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APPLICATION OF VIRTUAL COMPUTER TECHNOLOGIES IN PSYCHOTHERAPY: REVIEW OF RESEARCHES

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Abstract

The article examines the experience of using virtual computer technologies in psychotherapeutic help. Theoretical basis for the study of understanding of virtual reality is pointed out. Features of application of virtual computer technologies aimed at aiding people with behavior disorders, psychological rehabilitation and also at psychological correction of the consequences of traumatic stress are shown. The potential of using virtual computer technologies as a means of emotional states treatment of a person is described.

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Keywords: virtual computer technologies, psychotherapy, traumatic stress, interactive virtual psycho-informational complex.

Introduction.

Global informatization of society has led to rapid development and active use of virtual computer technologies (VCT) in almost all areas of people life. Today the terms "virtual", "virtual reality", "virtual environment", "virtual society", "virtual technologies" are frequently used in education, communication, professional activity, inclusion, rehabilitation and therapy processes. Using sensory organs, virtual reality (VR) allows the user to interact with the virtual environment. Wherein both a copy of the real world and an environment that is not available for the user in reality can be presented in virtual reality. Scientific studies of using VR are carried out both in Russia and abroad [1, 2, 3]. Issues relating to determination of opportunities and restrictions of using VCT to provide population with psychotherapeutic help and psychological support are important.

Virtual reality is an environment that has been artificially created by computer means. The user can transform VR or observe the transformation and experience realistic feelings. The idea of virtual reality was used even in scholasticism. However, extensive research in science and technologies began in the second half of the twentieth century. The issue of virtual reality was dealt with by such scientists as: Heilig M., Lem S., Kruger M., Tsuzue K., Sutherland A., Gibson W., Engelbart D., Nosov N.A., Yuxhvid A.V., Zinchenko A.Yu., Voyskunsky A.E., etc. The term "virtual reality" was introduced in the area of computer technologies by Lanier G. (1985). Virtual reality researches began with studies of opportunities of virtual environments. Thus, the term "virtual reality" and VCT were created by philosophers, writers, cyberneticians, programmers, sociologists and psychologists.

Modern virtual computer technologies are considered to be the most promising, integral, eco-friendly and effective means of improving people's quality of life. Specialists emphasize the advantages of VCT compared with traditional methods of science and practice: the ability to control the virtual environment and user's attention, the possibility to create VR with the specified parameters, provision of feedback to the user [1], [4].

The world practice shows the active application of virtual technologies in medicine and, in particular, in psychotherapeutic practice. In Russia virtual technologies are less frequently used, despite the results of experiments, that show their positive impact on

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people's quality of life (Selisskaya M.A., 2004; Voyskunsky A.E., Menshikova G.Ya., 2008; Zinchenko Yu.P., 2013, etc.). Among the people that need such help we should highlight the unemployed, disabled people, old people, people with psychological traumas. Particular emphasis should be placed on people who experienced traumatic stress in result of difficult life situations. Traumatization may result in behavior disorders, psychosomatic diseases, addictions, in other words, it may significantly harm the mental health of the victim. Measures to further develop means of VR and to apply them in practice of social psychological help are necessary to ensure the availability of VCT for specified people.

Theoretical basis of virtual reality research.

The idea of virtual reality was born in the second half of the twentieth century. Originally, the term "virtual", i.e. "possible, seeming" was used in quantum physics to explain so called virtual particles [5; 103]. Virtual particles are elementary particles that are impossible to detect, but without them it is impossible to explain the observed phenomena; they simultaneously do exist and don't exist. The described properties of the particles are also true for the virtual reality.

The matter of virtual reality is multi-faceted as it is actually a reflection of the physical world on the one hand and it enshrines everything that is impossible in the physical world on the other. Use of the VR means significantly widens the opportunities of the physical world.

VR suggests the immersion of a person in an artificial, illusive world via the computer (in this case the computer is a tool). The effect is achieved thanks to VRs following features:

1. The actuality of existence. There is neither past nor future for a person in a virtual reality. He exists "here and now" and is sharply focused on the current events;
2. Events inclusion. A human is an activist. He participates in the current events according to his inner feelings;
3. Vision of what is happening from own visual perspective. A person sees virtual events from his visual angle;
4. Objects reproduction. Virtual objects are produced by the actual interaction, including the interaction of a person with other persons or a computer;
5. Interpenetration of dream and reality borders. The events of virtual reality are subjectively perceived as real [6].

One can travel to VR using the computer means. As a result, a person is distracted from his daily problems, he becomes a direct participant and a director of the world which he created.

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The effectiveness of the impact of VR on a person is due to motivational, emotional, psychophysical and technical factors. Among them the most interesting are the following:

- phenomenon of "unfinished action", which motivates the user and facilitates his immersion in the virtual environment;
- change of emotional and physical state of the with the assistance of VCT;
- Technical characteristics of VR means. Appeal of VCT is due to the effect of presence.

According to the definition, "the effect of presence is a complex psychosocial phenomenon, that is occurring during the interaction a person with some reality, that is different from usual reality or the reality of presence" [7; 38]. The complex of technical means that is used for activization of memories and the user emotions stimulation, allows him to immerse himself in a constructed, illusive world

"Flow experience" is one of the phenomena that facilitate the immersion in virtual reality. It is a special state of preoccupation (Csikszentmihalyi M., 1990) [8; 78]. Flow experience has the following characteristics: the requirements of the task are perceived as appropriate to the skills; the subject is experiencing the feeling of control over his actions and environment; the requirements for the actions are clear, there is a fast feedback; the focused attention is achieved without the subject's efforts; subject feels the merge of his actions and awareness, and also self-forgetfulness. Heckhausen H. (1986) believes that the flow experience includes intensive positive emotions and it is valuable for the subject. Thank to this, the activity that has flow experience becomes internally motivated [9]. This, in turn, provides change of individual psychological features of the person.

Thus, the mechanisms of interaction of real and virtual aspects of individual's functioning are complementary. They allow the person to experience the effect of actual participation in events and create the opportunity for individual changes. These opportunities are used by scientists in education, rehabilitation, psychological counselling, psychological correction, etc. The effect of immersion in a virtual reality depends on both technical characteristics of equipment and individual psychological characteristics of the user, his emotional and physical states. Qualified specialist's support for impact of VR on the individual will result in the effectiveness of VCT application.

Application of VR in psychotherapy.

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Despite the effectiveness of using virtual computer technologies, they are still not a widespread means of assistance and support (including psychological) for people in need. Citizens who are in crisis situations are of greatest concern. According to specialists, the most vulnerable categories of population, in terms of risk of formation of traumatic stress and emergence of its adverse somatic and mental consequences, are socially unprotected population (lonely elderly people, orphans, migrants, emigrants, disabled people), large single-parent families, mentally and(or) somatically ill citizens [10], [11].

Saving mental health of the population is a priority for modern Russia [12]. According to the recommendations of the World Health Organization health sector reforms and state policy are aimed at development of methods focused on improving mental health of the population. Psychologists and psychiatrists believe that the number of people in need of psychological help increases every day [13]. Along with neurotic disorders and depressions there are social stress diseases, that are etymologically linked with unexpected crisis changes of life conditions. Therapy problems, prevention and correction of stress consequences attract the most attention as it a frequently met modern phenomenon [14]. Particular importance is attached to the problem of traumatic stress [15]. Rapid social economic changes, transformation of geopolitical situation, natural and man-made disasters, criminal incidents, physical and psychological abuse on the personality, starvation, long periods of stress, - this is a far from complete list of causes that can lead to mental traumatization of an individual. Traumatic stress is accompanied by emotional, behavioral and somatic expressions that can provoke the formation of neurotic disorders, psychogenic neurotic states, heavy neurosis, etc. According to the data of the World Health Organization (2003), spread of such forms of mental illnesses in population can become the cause of reduced quality of life and increased social economic costs at a state level.

VCT can become a means of psychological and psychotherapeutic help for people suffering from traumatic stress. Currently the efficiency of using the systems of virtual reality for helping people with phobic and panic disorders, patients with eating disorders, for psychological rehabilitation of individuals suffering from alcoholism, smoking and drug use, and also for psychological correction of consequences of posttraumatic stress, is proven [1, 16, 17, 18]. The efficiency of using VCT in cognitive-behavioral therapy to treat less severe disorders, such as monophobia, is being studied. VR is also used in therapy of wide range of anxiety disorders, eating

disorders, posttraumatic stress disorders, deep depression caused by pathological bereavement [19]. A significant number of articles that show the results of experimental, analytical studies and meta-analysis in this area, is published [20, 21, 22]. Let us examine in detail the results of these studies.

Using VR to diagnose and correct the body image in women suffering from eating disorders.

Virtual environment is successfully used in assessment and therapy of the negative perception of the body in women with eating disorders. (Aimé A., Cotton K., Guitard T., Bouchard S., 2012). The studies were started in the late 1990s. Riva G. (1997) and Perpiñá C. (2003) were using a computer program in treating of dissatisfaction of patients with their own bodies to fixate the changes of body's perception in them [23].

Aimé A., Cotton K., Guitard T., Bouchard S. (2012) were using virtual environments of various types for assessment and treatment of negative perception of the body image and eating disorders. Virtual environments act as a tool that allows to perceive constructive information about the body and to differentiate cognitive and affective perception of the real body. For example, a patient that considered herself to be too big or too fat was asked to choose a specific character with body parameters that would meet the patient's perception of her own body. Then a character was assigned with a task - to go through a narrow door. In result the patient got the facts indicating the inaccuracy of perception of her body image. It contributed to the formation of much more realistic body image [24].

Riva G. was studying the impact of VR on the efficiency of treatment of body image perception disorders. Both clinical and non-clinical samples participated in the experiment. Clinical sample was presented by patients with eating disorders. Experimental Cognitive Treatment (ECT) was in the basis of the treatment program. The main idea of this method was to change the perception of their own body in patients (Riva G., Bacchetta M., Cesa G., 2003) [24]. VR was used to challenge the idea that body and overweight perceptions were assumptions in reality. Virtual Environment for Body Image Modification 2 (VEBIM 2) was used to achieve this goal [24]. The study results show the significance of virtual means for stimulation of strong emotional reactions in patients with eating disorders.

Thus, VR can be used as an additional means to cognitive-behavioral therapy for diagnosis and therapy of patients with eating disorders. In terms of impact, VR is comparable to situations of real

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life as it may cause anxiety, and it is often more preferred than real traumatizing experience.

Virtual reality as a means of phobia therapy.

According to statistics, about 5% of the world population are suffering from phobic anxiety disorders. Not always the traditional methods of psychotherapy lead to expected results. VCT are successfully used as an additional means of therapy.

Rothbaum B.O., Hodges L.F., Kooper R. (1995) studied the features of using virtual computer technologies for treating patients with acrophobia [25]. The patients were placed in a virtual reality that had pedestrian bridges, exterior balconies and an elevator. In result such parameters of the patients as anxiety, avoidance, attitude and distress were improved.

In the experiment of Emmelkamp P.L., Bruynzel M. and others (2001), that was dedicated to study of using VR means in acrophobia treatment, therapeutic sessions were held along with the impact of virtual environment. It turned out, that correction of attitude towards tall buildings with help of virtual environment is more effective than with help of only traditional methods [26].

In the research, conducted by Botella C., Baños R.M., Perpiña C. (1998) the efficiency of using virtual reality for treatment of claustrophobic patients was studied. Virtual environment included the "house" and the "elevator", and each of them was used with various scenarios: presence or absence of windows, closed or opened doors and walls that can move and limit the space. The results of the study showed decreased anxiety and improved indicators of the behavioral avoidance test. The results were also confirmed after the next identical study [26].

The impact of virtual reality on the distress symptoms.

Schneider S.M. and Workman M.L. (1999) were studying the possibilities of using VR as a means of alleviation of distress symptoms, caused by chemotherapy in 10- to 17 year old children [27].

Commercially available smartphone with headphones was used as an equipment for the study. The image with appropriate sound was projected on the smartphone. The computer mouse was also used.

The research showed that VR had provided an effective distraction, that was technically simple in use. 82% of probationers noted that chemotherapy combined with virtual reality had better result than the previous treatment. No probationer noted that VR contributed to the deterioration of health. All probationers said that they liked the use of VR and that they would like to use the

equipment during the next chemotherapy sessions. Thus, the results have confirmed the hypothesis that distraction eases the distress symptoms. This research was one of the first with assumption that use of VR may have positive clinical results [27].

Using VR for posttraumatic stress disorder treatment.

Virtual reality is used for treatment of people, who experienced traumatic stress: former combatants, victims of the terrorist attacks and others. Difede J. and Hoffman H.G. (2002) have described the result of psychological therapy of a patient that survived the explosion in the World Trade Center in the USA [28]. The researchers assumed that the immersion in memories of traumatic event using the image exposure therapy in company of an experienced therapist may result in decrease of symptoms of posttraumatic stress disorder. The effect helps the patient to process and get used to memories and strong emotions, associated with the traumatic event: memories and emotions that they were avoiding. But many patients do not wish or cannot independently generate and experience traumatic emotional images. Thus, Difede J. and Hoffman H.G. had sought to find means that would ease the therapeutic process and make it more efficient. In their study they have described the treatment of a victim with acute symptoms of posttraumatic stress disorder, that survived the explosion in the World Trade Center during an attack on 11 September 2001 [28].

Therapy combined with use of VR proved to be efficient: there was reduction of acute symptoms of posttraumatic stress disorder. Depression and symptoms of posttraumatic stress disorder were diagnosed via the Beck Depression Inventory and the Clinician Administered PTSD Scale. There was a significant reduction of indicators of depression (83%) and symptoms of PTSD (90%) after the therapy using the virtual reality.

Analysis of a clinical case showed that the therapy with use of virtual reality is a promising new means of treatment of acute symptoms of posttraumatic stress disorder. In treating PTSD, virtual computer technologies can be useful to patients that are not able to tell about their traumatic experiences. Many sensory signals that can be demonstrated with use of VCT provide the immersion of patients in the process of therapy, they stimulate the effect of presence that can ease the processing of traumatic experience [28].

Gerardi M., Rothbaum B.O., Ressler K. (2008) have described the treatment of veterans of Iraq war with PTSD. The therapy included components of psychological education, relaxation and cognitive analysis. During the treatment the indicators of Clinician Administered PTSD Scale decreased by 56%. Reliable

changes were registered by the results of Clinician Administered PTSD Scale and by the results of self-evaluation reports [26].

The research results show that the impact of VR as an additional means of psychotherapy is effective in helping patients with various problems. The illusion of presence in the virtual world has a therapeutic meaning for the emotional processing of traumatic memories. Use of VR has a number of benefits which include eco-friendliness, easy application, humanity, easy control over the impact of stimuli, effectiveness in much shorter, in comparison with the real conditions, time. VR is not an invasive method. Simplicity of installation, use, maintenance and consistent improvement of technologies - these are the benefits of using VR as an additional means of helping patients.

In addition to opportunities that use of VR provides in therapeutic help, there are restrictions of use of VCT. First, we should note the expensiveness of equipment that is necessary for holding sessions with use of VR. Second, the therapist that uses VCT during the session should be technically ready to work with the equipment. Third, sole use of VCT in sessions with patients who experienced mental trauma, does not provide the opportunity to analyze traumatic experience. Fourth, the range of sensory stimuli that are used in the virtual environment is limited by technical capacity of equipment. Thus, it is impossible to consider all the details of sensory simulation to cause traumatic experiences for their further analysis [29].

Some specialists (researches and practicing therapists) believe that use of virtual environments in treatment of PTSD and panic disorder can lead to undesirable consequences and contribute not to healing but to aggravation of disease [30]. Thus, it is necessary to continue the work on the analysis of the possible negative effects of using VR technologies in treatment of specified disorders and to exercise caution in planning of therapeutic interventions for patients of this nosological group. A significant success can be achieved only in case of well thought-out approach to using VR means in treatment of patients with panic disorders and PTSD.

VCT as a means of treatment of adverse emotional states of an individual.

Currently the issue of increasing the efficiency of psychological correction of adverse emotional states caused by traumatic stress is topical and significant in terms of improving the quality of life of population of Russia. With this goal we believe it is possible to create a virtual computer technology that will help an individual to learn to control his psycho-emotional state and use it as

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an additional non-invasive means of therapy. Interactive virtual psycho-informational complex is one of the components of the technology. It can be used during the psychological correction and rehabilitation sessions in joint work of a psychologist (psychotherapist) and a patient. Independent use of the complex by a patient is also allowed.

Compactness of the equipment, absence of pain sensation, interactivity, dynamism of the education process should all be noted as advantages of the complex. A user will be able to choose some characteristics of the complex independently (interface features, sound options, choice of music, image, etc.) The complex will contribute to regulation of psycho-emotional state of an individual without the use of pharmaceutical products and will not form an addiction. Such physiological parameters as heart rate and respiratory rate will be diagnosed before and after the relaxation session, which will allow to track the user's well-being and to document changes of physiological parameters for their further correction.

Modules will operate in an education mode: a user gets instructions and clarifications for performing psychological correctional techniques. Correctness of performing the exercises is controlled by a program.

A user is offered a collection of modules, that imply learning of the respiratory self-regulation, muscular and emotional relaxation. 3D technologies are used to achieve the state that is significant for the therapy result. Audio-visual sequences are used as an additional means of relaxation. The individual can further use obtained skills without help of virtual computer technologies.

Thus, the use of interactive virtual psycho-informational complex will allow to correct adverse psycho-emotional states in people in need of therapeutic help and to simplify the process of psychosocial adaptation.

Conclusions

1. The modern level of development of virtual computer technologies allows us to use them to improve the quality of life of the population. Efficiency of the impact of VCT on an individual is due to motivational, emotional and psycho-physiological factors. Thanks to technical means, an individual is experiencing virtual reality events "here and now". This contributes to the individual-psychological changes of the user.

2. The use of VCT provides significant help to people experiencing consequences of traumatic stress and difficulties in psycho-social adaptation. Combination of traditional methods of

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psychotherapy and VCT is eco-friendly, humane, it contributes to achieve the results in a short time and to save the obtained effect for a long period of time.

3. The use of the described interactive virtual psycho-informational complex will contribute to improved efficiency of psychological correction of emotional states caused by traumatic stress.

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