analyzed differences in the subjective fear of flying and general discomfort scores for all three groups before and after treatment. The aim of the second analysis was to find out what influence, if any, the addition of relaxation techniques and aeronautical data had on reducing fear of flying. To do this, the evolution of the IRCAE group was analyzed throughout the treat-

ment procedure. Finally, the third analysis compared the CAE and IRCAE groups before treatment, after treatment, and at 6-month follow-up. Separate analyses for specific phobia patients and agoraphobic patients were not carried out because (a) only 4 patients were diagnosed as agoraphobic and (b) all 4 finished treatment and flew after exposure.

Analysis 1

The first question to answer was how many patients in each group completed treatment and how many actually flew after treatment. All 15 patients in the CAE group completed the exposure treatment, whereas 13 of 18 patients (72.2%) in the IRCAE group completed the treatment, $\chi^2(1, N = 33) = 4.91$, $p < .027$. Furthermore, 14 individuals in the CAE group took the actual flight (93.4%), whereas only 9 (50%) in the IRCAE group did so, $\chi^2(1, N = 33) = 7.27$, $p < .007$). In the WLC group, 2 of 17 subjects (11.8%) took a flight during the same period, $\chi^2(2, N = 50) = 21.2$, $p < .001$. When the IRCAE patients were asked about taking a flight a few days after finishing the information and relaxation procedure, none felt ready to do it. When they were asked again after the CAE procedure, 50% of them still refused to take the actual flight (and did not, in the end, fly).

At 6-month follow-up, unfortunately only 16 patients could be contacted for this new assessment. Nine patients in the CAE group and 6 in the IRCAE group had taken at least one flight on their own ($M = 3.93$, $SD = 4.3$, range = 1–14). No significant differences between the groups were found.

To evaluate treatment effectiveness in reducing fear of flying, a change score for the FFQ-II questionnaire was calculated by subtracting posttreatment FFQ-II scores from pretreatment scores. Because we have analyzed the number of patients who flew after treatment, posttreatment (i.e., postexposure) scores are those taken after exposure but before flying.

The mean improvement scores from the FFQ-II assessment of subjective fear of flying, before and after treatment (before flying), were 53.28 ($SD = 49.98$) for the IRCAE group ($n = 13$), 92.43 ($SD = 42.18$) for the CAE group ($n = 15$), and 0.68 ($SD = 24.63$) for the WLC group ($n = 14$). The participants from the WLC group were assessed by means of telephone interviews on the same dates 6 weeks after the initial assessment.

Although the standard deviations for the three groups differ greatly, the reliability of the analysis of variance (ANOVA) F value reliability remains high because the largest group ($n = 15$) is less than 1.5 times the size of the smallest group ($n = 13$). The ANOVA yielded significant differences among groups for the FFQ-II, $F(2, 39) = 19.009$, $p < .001$. Significant post hoc contrasts ($\alpha = .05$) were found between the CAE and IRCAE groups, the CAE and WLC groups, and the IRCAE and WLC groups. That is, both methods of treatment were significantly more successful than the WLC treatment, and the CAE method of treatment led to a greater reduction in patients' fear of flying than the IRCAE treatment did.

Analysis 2

A more detailed analysis of the patients' decrease in fear during the different phases of therapy was carried out. This was done by using just the first two treatment groups on the five occasions on which the FFQ-II questionnaire was completed by the patients (during the pretreatment, preexposure, postexposure, postflight, and

follow-up stages) to find out the effectiveness of each component of the treatment package. In other words, because the difference between the CAE and IRCAE treatment groups was the addition of information and relaxation training to the exposure therapy given to the IRCAE group, it is of major importance to evaluate whether those added components actually increase the fear-reducing power of CAE. It is worth remembering that the preexposure scores for the IRCAE group were obtained after they completed the information and relaxation training stage, just before starting the CAE therapy sessions.

The evolution of the FFQ-II mean scores obtained during the treatment and follow-up phases was analyzed, especially those of the IRCAE group. Although this analysis should be carried out using a repeated measures global linear model (ANOVA), the dramatic number of dropouts in the IRCAE group would have restricted the analysis to just 7 patients. This kind of analysis, although methodologically appropriate, would not have provided clinically meaningful results. For this reason, we chose a paired-sample, *t*-test analysis of consecutive assessment points, which was carried out separately for each treatment group, using alpha* correction. A conservative nonparametric analysis was also conducted to compare data for reliability. The evolution of the FFQ-II scores for both treatment groups is shown in Table 2.

Looking at the evolution of the IRCAE group, a significant decrease can only be observed between Assessment Points 2 and 3 (i.e., between information-relaxation and exposure assessments), $t(12) = 4.54$, $p < .001$. Corroborating our initial hypothesis, no significant differences were observed between the pretreatment scores and those taken after patients were provided with aeronautical data and relaxation training, $t(15) = .182$, $p = .85$. Therefore, this treatment component does not contribute significantly to reducing fear of flying. Furthermore, no significant differences were found in comparisons between Assessment Points 3 and 4 and between Assessment Points 4 and 5. This means that once patients' self-assessed fear of flying is clearly reduced after CAE treatment, no significant additional decreases in FFQ-II ratings occur at the postflight assessment stage (Assessment Point 4) or after taking flights during the follow-up period (Assessment Point 5). Wilcoxon's test has shown the same results: a significant decrease only between Points 2 and 3 (before and after CAE) ($z = 3.18$, $p < .001$).

TABLE 2. FFQ-II Scores for Both Treatment Groups at Each Assessment Point

Group	Pretreatment	Pre-CAE	Post-CAE	Postflight	Follow-up
IRCAE					
All patients	159.80 ± 47.57 (n = 18)	162.87 ± 41.97 (n = 16)	102.77 ± 4.72 (n = 13)	66.55 ± 30.08 (n = 9)	72.57 ± 62.80 (n = 7)
Other[a]	162.06 ± 46.98 (n = 16)	157.92 ± 43.53 (n = 13)	82.11 ± 37.49 (n = 9)	64.00 ± 30.91 (n = 7)	
CAE					
All patients	154.50 ± 38.34 (n = 15)	158.13 ± 44.60 (n = 15)	62.07 ± 20.61 (n = 15)	60.23 ± 22.03 (n = 13)	66.11 ± 28.97 (n = 9)
Other[a]	63.38 ± 20.60 (n =13)	51.44 ± 14.65 (n = 9)			

Note. Values represent means ± standard deviations. FFQ-II = Fear of Flying Questionnaire-II; CAE = computer assisted exposure; IRCAE = information and relaxation plus CAE.

[a]Means and standard deviations only for patients with data available at next assessment.

Examination of the CAE group's self-assessment of their fear of flying indicates that paired-sample comparisons also only show a significant reduction in discomfort between the pretreatment and post-CAE assessments, $t(14) = 8.14$, $p < .001$; $z = 3.4$, $p < .001$. Once again, flights taken at the end of treatment or afterward, during the follow-up period, do not contribute significantly to a greater decrease in their FFQ-II subjective discomfort scores.

Analysis 3

Finally, despite the limited number of participants whom we were able to assess at 6-month follow-up, a repeated measures ANOVA (2 × 3 mixed design) was performed to analyze differences between the CAE and IRCAE groups throughout treatment (i.e., pretreatment, before the posttreatment flight, and at 6-month follow-up). Given the high dropout rates, the characteristics of dropouts' fear intensity and avoidance were analyzed. Compared with those contacted at the follow-up stage, the dropouts did not differ in their pretreatment FFQ-II scores, t (31) = .021, *ns*, or in the avoidance category, χ^2 (1, N = 33) = .036, *ns*. A sequential analysis was used because of its appropriateness when groups do not have the same sample size. The results of flight phobia self-assessments are shown in Table 3.

ANOVA revealed a significant time effect, as shown in Table 3, but no group or interaction effect. Both groups showed a significant improvement at the posttreatment stage. Although the CAE group had a lower mean at the posttreatment stage than the IRCAE group, it was not statistically significant.

The CAE group's mean score for the FFQ-II questionnaire after treatment (M = 56.11, SD = 13.25) was below the mean value in nonphobic samples (M = 65.24, SD = 30.8; Tortella-Feliu & Fullana, in press), and the group's reduction in fear was, therefore, highly significant, $t(12) = 6.61$, $p < .0001$. At the follow-up stage, the CAE group's mean score rose (M = 66.11, SD = 28.97), reaching a value similar to that of nonphobic samples. Nevertheless, this increase was not statistically significant. In contrast, the IRCAE group's mean score at posttreatment (M = 82.71, SD = 42.4) was still slightly higher than the mean observed in nonphobic samples, although the improvement observed after the pretreatment assessment was statistically significant, $t(8) = 3.9$, $p < .01$. At the follow-up stage, the IRCAE group's self-assessment of their flight phobia improved slightly (M = 72.57, SD = 62.8), although this was not a statistically significant change compared with their posttreatment assessment.

TABLE 3. Treatment Group Comparisons of Flight Phobia Self-Assessments at Pretreatment, Posttreatment, and Follow-Up

	FFQ-II scores		
Stage	IRCAE (n = 7)	CAE (n = 9)	F(1, 15)
Pretreatment	153.13 ± 51.71	161.20 ± 38.02	Group: 0.31, *ns*
Posttreatment	82.71 ± 42.40	56.11 ± 13.25	Time: 36.50*
Follow-up	72.57 ± 62.80	66.11 ± 28.97	Interaction: 1.02, *ns*

Note. FFQ-II = Fear of Flying Questionnaire-II; CAE = computer-assisted exposure; IRCAE = information and relaxation plus CAE.
*$p < .01$.

The improvements at the follow-up stage remain significant when the follow-up mean scores are compared with pretreatment mean scores (ts = 4.31, $p < .0007$, for the IRCAE group and 5.77, $p < .0001$, for the CAE group).

Discussion

The first objective of this study was to evaluate the effectiveness of CAE for the treatment of fear of flying as opposed to a more traditional fear of flying multicomponent program (IRCAE) or to a WLC treatment. In accordance with our initial hypotheses, both treatments were more successful than being on the waiting list. Although both the CAE and IRCAE treatments proved effective in reducing patients' fear of flying, the results of the study suggest that CAE therapy alone is a better clinical choice than CAE combined with information and relaxation training. First, CAE is much shorter than the other treatment, although equally effective. That is, it is far more cost effective as a means of treating flight phobia. Second, 5 patients gave up the IRCAE treatment, 4 during the information-relaxation phase, but no one gave up in the CAE treatment group. This is highly relevant from a clinical point of view and is consistent with other findings: Although patients do not fail to complete simulated exposure treatments (e.g., Mühlberger et al., 2001), significant dropout rates are not rare in long multicomponent methods of treatment or in relaxation training (e.g., Beckham et al., 1990; Denholtz & Mann, 1975). Last, only half of those who began the IRCAE treatment took the actual flight. The fact that this treatment lasted longer could explain the higher dropout rate, but it does not explain why more patients among those who finished the IRCAE treatment refused to take an actual flight. Perhaps arousal-reduction techniques interfere with exposure. Although patients were instructed to use controlled breathing and relaxation only when unpleasant psychophysiological symptoms arose, they could have been using these coping skills widely during exposure sessions. This is only a speculative explanation based on previous exploratory analyses of CAFFT exposure conditions (e.g., exposure time to each sequence, experienced discomfort while exposed). For example, the IRCAE exposure time to the take-off sequence was significantly shorter than the CAE exposure time to the same sequence (although no differences were found in the total exposure time to all five sequences). Perhaps patients in the IRCAE group passed through exposure to this sequence, which is usually the sequence that flight phobics fear the most, more quickly because they used the previously learned skills to control activation.

The second objective of this study was to analyze the contribution of the relaxation and information-related components of IRCAE to the reduction of fear of flying. From an analysis of the data obtained from the IRCAE group, the self-assessments of patients' fear of flying show no reduction in fear after the aeronautical data and arousal-control procedures, and all patients refused to take an actual flight at this point. The prediction that the critical component of IRCAE treatment would be the CAE phase, and that the other aforementioned components would not contribute specifically to therapeutic success, was, therefore, corroborated by these results. It is worth remembering, however, that both information and relaxation components were used in a brief format in the study.

During both methods of treatment, the main reduction in fear was obtained after CAE. The posttreatment actual flight did not contribute significantly to reducing self-assessed levels of flight phobia. Thus, CAE could be effective in itself in the treatment of flight-phobic patients instead of being used in the training stages or previ-

ous skill acquisition phase before the in vivo exposure represented by the actual flight.

It is also significant that, after an average of five 50-min sessions of CAE, patients feel they are able to take a flight. This average is similar to the time dedicated to rapid treatment of specific phobias. Although more detailed analyses with larger samples of phobic patients are needed, previous data not reported here suggest that intensive treatment contributes to better results. Higher treatment density may be related to higher anxiety release.

Most studies conducted an in vivo flight as the last step of a multicomponent program. Researchers have frequently claimed this flight to be chiefly responsible for treatment success while, at the same time, using it as a means of measuring results. Some authors (e.g., Öst et al., 1997) criticized the reliability of this "graduation flight" as a means of measuring behavioral avoidance on the grounds that patients are accompanied by the therapist or fellow patients in this in vivo exposure session. In our study, the in vivo flight should not be seen as an active part of treatment. However, it should neither be understood as a posttreatment behavioral test during which the patients were accompanied by their therapist, considering the minimal contact maintained before and during the flight and the fact that they were responsible for paying 50% of the ticket. The role of these flights at the end of treatment and how posttreatment behavioral tests must be conducted need to be clarified.

At 6-month follow-up, the self-assessment of anxiety levels remained constant for both treatment groups, and all the patients who had taken a flight at the end of treatment, except one, had taken at least one other flight that they had paid for themselves. None of them reported having used alcohol, drugs, or medication when they flew. The average number of flights taken during this period is very high. Perhaps this is related to two main factors: (a) Patients live on a small island about 130 km from the mainland and so leave the island quite often, and (b) some patients sought treatment because they need to fly for reasons related to their jobs. However, because 46% of patients never completely avoided flying before treatment, this follow-up result must be considered with caution. Furthermore, both these factors limit our capacity to generalize the results.

Despite experiencing great discomfort while flying and trying to reduce this by means of unhealthy coping strategies (e.g., alcohol or nonprescribed tranquilizers), some of the patients who participated in the study had occasionally flown during the 2 previous years but only if absolutely necessary. This may constitute a problem with regard to the methodology of avoidance-behavior analyses. The inclusion of a WLC group can partially overcome this limitation at the posttreatment stage, although the group was not included in the study at follow-up. In any case, we believe that research on methods of flight phobia treatment should not be solely devoted to complete avoiders, excluding other people who are seriously handicapped in their private or professional lives and seek clinical help.

One aspect of the results of this study that could benefit from more attention in future research is the great variability observed among patients in self-assessments of anxiety reduction after treatment. This is probably related to the heterogeneity of fear of flying. Studies analyzing clinical characteristics of flight phobia have identified several subtypes of patients with this disorder (McNally, 1997; McNally & Louro, 1992; Van Gerwen et al., 1997; Wilhelm & Roth, 1997). It is widely recognized that fear of flying is a distinctive, nonunitary type of specific phobia with several underlying components, and it may sometimes be secondary to or an expression of other phobias, including agoraphobia and panic disorder. These findings could have im-

portant implications for treatment, especially in the selection of treatment components or in regard to the focus of treatment. Perhaps CAE treatment suits some subtypes of flight phobia but not others, or modifications are needed in the program to deal with this heterogeneity.

Finally, future research into CAE will need to consider certain limitations involved in this study. First, although the therapists gave only limited therapeutic advice, the therapist was present during all the exposure sessions, including the flight itself. From this study, we cannot determine whether the therapeutic effect can be attributed solely to CAFFT, to the presence of the therapist, or to the interaction of both. A rigorous CAFFT test would involve a controlled study in which treatment was given by computer alone. In fact, one of the great advantages of computer administration is that the rationale and periodic assessment and even therapeutic hints to increase the effectiveness of exposure can be easily integrated into the program. Second, the adequacy of using gradual exposure or, as has been suggested for the treatment of phobias, starting exposure with mild or high anxiety-evoking scenes and sounds will require a detailed analysis to reach a more cost-effective method of treatment. Third, patients were recruited by advertisements in local newspapers, and this procedure may limit the ability to generalize the results. We used this method because there was no treatment available for phobic flyers on the island, so this was the best way to let them know about our treatment. We realize, however, that people seeking treatment "spontaneously" may differ from those who read the advertisement. A study on the clinical usefulness of CAFFT is currently being conducted at the island's international airport, and further research should be done to address this specific issue.

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Zusammenfassung

Diese Studie untersucht die Effektivität einer computerunterstützten Konfrontationsbehandlung zur Überwindung von Flugangst und analysiert den Einfluß von Entspannung und informationsbezogenen Komponenten auf die Angstreduktion. Fünfzig Klienten mit Flugangst wurden randomisiert einer von drei Behandlungsmethoden zugeordnet: (a) Computerunterstützter Konfrontation mit dem angstauslösenden Reiz (computer-assisted exposure: CAE), (b) einer Mehrfachkomponenten Behandlungsmethode mit Information, Entspannung (relaxation) und CAE (IRCAE). Hierbei wurden aeronautische Daten verwendet und Techniken zur Arousalreduktion eingesetzt und (c) eine Kontrollgruppe von der Warteliste. Zum Behandlungsende wurde ein richtiger Flug gechartert. Die Ergebnisse zeigten, dass die ersten beiden Behandlungsmethoden mehr Effekte zeigten als die Kontrollbedingung. Die CAE-Gruppe wies die größte Angstreduktion auf. Bei der IRCAE-Gruppe wurde aufgrund der Informations-Entspannungsphase allein keine Angstreduktion beobachtet. Katamnesedaten mit Selbsteinschätzungen zeigten, dass die erzielte Angstreduktion stabil blieb.

Résumé

Cette étude examine l'efficacité du traitement d'exposition assisté par ordinateur pour aider à surmonter la phobie d'avion et analyse le rôle de la relaxation et d'éléments reliés à l'information pour réduire la peur. 50 phobiques d'avion ont été attribués par hasard à une des 3 méthodes de traitement: (a) exposition assistée par ordinateur (CAE); (b) une méthode de traitement à plusieurs éléments, l'information, la relaxation et la CAE (IRCAE) incluant CAE, des données aéronautiques, et des techniques de réduction de l'excitation; (c) un groupe d'attente comme contrôle. A la fin du traitement, un vol réel a été organisé. Les résultats montrent que les 2 premières méthodes étaient plus efficaces que l'appartenance au groupe contrôle. C'est le groupe CAE qui a montré la réduction de peur la plus importante. Selon les données du groupe IRCAE, il n'y avait pas de réduction de la phobie d'avion après la phase d'information-relaxation. Les données catamnestiques montrent une stabilité de l'amélioration du taux d'anxiété autoévaluée.

Resumen

Este estudio examina la eficacia del tratamiento de exposición asistido por computadora en el caso de la fobia a volar y analiza el rol de la relajación y de los componentes relacionados con la información en la reducción del miedo. Se asignaron al azar cincuenta fóbicos a volar a uno de tres métodos de tratamiento (a) exposición asistida por computadora (CAE); (b) un método múltiple compuesto de información, relajación y CAE (IRCAE) que incluyó CAE, datos aeronáuticos y técnicas de reducción de la alerta; y (c) un grupo de control con pacientes de la lista de espera. Al final del tratamiento se realizó un vuelo real. Se vio que los primeros dos métodos fueron más efectivos que el control. La mayor reducción del miedo se registró en el grupo CAE. De acuerdo con los datos del IRCAE, no se observó reducción de la fobia a volar luego de la fase de información-relajación. Los datos de seguimiento mostraron que la mejoría de la ansiedad autoevaluada se mantuvo constante.

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