

## The effect of virtual reality on cognitive-behavioral therapies: a case study of social phobia

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### Abstract:

The present study aims to investigate the effectiveness of virtual reality confrontation in cognitive behavioural therapy in an adult with social phobia. In this regard, we conducted a case study with a social phobia disorder. The case has 12 treatment sessions, in which she was exposed to social situations designed in virtual reality. This application is compatible with our environment and contains characters who speak the Algerian dialect.

The treatment period consisted of three phases: the diagnostic phase, the treatment phase, and the follow-up phase.

After analysing the test results and their interpretation, we concluded that the treatment program that benefited the case had a positive effect on the symptoms of the disorder, especially social anxiety and confrontation with strangers.

**Keywords:** *Cognitive Behavioural Therapy; Virtual reality; Social phobia; Diagnostic; Evaluation*

### المخلص:

تهدف الدراسة الحالية إلى التعرف على فعالية المواجهة بالواقع الافتراضي في العلاج المعرفي السلوكي لدى الراشد المصاب بالرهاب الاجتماعي. ففي هذا الصدد قمنا بدراسة حالة تعاني من اضطراب الرهاب الاجتماعي، شخّصت على أساس معايير التشخيص للدليل الإحصائي للاضطرابات النفسية والعقلية DSM-IV. خضعت الحالة لـ 12 حصة علاجية تم من خلالها تعريضها لمواقف اجتماعية مصممة في

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## The effect of virtual reality on cognitive-behavioral therapies: a case study of social phobia

الواقع الافتراضي واستعمال تقنيات خاصة بالعلاج المعرفي. استعمالنا في دراستنا تطبيق خاص بالواقع الافتراضي، يتمشى مع بيئتنا ويحتوي شخصيات تتكلم باللهجة الجزائرية. يهدف هذا الأخير الى تسهيل عملية المواجهة.

فبعد تحليل نتائج الاختبارات وتفسيرها، تبين ان نسبة القلق الاجتماعي انخفضت بشكل ملحوظ في اختبار الرهاب الاجتماعي. استنتجنا بان البرنامج العلاجي الذي استفادت منه الحالة كان له تأثير ايجابي على اعراض الاضطراب خاصة القلق الاجتماعي ومواجهة الاشخاص الغرباء.

**الكلمات المفتاحية:** الرهاب الاجتماعي، التشخيص، العلاج المعرفي السلوكي، التقييم، الواقع الافتراضي.

### 1. INTRODUCTION

The social anxiety is among the most common psychological disorders, nearly 2% of people report feeling symptoms of social anxiety (Lépine: 1975, p 82 ), it affects their daily life especially social and professional relations.

The social anxiety is also called social phobia in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM).

In this context, we dealt with the therapy of social phobia disorder and to what extent the cognitive behavioural therapy is effective, namely the virtual reality therapy role in diminishing social phobia symptoms as he studied the case of social phobia after undergoing the virtual reality therapy. Virtual reality treatment is based on cognitive behavioural therapy theories which aim to approach and treat mental disorders.

Our study deals with assessing the effectiveness of virtual reality therapy in order to lessen the social phobia symptoms such as avoiding social situations and the feel of fear during interactions with others.

Has exposure method in the virtual reality therapy a positive effect on the treatment of social phobia disorder?

We do the hypothesis that « Exposure » method has a positive effect in virtual reality therapy as it lessens the social phobia disorder.

The importance of the study lies in proposing a cognitive behavioural therapy program based on principles set on the ground on a virtual reality following the same steps and conditions in real life.

We present in this article a first part which concerns the review of the literature, then the second part concerns the presentation of the clinical case with all the steps taken during therapy, and finally a third part to discuss the results obtained.

## **2.Theoretical aspect**

### **2.1. Cognitive Behavioural Therapy**

Cognitive Behavioural Therapy is linked to many other domains mainly: clinical psychology, developmental psychology, cognitive psychology, educational psychology and psychopathology. The discipline approaches the incentives that lead to responses as well as different mechanisms contributing in the development of normal or pathological behaviours.

Cognitive Behavioural Therapy is related to anxiety such as : generalised anxiety, social anxiety, specific phobia, panic attack, obsessive-compulsive disorder, post-traumatic stress disorder, depression and behavioural eating disorder.

Many definitions were given to Behavioural therapy; it is psychological treatment methods, which aim to transform acquired pathological behaviour into a behaviour that adjusts the social environment by means of incentives with exposure to negative stimuli. (Tribolet: 2006, p 64).

However, Cognitive therapy focuses on a complementary approach of the behavioural therapy; it is a short-term therapy relying on the evaluation of the situation by the prognostic regarding the surrounding situation. This technique takes into account different interactions between the individual and external factors including: ideas, self-dialogue and mental images. (Tribolet: 2006, p 59).

Cognitive Behavioural Therapy is used with adolescents and adults; and according to (Cottraux: 2008, p 67), this therapy is performed on three levels: the behavioural level, the cognitive level and the reaction level. The researcher thinks that behavioural patterns and cognitive processes are not the only levels of the therapy for they both interact with the reaction and the emotions; and these levels are related to environmental factors experienced by the individual.

Each individual is affected by environmental changes and alterations subsequent to living conditions, which may create psychological and social problems. Everyone experiences psychological stress related to family, society and work life at different levels.

### **2.2. Virtual reality therapy**

Virtual reality therapy is a modern and an entertaining technology relying on computer programs, which enable to interact with the situation without experiencing any embarrassment. (Rissine Leart: 2006). The virtual reality may change according to the user as he is given the chance to move from one place into another, the main purpose consist of training the patient to live integrating situations through behavior and cognitive stimuli in a digital environment created for definite purposes.

## **The effect of virtual reality on cognitive-behavioral therapies: a case study of social phobia**

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Over the past few years, virtual reality therapy has been used to treat a range of psychological disorders such as specific phobia and obsessive-compulsive disorder. However, studies conducted on social anxiety diverge according to the treatment motive and purpose.

Anderson and his associates (2005) have undertaken a comparative study between the effectiveness of exposure in virtual reality and exposure in pure reality for people suffering from social anxiety. The study found out one factor, which is speaking in public, 79 individuals-women in majority were divided into three groups: the first group confronted a real situation (8 sessions), the second group confronted a virtual reality and the third group was put on a waiting list. The results have shown significant improvement in the first and second groups in comparison with people put on a waiting list. There were no significant difference between confronting virtual reality and pure reality.

Terms most commonly used in Cognitive Behavioural Therapy are:

**Exposure :** it is used to treat anxiety such as : generalised anxiety, social anxiety and specific phobia, the patient confronts his fear in order to help him react positively with this kind of situation.

Grazianiet Eraldi-Gackiere (2007) both define exposure as a method which allows identifying those situations at the origin of the fear in order to decrease anxiety according to given rules.

**Virtual exposure :** it is most commonly used in cognitive behavioral therapy as Woolpe (1975) was the first to propose this method based on reciprocal inhibition which consists in the capacity of creating virtual situations related to the anxiety stimuli as the key to overcoming fear and anxiety is by « degrees ».

**Exposure in reality:** it is to encourage the patient to create a direct link with the stimuli gradually in order to get used to different situations and lessen fear and anxiety symptoms.

Marks (1987) is among the first researchers who used this treatment by confronting reality on patients suffering from anxiety, depression and sexual disorders.

**Exposure in virtual reality:** it involves creating a virtual situation by using specially programmed computers through which the individual confronts situations causing anxiety by using special headset, glasses and sensors reacting to movements.

This technique was inspired from digitally programmes with visual immersion devices and artificially created environments and may have two forms: either by using screens headphones, and a position monitor that shifts the visual scene to

match the patient's head movements or glasses allowing the view of the virtual reality situation. The term virtual reality is used in games videos and movies and was integrated in other domains including: medicine, psychopathology and psychiatry.

### **3. Practical aspect**

In this study, we used the clinical methodology which aims at the recognition and the nomination of the states, aptitudes, and behaviors in order to evaluate a therapeutic program.

The clinical case was selected from a liberal psychiatrist and the diagnosis was made according to the standards of the DSMIV.

#### **3.1. Description of the clinical case**

Mr “M” was seen for fear and constant anxiety, he declares that he is not an ordinary man and he is different from the others, he is always isolated and avoids interacting with the others. Mr “M” says that he finds difficulties in his job; he works in an administration and experiences many problems because he avoids his colleagues.

Mr “M” has one brother and one sister older than him, his mother died, he leaves with his father and mother-in-law, and he finds difficulties to communicate with people he does not know. Since his mother died when he was in his twenties, he had difficulties to get along with his family and especially his mother-in-law.

The first interview has revealed that Mr “M” suffers from social anxiety, which he developed in the last five years. Mr “M” was shy since his childhood, he had a strict upbringing, he qualifies his father as being “violent and easily angered”; he has to lower his voice and his eyes when addressing his father.

He quitted his job five years ago and started to be isolated and avoided to interact with his environment, he is alone most of the time.

Mr “M” saw the doctor when the disorder started and felt better after taking the medicine Paroxetine but gave it up for financial reasons and since then, his condition deteriorated significantly.

#### **3.2. Functional analysis**

Functional analysis is used with the SECCA grid (Situations, Emotions, Cognitions, Behaviors, Anticipation) presented by J. Cottraux (1998), it allows the junction between two parts: Diachrony and Synchrony.

##### **Diachrony**

Background: the strict education and his authoritarian father contributed in the psychological fragility of Mr “M”.

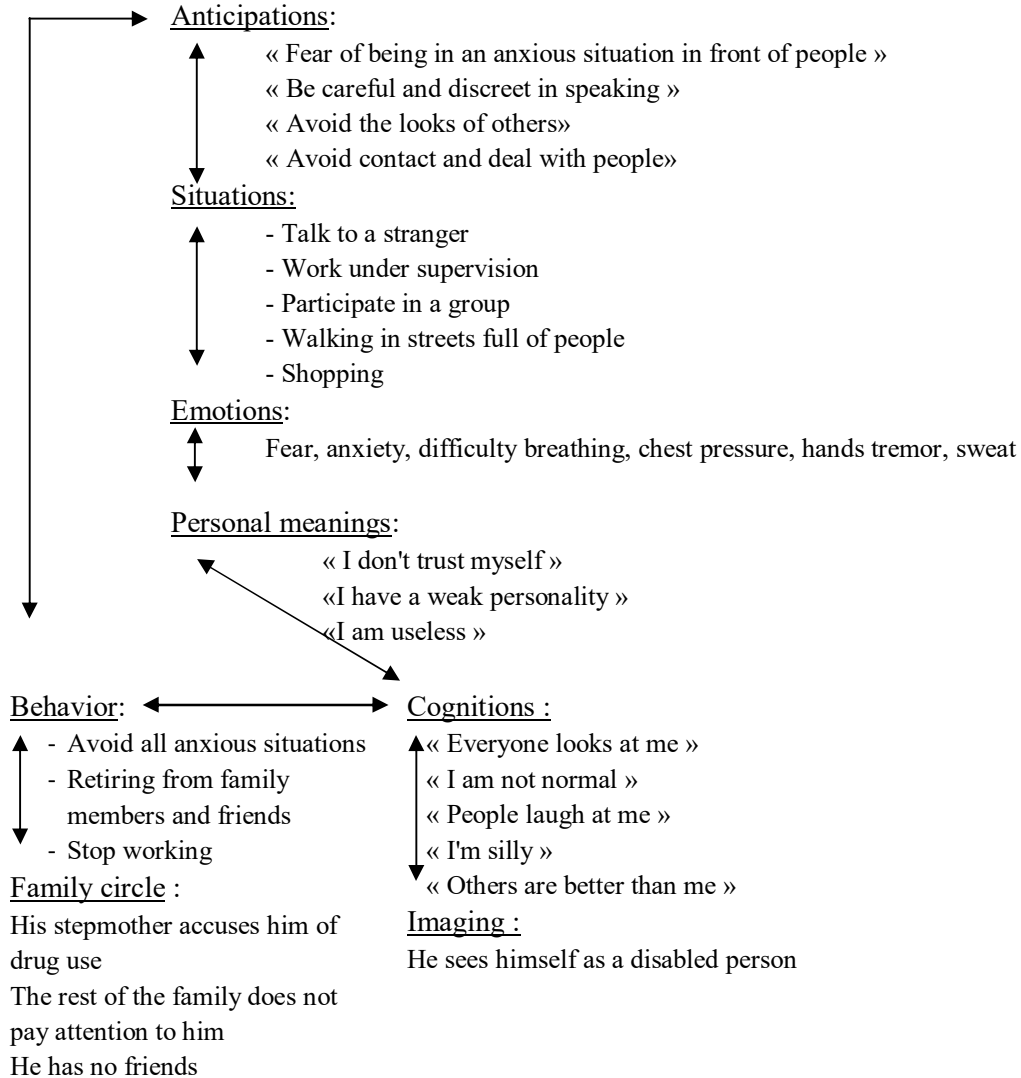
Main stimuli factors: the mother’s death (terminal cancer) for she was Mr “M”’s sole support.

## The effect of virtual reality on cognitive-behavioral therapies: a case study of social phobia

Other factors: his mother-in-law accused him of abusing substances, which led to conflict with his father and the rest of his family.

Personal and family medical history: None

### Synchrony



### 3.3. Means of evaluation

Methods used before, during and after the treatment period to assess the severity of disorders:

- Beck inventory for depression (Beck A.T (1979)): to search for symptoms of depression
- Fear Questionnaire (Marks I.M, Mathews A.M (1979)) : to assess some of the most common phobias

- Liebowitz Social Anxiety Scale (Liebowitz M. R. (1987)) : to assess the severity of social phobia

#### **Methods used during the treatment period**

- Subjective scale to measuring the level of anxiety severity in the context of social situations, on a scale from 0 to 100

#### **3.4. Treatment**

Mr “M” could not stand social disorder although his medication during after the last 5 months of his therapy sessions, he finds it difficult to go outside and have social interactions.

A specialist had explained the treatment of social anxiety by virtual reality therapy and had proposed 10 sessions. The first session consists of informing and explaining social disorder and its treatment; the other sessions were dedicated to understanding the virtual reality and the different cognitive techniques (8 sessions) and the last session was meant to assess and develop the results obtained after one-month treatment.

#### **Therapeutic purposes**

Therapeutic purposes were set with Mr “M” for he wants to be free to interact with the others and to go outside without fear or anxiety; he wants to have a job as he finds difficulties to find a stable, permanent employment.

#### **Used techniques**

Mr “M” attended ten therapy sessions during which:

A virtual reality was used: a bank offering many situations, which allow the patient to make visits, move, talk to people he does not know and do activities under other’s scrutiny.

#### People represented in the virtual reality:

- The receiving office employee
- A client in the waiting room
- A bank employee

When the patient enters the bank, he is oriented to the receiving office with a lighted panel.

#### Some cognitive techniques were used:

- Explaining social disorder
- Cognitive reconstructing
- Solving Socrates’ problems during the virtual reality treatment

In addition to the assessment of assignments between sessions.

#### **Analysis of the results**

- 1- Fear Questionnaire: The score obtained through the fear of Marks form was passed from 36 degrees before treatment to 28 degrees, after four

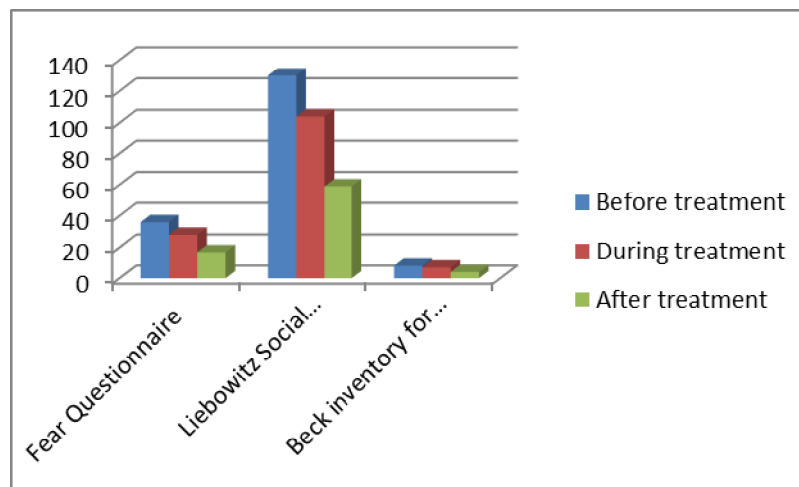
## The effect of virtual reality on cognitive-behavioral therapies: a case study of social phobia

treatment sessions. The end-treatment result was recorded in the post-treatment period score of 17 (Fig. 1).

- 2- Liebowitz Social Anxiety Scale : The questionnaire recorded a change at the level of the final score, as the case got a total of 130 degrees before treatment (anxiety: 69, avoidance: 61), then 104 degrees (anxiety: 36, avoidance: 48) during the treatment, to reach 59 degrees after the end of treatment (anxiety : 34, avoidance: 25) (Fig.1).
- 3- Beck inventory for depression: By applying the Beck depression scale, the researcher scored an 8th before the treatment, 7 during the treatment, then it decreased to 4 at the end of the treatment period (Fig.1).

**Figure 1**

*Test results before, during and after therapy*



#### 4. Discussion of results

Social disorder causes major problems on personal, relational, social and professional levels, Cognitive Behavioural Therapy is considered among the main proposed means of treatment of social phobia.

This study aims at assessing the effectiveness of a cognitive behavioural treatment programme based on exposure method in virtual reality on a patient suffering from social phobia.

To do so, two evaluations were undertaken: pre-assessment (before treatment) and post –assessment (after treatment) by measuring different changes at the level of anxiety, social phobia and depression symptoms if found in the case.

The results showed changes in the level of anxiety and social avoidance measured by the Liebowitz scale as the degree of anxiety moved from 69 points



before treatment to 34 points after the treatment, which implies a significant diminishing in the anxiety symptoms that the patient was experiencing.

These results converge with Anderson's study (2005) which proved the effectiveness of virtual reality in the treatment of social anxiety.

Thus, the degree of social anxiety lowered thanks to treatment by exposure in virtual reality; Mr "M" expresses now his feelings easily. His behaviour has changed and he is able to leave his home for shopping, he can have small talks with people he does not know without any fear or anxiety; he is also capable of confronting situations that used to cause him extreme fear and panic.

At the moment, Mr "M" is looking for a new job that will encourage him to interact with others.

Regarding social avoidance, we have noticed that it lessened from 48 points before treatment to 25 points after the treatment.

Furthermore, we have evaluated depression symptoms that may come with social disorder by using Beck Scale, we did not find any results since the case obtained 8 points before treatment by exposure to virtual reality and 7 points after treatment which indicates the absence of depression symptoms that come with social phobia; this proves the effectiveness of antidepressants.

## 5. Conclusion

Cognitive Behavioural Therapy is considered among the most modern treatment of numerous disorders namely: depression, obsessive-compulsive disorder, post-traumatic stress disorder, generalised anxiety and social anxiety.

The method of Exposure in reality, virtually and virtual reality is the most prominent technique in Cognitive Behavioural Therapy, many computers programmes were elaborated lately and were based on the virtual reality method adapted to patients suffering from specific phobia and social anxiety.

To do so, we conducted a study of a patient suffering from social anxiety that attended 12 therapy sessions and confronted social situations created in a virtual reality.

We came up with the conclusion that the therapy undertaken by the patient had a positive effect on disorder symptoms especially social anxiety and confronting strangers. Consequently, the patient should follow spaced sessions to avoid regression and acquired positive behaviour.

Finally, this study should be applied on other patients experiencing the same disorder in order to come up with a therapeutic model to be generalised.

## The effect of virtual reality on cognitive-behavioral therapies: a case study of social phobia

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