

Virtual Reality Exposure Therapy in Patients with Obsessive-Compulsive Disorder

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Abstract— Virtual reality (VR) is a novel method that can be used for achieving symptom provocation in OCD in a controlled environment. In the current project, we aim to validate a virtual reality exposure therapy (VRET) as a tool for provoking symptoms in people with OCD. We developed a virtual environment in which different kinds of OCD-specific items typical for home setting are displayed. We used dimensional approach to create specific tasks for patients suffering from symptoms of the following domains: “contamination/cleaning”, “symmetry/ordering” and “fear-of-harm/checking”. We hypothesize that the degree of anxiety and tendency to perform compulsive behavior in people with OCD would be different from that of matched healthy controls. Specifically, we are interested in how would the symptoms change over time if the patient is repeatedly exposed to these OCD-provocative tasks and scenarios.

Keywords—*obsessive-compulsive disorder, virtual reality, exposure therapy, dimensional model*

I. INTRODUCTION

Obsessive-compulsive disorder (OCD) is defined by the presence of obsessions, compulsions, or both. Obsessions are intrusive recurrent and persistent thoughts, images or urges; compulsions are defined by repetitive behaviors (e.g., washing, checking, arranging things in a specific way) or mental acts (e.g., counting, repeating formulas). These are often performed as a way of preventing obsessive thoughts or making them disappear [1] and temporarily reduce anxiety.

OCD symptoms (OCS) induce personal distress, take up a lot of time and can strongly interfere with the person's work or social and personal life. OCD is often chronic, relapsing illness. The symptoms are very heterogeneous; two individuals with OCD can suffer from completely non-overlapping symptoms. A dimensional approach [2] to OCS is one way how to describe and organize this heterogeneity. That is important not only for research but mainly for clinical

practice. The research is still ongoing, but the most often reported OCD dimensions are “contamination/cleaning”, “symmetry/ordering”, “fear-of-harm/checking” and “hoarding” (however, hoarding disorder was established as a distinct diagnosis in DSM-V).

The most common treatment for OCD is a combination of cognitive-behavioral therapy (CBT) and antidepressant medication. Specifically, exposure and response prevention (E/RP) seems to be very useful for treating OCD. This involves a person that is deliberately and voluntarily exposed to the stimuli that triggers the obsessive thoughts (exposure) and that is taught techniques how to avoid performing the compulsive rituals (response prevention).

It is very important to choose the situation that corresponds as much as possible with the situations from patient life that triggers symptoms the most. VR exposure therapy (VRET) seems to be a good alternative to in vivo (standard) exposure. In VRET, the person is immersed in a virtual environment whose characteristics confront him/her with a feared situation or stimuli. Often, it is easier, economical and safer to access these stimuli in virtual environment than in real life. There is already evidence showing that VRET is effective for treating anxiety disorders such as different types of phobia or PTSD (for a review, see [3]). Some studies have examined and subsequently supported the ability of VR environment to provoke anxiety and OCS in patients with OCD relative to healthy controls [4, 5, 6]. However, to our knowledge there are no studies assessing the efficacy of VRET in reduction of OCS.

II. METHOD

A. Apparatuses

The HTC Vive head-mounted display is used for immersing the participant into the VR experience, providing accurate tracking of the person's head and hand movements. The participant uses a teleporter to move through the virtual

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house. The view on the screen is a first-person perspective with participant seeing virtual hands instead of controllers he is holding.

B. Experimental Design & Procedure

In the current research, we aim to validate VR environment that is designed specifically to provoke OCS typical for home setting. In order to overcome the problem of symptoms heterogeneity, we designed VR environment in concordance with dimensional model of OCS. Specifically, we incorporated OCD-specific items and scenarios with corresponding subtasks from three of the above listed dimensions “contamination/cleaning” (C), “symmetry/ordering” (S) and “fear-of-harm/checking” (CH) into the virtual environment. The VR scenario was created by psychologists, psychiatrists and VR designers by using Unity engine (<https://unity3d.com/>). VR scenario displays a family house (with bedroom, kitchen etc.) The participant can explore the house freely or can perform certain tasks corresponding with specific symptom dimension (see Table I.). All activities have direct effect on the environment (e.g., touching dirty surface results in dirty hands, walking into the house without cleaning the shoes first results in leaving footprints). Distinct dimensions often tend to occur together, therefore the therapist can choose more than one dimension.

The sample will consist of 40 OCD patients (age 18-55) and a smaller sample of healthy controls (recruited only for the single-session validation study). After giving informed written consent, the specific exposure elements for every patient will be determined during the first session according to his/her symptomatology and used for the remaining sessions. The study will consist of 7 approximately 60-minutes long sessions (one per week) during patients' treatment in the Inpatient Ward or at the Day Care Center that will be combined with standard CBT techniques. The patient will be guided by a therapist or a virtual voice to perform certain task (e.g., turning on a gas, handling a raw meat) without performing corresponding compulsion (e.g., repetitive checking, washing hands). Each action can be repeated until the anxiety decreases or disappears just as during standard exposure therapy. Other outcome measures will include the variables related to the specific symptom domain. For example, for the symptom dimension „fear-of-harm/checking“ the number of checking compulsions and checking time in VR environment will be used. After the first and the last session, all participants will be asked to fill in the questionnaires assessing the sense of presence (Slater-Usoh-Steed Presence Questionnaire) and simulator sickness (SSQ). During each session, participants will fill in the questionnaires assessing subjective anxiety (Spielberger State-Trait Anxiety Inventory; STAI-6) and tendency to perform compulsions provoked by exposure scenario (Visual Analogue Scale). Once a week, the severity of OC symptoms will be assessed (The Yale–Brown Obsessive Compulsive Scale; Y-BOCS) by the psychiatrist.

We hypothesize that 1) the degree of anxiety and tendency to perform compulsive behavior in people with OCD would be higher than those of matched healthy controls and that 2) there will be a positive correlation between perceived anxiety and rated sense of presence. We also hypothesize that 3) OCD

subjects will exhibit a decrease in anxiety and compulsions tendency after 7 sessions compared to the patients undergoing standard treatment only.

TABLE I. EXAMPLES OF OBSESSIONS (O) AND COMPULSIONS (C) FROM OUR VR HOME

	Symptom Dimension		
	C	CH	S
O	contamination by germs and diseases	harming yourself and others	disorderliness
C	washing hands, wearing gloves, vacuuming	checking plugs, doors, hiding sharp objects	straightening and ordering objects

III. CONCLUSION

In this project, we aim to develop and validate a virtual reality exposure therapy (VRET) as a tool for symptoms provocation in OCD patients. We will present the example scenarios and preliminary data as a poster presentation at the conference.



Fig. 1. Screenshot illustrating situations within the virtual home corresponding with dimensions “contamination/cleaning” and „fear-of-harm“.

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