Experiential Cognitive Therapy in the Treatment of Panic Disorders with Agoraphobia: A Controlled Study

F. VINCELLI, Ph.D., L. ANOLLI, Ph.D., S. BOUCHARD, Ph.D., B.K. WIEDERHOLD, Ph.D., M.B.A., BCIA, V. ZURLONI, M.S., and G. RIVA, Ph.D.

ABSTRACT

The use of a multicomponent cognitive-behavioral treatment strategy for panic disorder with agoraphobia is actually one of the preferred therapeutic approaches for this disturbance. This method involves a mixture of cognitive and behavioral techniques that are intended to help patients identify and modify their dysfunctional anxiety-related thoughts, beliefs and behavior. The paper presents a new treatment protocol for Panic Disorder and Agoraphobia, named Experiential-Cognitive Therapy (ECT) that integrates the use of virtual reality (VR) in a multicomponent cognitive-behavioral treatment strategy. The VR software used for the trial is freely downloadable: www.cyberpsychology.info/try.htm. Moreover, the paper presents the result of a controlled study involving 12 consecutive patients aged 35–53. The selected subjects were randomly divided in three groups: ECT group, that experienced the Cognitive Behavioral Therapy–Virtual Reality assisted treatment (eight sessions), a CBT group that experienced the traditional Cognitive Behavioral approach (12 sessions) and a waiting list control group. The data showed that both CBT and ECT could significantly reduce the number of panic attacks, the level of depression and both state and trait anxiety. However, ECT procured these results using 33% fewer sessions than CBT. This datum suggests that ECT could be better than CBT in relation to the “cost of administration,” justifying the added use of VR equipment in the treatment of panic disorders.

INTRODUCTION

Within the Diagnostic and Statistical Manual of Mental Disorders framework,1 the essential feature of panic disorder (PD) is the occurrence of panic attacks. A panic attack is a sudden onset period of intense fear or discomfort associated with a cluster of physical and cognitive symptoms, which occur unexpectedly and recurrently, such as pervasive apprehension about panic attacks, persistent worry about future attacks, worry about the perceived physical, social or mental consequences of attacks, or major changes in behavior in response to attacks. The disorder is often associated with circumscribed phobic disorders such as specific phobias, social phobias, and especially with agoraphobia.2 Indeed, avoidance of public places to reduce fear or panic becomes the main cause of incapacity in patients, who, in more serious cases, are confined to their homes patterns.

Clark, Salkovskis, Barlow, and other colleagues have outlined the traditional Cognitive-Behavioral Treatment (CBT) for PD with agoraphobia (PDA).3–6 Evidence collected over the past 20 years has consistently shown the effectiveness of a multicomponent cognitive-behavioral strategy in the treatment of panic disorder with agoraphobia.

1Laboratorio Sperimentale di Psicologia, ATN-P Lab, Istituto Auxologico Italiano, Verbania, Italy.
2Department of Psychology, Università Cattolica, Milan, Italy.
3Department of Psychology, Universite du Quebec a Hull, Canada.
4Virtual Reality Medical Center, San Diego, California.
The treatment package includes exposure to the feared situation, interoceptive exposure, cognitive restructuring, breathing retraining, and applied relaxation. On average, the duration of the protocol is 12–15 sessions. The protocol involves a mixture of cognitive and behavioral techniques, which are intended to help patients identify and modify their dysfunctional anxiety-related thoughts, beliefs and behavior. Emphasis is placed on reversing the maintaining factors identified in the cognitive and behavioral patterns.

The paper presents a new treatment protocol for PDA, named Experiential-Cognitive Therapy (ECT), that integrates the use of virtual reality (VR) with the traditional multicomponent CBT strategy. Using VR software, it is possible to re-create, with the subject undergoing treatment, a hierarchy of situations corresponding to reality. Particularly, the feeling of actual presence offered by the realistic reproduction of cybernetic environments and by the involvement of all the sensorimotor channels, enables the subject undergoing treatment to live the virtual experience in a more vivid and realistic manner than he could through his own imagination.

The efficacy of the proposed approach is evaluated in a controlled trial.

MATERIALS AND METHODS

The Experiential-Cognitive Therapy protocol

Francesco Vincelli and Giuseppe Riva at the Applied Technology for Neuro-Psychology Lab of Istituto Auxologico Italiano, Verbania, Italy, developed the first version of the ECT protocol for PDA, in cooperation with the Department of Psychology at the Catholic University of Milan, Italy. The actual version includes the efforts of researchers from the Center for Advanced Multimedia Psychotherapy, California School of Professional Psychology, San Diego, from the Department of Psychology, Universite du Quebec a Hull, Canada, and from the Seoul Paik Hospital, Inje University, Seoul, Korea.

The clinical protocol. The goal of ECT is to recondition fear reactions, to modify misinterpretational cognition related to panic symptoms and to reduce anxiety symptoms through the integration of VR experiences and traditional techniques of CBT. The overall treatment is composed of eight sessions and of different booster sessions for 6 months after the therapy (Table 1).

The first goal of session 1 is to discuss with the patient the etiologic model of PDA and to delineate the program of ECT. The description is necessary to obtain an active role of the patient in the therapy.

Then the patient is introduced to VR through the use of a head-mounted display and a joystick. The innovative principle of ECT is to integrate cognitive and behavioral techniques with the experiential possibilities offered by VR. Then the next step of session 1 is to structure the graded exposure procedure to virtual environments: the patient is exposed to each of the four virtual environments, with the minimum level of difficulty (e.g., small number of subjects present in the environments, ready access to the exits, plenty of room in the elevator), and is asked to evaluate the experience on subjective units of distress (SUDs) scale. In this way, the therapist obtains a hierarchy of virtual environments, from the least anxiety provoking to the most, which will be used along the treatment.

After a hierarchy of administration between the environments has been established, the next step is to establish a hierarchy of stimuli within each environment. In the ECT treatment program, the virtual environments—an elevator, a supermarket, a subway ride, and a large square—are designed to reach this goal. In both the supermarket and underground, the increase in difficulty may be obtained by increasing the number of persons present in the environment and by moving at a distance from the exits of the environments. In the square, it is possible to increase the number of people present and to approach narrower spaces that offer fewer ways out. In the lift, it is possible to arrange for the presence of other people and to enlarge or restrict the space inside the lift.

The following step is to show the patient the role of avoidance as the main source of agoraphobic and panic behaviors. The therapist underlines the importance of regular exposure to feared situation and structures with his patient a self-exposure schedule. In vivo graded self-exposure as homework, initially with the co-therapist (when it is possible), is very important to empower the efficacy of the therapy. This step can be more easily approached by graded exposure to virtual reality and produces important advantages for the patient: reducing the number of sessions, reducing dependency on the therapist, and helping to maintain therapeutic achievements.

Each session starts with the review of the homework, to verify the difficulties that have emerged during self-exposure and to reinforce the patient for the tasks that have been carried out. After the graded exposure procedure and after session 2 focused on cognitive assessment assisted through graded exposure to virtual environments, session 3 is based on
cognitive restructuring. In PD cognitive treatment focuses upon correcting misappraisals of bodily sensations as threatening. The cognitive strategies reduce attentional vigilance for symptoms of arousal, level of chronic arousal, and anticipation of the recurrence of panic.

Cognitive treatment starts by reviewing with the patient a recent panic attack and identifying the main negative thoughts associated with the panic sensations. Once patient and therapist concord that the panic attacks involve an interaction between bodily sensations and negative thoughts about the sensa-

**Table 1. The Experiential-Cognitive Therapy Protocol for the Treatment of Panic Disorder with Agoraphobia**

**Session 1**
- Description of the etiologic model of PDA according to cognitive behavioral approach
- Connection between the model and a recent PDA of the patient
- Introduction to Virtual Environments
- Graded exposure to virtual environments and set a hierarchy of the virtual stimulus
- Homework: diary of panic attacks

**Session 2**
- Homework review
- Cognitive assessment assisted through graded exposure to virtual environments
- Introduction and scheduling of *in vivo* self-exposure
- Homework: diary of panic attacks, *in vivo* self-exposure

**Session 3**
- Homework Review
- Cognitive restructuring assisted through graded exposure to virtual environments
- Homework: diary of panic attacks, *in vivo* self-exposure

**Session 4**
- Homework review
- Graded exposure to virtual environments
- Cognitive restructuring face to face
- Homework: panic attacks diary, *in vivo* self-exposure

**Session 5**
- Homework review
- Interoceptive exposure
- Interoceptive exposure assisted through graded exposure to virtual environments
- Homework: *in vivo* interoceptive exposure, panic attacks diary

**Session 6**
- Homework review
- Interoceptive exposure assisted through graded exposure to virtual environments
- Cognitive restructuring face to face
- Homework: *in vivo* interoceptive exposure, diary of panic attacks

**Session 7**
- Homework review
- Interoceptive exposure assisted through graded exposure to virtual environments
- Cognitive restructuring face to face
- Homework: *in vivo* interoceptive exposure, diary of panic attacks

**Session 8**
- Homework review
- Cognitive restructuring and prevention relapse
- Follow-up session schedule
- Retest

**Booster sessions**
- Follow-up after 1 month, 3 months, and 6 months
- Review and reinforcement of patient’s tasks
- Management and prevention of future relapse
tions, a variety of procedures is used to help patients challenge their misinterpretations of the symptoms. Many patients interpret the unexpected nature of their panic attacks as an indication that they are suffering from some physical abnormality. In these cases, a psycho-education program presenting the nature of anxiety can help, especially if it is tailored to patient’s idiosyncratic concerns. One of the prevalent errors in cognitions is overestimation. The panickers are inclined to jump to negative conclusions and to treat negative events as probable whereas they are unlikely to occur. Another type of cognitive error is misinterpreting events as catastrophic. Decatastrophizing means to realize that the occurrences are not as “catastrophic” as stated, which is achieved by contemplating how negative events are managed versus how “bad” they are. This is best done in a Socratic style, so that clients examine the content of their statements and reach alternatives. The cognitive strategies are conducted in conjunction with behavioral technique of graded exposure in virtual reality. The schedule of session 4 is analogous to the one of session 3. The first part is dedicated to graded exposure. The second part is dedicated to the careful inquiry of cognitive distortions and their modification.

The key feature of sessions 5–7 is interoceptive exposure. The theoretical basis for interoceptive exposure is one of fear extinction, given the conceptualization of panic attacks as “conditioned” alarm reactions to particular bodily cues. Since according to the cognitive model panic disorder is considered as a “phobia of internal bodily cues,” the purpose is to modify associations between specific bodily sensations and panic reactions. This technique is also used during the exposure to the virtual environments.

After cognitive restructuring, prevention relapse is an important step of the last session, session 8. In this session, the therapist schedules the self-exposure homework and reinforces the patient for the tasks that have been carried out and for the future tasks.

**VR software.** For its use in ECT, Giuseppe Riva designed the Virtual Environments for Panic Disorders (VEPD) virtual reality system. VEPD is a four-zone virtual environment developed using the Superscape VRT 5.6 toolkit.

The four zones reproduce different potentially fearful situations—an elevator, a supermarket, a subway ride, and large square. In each zone, the therapist, through a setup menu, defines the characteristics of the anxiety-related experience. Specifically, the therapist can define the length of the virtual experience, its end and the number of virtual subjects (from none to a crowd) to be included in the zone.

- **Zone 1:** In this zone, an elevator in which the subject has to enter, the subject becomes acquainted with the proper control device, the head mounted display and the recognition of collisions.
- **Zone 2:** This zone shows a supermarket in which the patient can go for shopping. The subject can pick up objects and pay for them at the cash register.
- **Zone 3:** This zone reproduces a subway ride. The subject is located in the train that moves between different stations.
- **Zone 4:** The last zone is a large square in which are located a medieval church, different buildings, and a pub.

The VEPD software can be freely downloaded at the web site www.cyberpsychology.info/try.htm. It can be used on a standard PC with Pentium IV/ Celeron/Athlon 1.2 GHz or better, 64 MB of RAM or better, graphic card with 32 MB of VRam or better, using Windows 95/98/2000/NT/XP.

**VR hardware.** The VR hardware includes the following:

- **The head mounted display:** Glasstron PLM-A35 developed by Sony Inc., Japan. The Glasstron uses LCD technology (two 0.7 inch active matrix color LCD’s) displaying 180000 pixels (PLM-A35: 800H × 225V) to each eye. Sony has designed its Glasstron so that no optical adjustment at all is needed, aside from tightening two ratchet knobs to adjust for the size of the wearer’s head.
- **The motion gyroscopic tracker:** InterTrax 30 (serial interface; azimuth, ±180 degrees; elevation, ±80 degrees; Refresh rate, 256 Hz; latency time, 38 ± 2 msec)
- **A PC Pentium IV:** 2 Ghz processor, 128 MB Ram and a GeForce 4 Ti 200 graphic card
- **A joystick.**

**The controlled clinical trial**

**Sample.** Participants were recruited from people who requested treatment at the Anxiety Units of both the S. Carlo Hospital and the Niguarda Hospital in Milan, Italy. Eighteen female participants were invited. To participate in the study, subjects had to meet DSM-IV research criteria for anxiety disorders for a minimum of 6 months determined by independent clinicians on clinical interviews.
Individuals were excluded in the following cases: if they were among people with psychotic or bipolar disorders, or among those who show high suicidal risks, or those who are medically ill (i.e., cardiac conduction disease, vestibular dysfunction) and, finally, pregnant women. Twelve participants met the inclusion criteria and took part in the study (mean age, 43.83 ±6.68; range, 35–53 years).

The subjects who satisfied the entry criteria were randomly assigned to one of the three conditions: ECT group, CBT or waiting list control group. The subjects in the ECT group were submitted to the eight-session protocol described above. The subjects in the CBT group were submitted to a standard 12-session protocol, including classical CBT: cognitive restructuring, Socratic style, interoceptive exposure, and imaginative exposure to the feared situations. The therapist involved in both CBT and ECT (the first author of this paper) is a chartered psychotherapist with a 4-year degree in CBT.

People on medication were not allowed to modify the prescribed dosage during the treatment. Before starting the trial, the nature of the treatment was explained to the patients, and their written informed consent was obtained.

**Assessment.** Independent assessment clinicians who were not involved in the direct clinical care of any subject assessed subjects. They were M.A.-level psychologists or Ph.D.-level psychotherapists. For the clinical interview, they used a semi-structured interview with the aim of identifying relevant DSM IV diagnostic criteria in the subjects. All the subjects were assessed at pretreatment and upon completion of the clinical trial. The following psychometric tests were administered at each assessment point:

- **BDI-II—Beck Depression Inventory:** the BDD-II consists of 21 items to assess the intensity of depression in clinical and normal patients. Each item is a list of four statements arranged in increasing severity about a particular symptom of depression.
- **STAI—State-Trait Anxiety Inventory for Adults:** The State-Trait Anxiety Inventory for Adults (STAI-A) is comprised of 40 multiple choice questions used for measuring anxiety in adults. This scale differentiates between the temporary condition of “state anxiety” and the more general and long-standing quality of “trait anxiety.”
- **ACQ—Agoraphobic Cognitions Questionnaire:** The Agoraphobic Cognitions Questionnaire consists of 14 items, which may be scored as a total scale or according to its two subscales: Loss of Control and Physical Concerns. Each of the subscales consists of seven items.
  - **FQ—Fear Questionnaire:** The Fear Questionnaire consists of 20 items surveying a wide range of reasonably common sources of disturbed reactions. Most items consist of phrases with 2–6 words evaluated on a five-point Likert scale: 0 (Not at all) to 4 (Very much).

During the assessment, the following were also used:

- Subjective measurements (self reports, diaries)
- Subjective units of distress (SUDs) during exposure to virtual environments. In particular, SUDs were taken at baseline, after 10 min, and after 20 min.

**Statistical analysis.** Given the limited size of the sample, we decided to use three non-parametric test: the Wilcoxon Mann-Whitney Test, the Wilcoxon Signed Ranks Test, and the Kruskal-Wallis test.

The Wilcoxon Mann-Whitney Test is one of the most powerful of the non-parametric tests for comparing two populations. It is used to test the null hypothesis that two populations have identical distribution functions against the alternative hypothesis that the two distribution functions differ only with respect to location (median), if at all.

The Wilcoxon Signed Ranks Test is designed to test a hypothesis about the location (median) of a population distribution. It often involves the use of matched pairs, for example, before and after data, in which case it tests for a median difference of zero. The Wilcoxon Signed Ranks test does not require the assumption that the population is normally distributed.

The Kruskal-Wallis test is a non-parametric test used to compare three or more samples. It is used to test the null hypothesis that all populations have identical distribution functions against the alternative hypothesis that at least two of the samples differ only with respect to location (median), if at all.

**RESULTS**

**Pre-treatment tests**

No differences were found between the waiting list condition and the treatment conditions at pre-treatment in demographic and clinical variables: age, duration of the fear, and level of perceived impairment.
Moreover, the Kruskal-Wallis tests showed no significant discrepancies among the three groups for the scales included in the assessment protocol.

Pre-post treatment tests

The Wilcoxon Signed Ranks test showed significant differences in the BDI-II, STAI and FQ scores in the ECT and CBT group between pre- and post-measurements (Table 2). In particular, both sample reported a general improvement in both the level of depression and anxiety. Specifically, both state and trait anxiety was lower after the treatment. No differences were detected in the waiting list group.

Then we used the Wilcoxon Mann-Whitney Test to verify any significant difference between ECT and CBT groups. The tests have not reported any difference.

Clinically significant improvement

All the participants in the ECT and CBT group achieved a clinically significant improvement using strict criteria. In particular, the number of panic attacks after the therapy in both cases decreased to zero (Table 2).

None of the participants in the waiting list group showed clinically significant improvement on the post-test.

Drop-out

None of the participants refused treatment, and none of them dropped out of the study.

Simulation sickness

None of the subjects who entered the ECT treatment experienced simulation sickness during the treatment.

CONCLUSION

One of the needed parameters in assessing the effectiveness of therapies is the ratio existing between the “cost” of administration of the therapeutic procedure and the resulting “benefits” [11]. By cost it is meant the expenditure not only in terms of money and time, but also in terms of emotional involvement by the person to whom the therapy is directed. The benefits regard the effectiveness of the treatment, that is, the achievement of the target set, in the shortest time possible. Exposure therapy traditionally is carried out “in imagination” or “in vivo.” In the first case, the subject is trained to produce the anxiety-provoking stimuli through mental images; in the second case, the subject actually experiences these stimuli in semi-structured situations. Both methods present advantages and limitations regarding the cost-benefit ratio. In the first

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Significant Differences between the Three Samples (Pre-Post Analysis)</th>
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<tbody>
<tr>
<td></td>
<td>Waiting list</td>
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<tr>
<td>Panic attacks</td>
<td></td>
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<tr>
<td>Pre</td>
<td>1.75 ± 0.50</td>
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<tr>
<td>Post</td>
<td>1.75 ± 0.50</td>
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<tr>
<td>BDI-II scores</td>
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<tr>
<td>Pre</td>
<td>23.00 ± 0.16</td>
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<tr>
<td>Post</td>
<td>23.75 ± 1.50</td>
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<tr>
<td>State anxiety scores</td>
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<tr>
<td>Pre</td>
<td>48.75 ± 2.20</td>
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<tr>
<td>Post</td>
<td>49.00 ± 3.16</td>
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<tr>
<td>Trait anxiety scores</td>
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<tr>
<td>Pre</td>
<td>47.75 ± 1.71</td>
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<tr>
<td>Post</td>
<td>47.75 ± 3.50</td>
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<tr>
<td>FQ scores</td>
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<tr>
<td>Pre</td>
<td>46.50 (5.00)</td>
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<tr>
<td>Post</td>
<td>48.00 (5.60)</td>
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</tbody>
</table>

*The pre-post scores were significantly different (p < 0.05—Wilcoxon Signed-Rank Test).
case, the prevalent difficulty is represented by teaching the subject to produce the images that regard experiences associated with anxiety: most failures linked to this therapy are those subjects who present particular difficulties in visualizing scenes of real life. The cost of the application, however, is minimal, because the therapy is administered in the physician’s office, thus avoiding situations that might be embarrassing for the patient and safeguarding his privacy. In the second case, the difficulty lies in structuring, in reality, experiences regarding the hierarchically ordered anxiety-provoking stimuli, so the cost in terms of time, money and emotions is high. Then, the advantage of contending with real contexts augments the likelihood of effectiveness of the “in vivo” procedure.

In this paper, we proposed a new approach—ECT—that integrates VR experiences with the traditional CBT. The feeling of actual presence offered by the realistic reproduction of cybernetic environments and by the involvement of all the sensorimotor channels enables the subject undergoing treatment to live the virtual experience in a more vivid and realistic manner than he could through his own imagination. Moreover, VR constitutes a highly flexible tool, which makes it possible to program an enormous variety of procedures of intervention on psychological distress. The possibility of structuring a large amount of controlled stimuli and, simultaneously, of monitoring the possible responses generated by the user of the program offers a considerable increase in the likelihood of therapeutic effectiveness, as compared to traditional procedures.

In the proposed method, we decided to integrate the experience of the virtual environments with the techniques included in the CBT approach because they showed high levels of efficacy. Through virtual environments we can gradually expose the patient to feared situation: virtual reality consent to re-create in our clinical office a real experiential world. The patient faces the feared stimuli in a context that is nearer to reality than imagination. Other significant advantages are the supervised exposure to agoraphobic situations and the possible boost to the effectiveness of cognitive restructuring by practicing it in anxiety-inducing situations.

The result of this controlled studies showed that ECT—like CBT—was able after the treatment to significantly reduce the number of panic attacks, the level of depression, and both state and trait anxiety. Yet, ECT obtained these results using 33% fewer sessions than CBT (eight vs. 12). This datum suggests that ECT could be better than CBT in relation to the “cost of administration,” justifying the added use of VR equipment in the treatment of panic disorders.

Despite these findings we would like to address some of the limitations of our study. First, the sample was carefully selected, but relatively small. Studies with larger samples are needed. Second, we did not include a follow-up assessment (e.g., 6 months later).

In conclusion, the present study demonstrated that the exposure to the VR environments included in ECT elicited strong psychological responses. The anxiety and depression levels associated to these responses decreased with exposure and with repetition of exposures. In addition, ECT was faster than CBT in reducing panic attacks as well as anxiety and depression scores. We conclude that VR—added to traditional CBT—offers a new and promising approach for the treatment of PD and presumably also for other phobias and anxiety disorders.

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Address reprint requests to:
Francesco Vincelli, Ph.D.
Laboratorio Sperimentale di Ricerche Psicologiche
Istituto Auxologico Italian
Casella Postale 1
28900, Verbania, Italy
E-mail: fvincelli@hotmail.com