THE APPLICATION OF PERSONALIZED AVATARS IN THE TREATMENT OF PHOBIAS USING VIRTUAL REALITY

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Abstract: *The paper will present the possibilities of modern methods of treating various forms of phobia using virtual reality applications. Special emphasis will be placed on the treatment of public speech phobia and helping people who have discomfort during public appearances, presentations, giving interviews, etc. One of the approaches is that these situations are leveled from the most desirable to the least pleasant in order to persons passing through the treatment get relaxed and reduce tension. Leveling these situations can be achieved by using personalized avatars that are close to those who are subjected to a treatment, so that the environment completely varies from all known people who are present in the audience, to completely unknown persons. It is also possible to level the situation using facial expressions in the form of approval or indignation during public speaking.*

Key words: *personalized avatars, phobias, virtual reality, public speaking*

1. INTRODUCTION

According to Merriam Webster Dictionary [1], virtual reality can be defined as: "An artificial environment which is experienced through sensory stimuli (such as sights and sounds) provided by a computer and in which one's actions partially determine what happens in the environment".

For over two decades, virtual reality technology has been used in various industry branches [2].

The rapid development of this technology has enabled experts in various fields to deploy it in a way which enabled them to approach certain information which were unavailable in the past. Preclusive data from a nonclinical sample supports the usage of VR exposure versus in vivo exposure [3].

The usage of VR technology has lately found its place in psychology in the treatment of phobias. Therapists can now use it while conducting treatment session with their patients. By being able to customize it to the needs of different patients, psychologists can approach them in a personalized way which will be most appropriate to their needs in accordance to the extent to which phobia is expressed. One of the suitable alternatives to common in vivo exposure might be computer supported way of patients' exposure. This type of therapy has been proven to be more effective than those based on imaginary exposure, particularly in the treatment of special phobias [4]. Some researches indicate that exposure therapy is the most effective one regarding the reducement of negative symptoms [5]. VRET (virtual reality exposure therapy) is a new gadget for conducting psychological treatments. During patients' imbursement in a VE (virtual environment), they can gradually be exposed to specific feared stimuli within a contextually relevant setting, since it uses real time computer graphics, visual displays, body tracking devices and other sensory input instruments to immense an individual in a computer – generated virtual environment [6] [7].

Several case studies have demonstrated the effectiveness of exposure therapy brought by VR. These were related to the fear of flying [8], fear of heights [9], claustrophobia [10], fear of spiders [11] and fear of going outside and being in public places [12]. Besides these, VRT (virtual reality treatment) has also been used in treating the fear of public speaking. Researches, conducted indicate that this technique has positive results in reducing the fear of public speaking [13]. According to Lee et al., [14] there are two relevant techniques used to create a virtual reality system for the treatment of this kind of phobia: model-based and movie-based technique. The main disadvantage of the first one is the quality of the audiences' creation and unnatural motions, while the other one uses a movie file shot with actual audiences, but the main disadvantage is the fact that virtual audiences cannot be controlled individually, since all virtual audiences are included in one movie file.

Figure 1.clearly depicts possibilities provided by VR based applications. Besides leisure, it is noticeable that it can indeed be deployed in medical purposes with wide range of usage with special emphasis on phobias treatment.
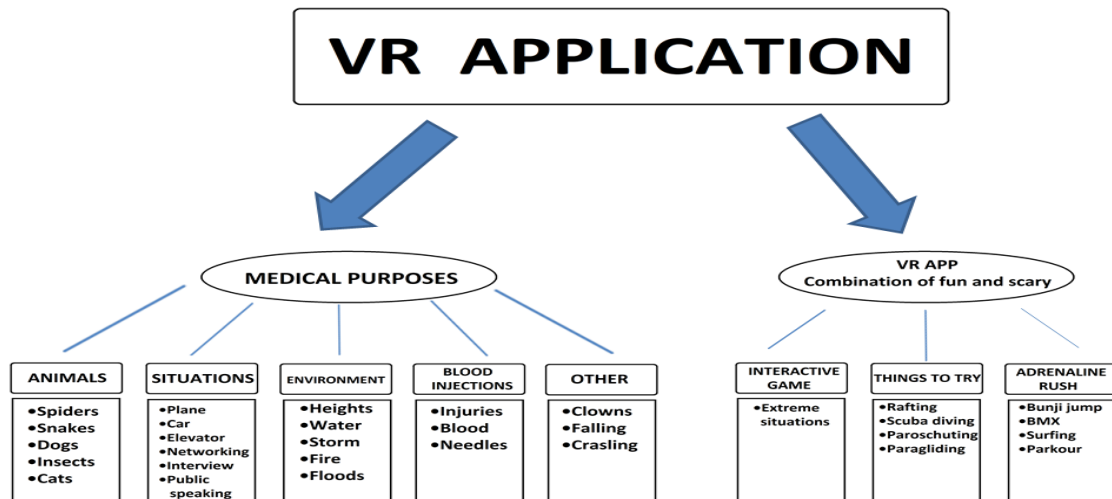
Fig. 1. *Possibilities for applications usage*

2. USAGE OF VR TECHNOLOGY IN PUBLIC SPEAKING PHOBIA TREATMENTS APPLICATIONS

PSA (Public Speaking Anxiety) is one of the most common phobias. This phobia often leads to big difficulties related to workplace, school and social life, and often results in drug and alcohol abuse by those individuals and their endurance for self – help. Individuals who are suffering from these issues have tendency to overestimate the threat of public judgment, scrutiny, or embarrassment. Negative and disordered images of how others see them are also quite common for these individuals [15]. The idea behind usage of VR for conducting therapies related to phobias is to cause certain fears that can be handled by therapists. During an exposure session, therapists usually ask their patients about the anxiety level that they are experiencing, often using the SUD (Subjective Unit of Discomfort) scale [16]. It is a scale from zero ("no anxiety at all") to 10 ("the highest level of anxiety that you can imagine") which measures the subjective intensity or level of anxiety the individual is experiencing. Controlled studies to this date have shown that VRET (Virtual Reality Exposure Therapy) may be an effective exposure delivery way for treating social phobias [17]. When struggling with phobia of public speaking, the VRET technique has been created in order to develop virtual environments that simulate the common settings where public speaking is demanded (e.g. classrooms, meeting rooms, public places etc.). This kind of environment is populated with human avatars that serve as social element of the environment, acting as a virtual audience for the participant while in virtual environment. Participants' usual task is to give a short speech in front of the avatars [18]. For instance, putting an individual with a fear of public speaking in a virtual classroom or meeting room, may cause the same effects in the individual's brain as truly being there in reality, giving the therapist an opportunity to help bring the fear to a controllable level [19]. The research carried out by Slater et al., [20] show that people do respond to these avatars in a way similar to their behavior in real life situations – that an extremely negative audience can provoke stress in almost anyone, no matter the individuals' confidence. The results also indicate that people response to the static or positive audience, were positively and significantly associated with their public speaking stress measured before their exposure in virtual environment.

2.1. Overview of the existing applications

Since the fear of public speaking is one of the most frequent phobias, many different approaches and applications have been developed so far, as a helping device for healing this and other disorders. Two most popular applications used for practicing and overcoming the fear of public speech are **Virtual Speech**[21] and **Virtual Orator**[22]. Virtual Speech application, offers its users multiple situations and environments in which certain indi-vidual is forced to give a speech or to interact with other people. It provides different courses such as:

- Public Speaking
- Job Interview Preparation
- Business Networking
- Mindfulness Meditation
- Sales Training
- Learn English for Business
- Train the Trainer

VR is good alternative to in vivo exposure that facilitates generalization further than the specific situations treated [23]. Examples of virtual environments [24], which are used in VR applications such as virtual meeting room (Fig.2), virtual conference room (Fig.3),classroom (Fig. 4), small theater lecture (Fig. 5), charity event (Fig. 6) and formal conference room (Fig. 7) are shown further in the text.

Fig. 2.*Meeting Room* [21]

Fig. 3.*Conference Room* [21]

Fig. 4. *Classroom* [21]

Besides these, it also offers its users with features such as ability to use their own slides as part of preparation for upcoming events, with realistic sounds and visual distractions and the possibility to track their progress by unlocking awards, speech tracking and recording.

On the other hand, Virtual Orator, comes up with its own features and environments aiming to help its users to overcome the aforementioned disorders and to prepare them for upcoming events and situations.

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Fig. 5. *Small theater lecture* [22]

Fig. 6. *Charity event* [22]

Fig. 7. *Formal Conference Room* [22]

Both of previously mentioned applications operate both on Android and iOS platforms. In order to be used, these applications require Head Mounted Display (HMD) also known as VR head set. These two include realistic audience or avatars, so the situation simulation can be more natural for the users. The user interact with the audience, as they ask questions which can be set in the right moment to the speaker.

2.2. The importance of personal avatars

VR technology provides new ways of interactions between humans and computers in which users take active place within a computer-generated three-dimensional virtual world [25]. For instance, the process of treating phobia of public speaking, a virtual environment would include the usage of synthetic avatars, which are showing various characteristics which can cause different unpleasant symptoms [26]. In accordance with their phobia, patients are introduced to the main stimulus of their fear in a 3D high fidelity, Virtual environment in which they can move and interact with objects and avatars around them (Fig. 8).

Fig. 8.Business Networking[22]

The biggest amount of experimental systems related to social phobia is concentrated around the fear of public speaking [27]. In these cases users are asked to give a speech in front of a certain number of human avatars in

order to prepare themselves for upcoming meetings, presentations or job interviews.

Technology required for creating inhabited virtual environment (IVE) is highly complex and diverse, since multiple different tools are used such as [28]:

- Real time engine;
- Computer graphics;
- Character animation;
- Artificial intelligence;
- Support for immersion and iteration.

From the perspective of the design, the creation of 3D human models should be focused of minimum mesh complexity, small size of textures and carefully defined mesh of deformation data. The creation of every model requires a lot of time and excellent expertise, but on hand of the management of texture variety in the rendering module, designers can produce different appearances such as skin tone and clothing to each mesh [28].

The usage of personalized avatars, which will be used within the application itself, implies the creation of familiar faces for every patient. This way, patients can give speeches in front of familiar faces, unfamiliar faces, and in front of mixed audience. Therefore, the process of overcoming this specific fear can be controlled and channeled in accordance with patients' level of fear or anxiety experienced in these situations. By introducing personalized avatars instead of solely generic avatars, patients might feel less pressure and less stressed when having someone they can recognize in the audience. This option can certainly help a lot in the healing process due to different approaches deployed in treatment sessions.

3. STRUCTURE OF VR APPLICATION FOR PHOBIA HEALING

Platform itself will induce different elements needed in order to start preparation or healing process of a certain individual. These aspects are related to different:

- Occurrences – lecture, job interview and business idea pitch;
- Environments – amphitheater, conference room and office within which different conditions will be present which are related to lighting and space capacity;
- People – young (up to 25 years of age), middle (up to 50 years of age) and older (older than 50 years of age);
- Environmental influences – auditorium reactions and its structure in terms of their reactions to individuals speech and whether certain individual recognizes them or not;
- Topics – familiar, relatively familiar and unfamiliar.

Previously developed, morphological matrix (Fig. 9) shows which are the key variables which are likely to be combined in order to simulate certain conditions. It was developed in order to visually present multiple factors which have to be included in order to simulate and produce wanted reaction of the patient.

Aforementioned segments which are supposed to be created as a part of the platform represent the most common daily struggles which people who suffer from this phobia are likely to face.

Based on these elements, various situations in different environments can be simulated according to the patients' needs. This way, the process of preparation for a certain situation or overcoming of phobia can be carried out more efficiently.
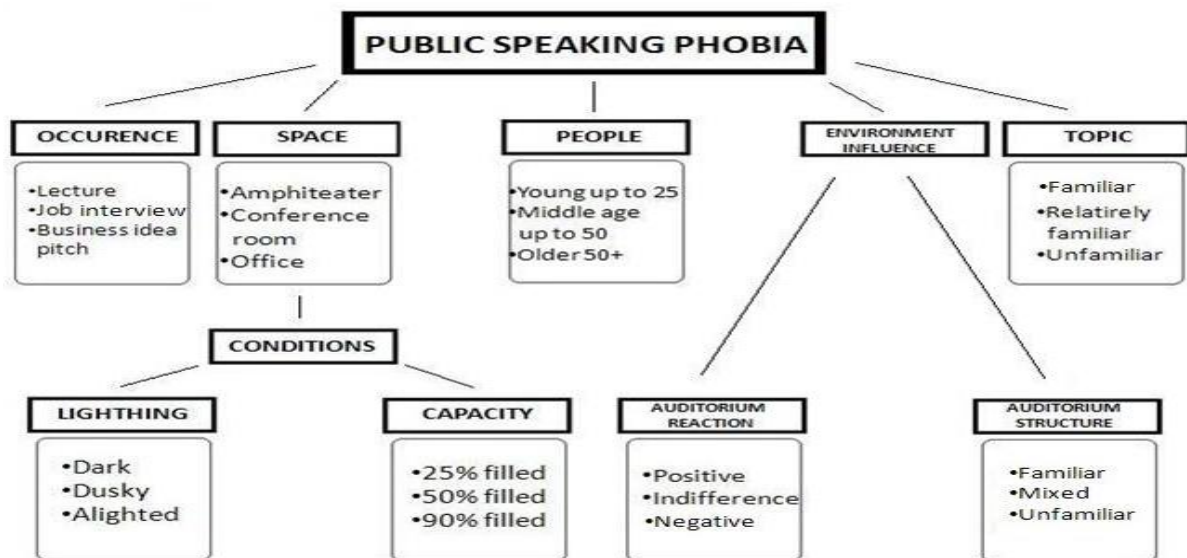

Fig. 9. Morphological matrix of the VR solution

By putting different elements together while conducting a therapy, therapists will be able to scale and level these elements in accordance to the patients' current state and progress. This will allow them to create different levels and grade them in a way which will be the most beneficial for the patients' needs. As

healing sessions forward, different variables will be included in order to evaluate patients' progress and to decide whether to introduce other segments into the platform. Based on these projections and results, further steps in the treatment process can be undertaken as the part of the healing process which will result in minimization of anxiety levels when certain individual is exposed to the uncomfortable situations.

In order to simulate realistic conditions as much as possible, avatars, both familiar and unfamiliar will be able to ask questions during patients' presentation. This presents one of the platforms' key features. With them asking questions the situation and overall conditions will be simulated much better. According to the wanted reactions avatars' behavior will be programmed so it can stimulate different emotions of the patient who will be speaking about certain topic, which will also be programmed in accordance to the patients' potential needs or current state. In this way preparation for both expected and unexpected situations is much more likely to be successful since sometimes it is not possible to plan some occurrences. By doing so, it will be possible to evoke positive feelings experienced in the therapy when certain individual finds itself in an unpleasant situation.

To make this process even easier for the patients, the platform will provide them with the potential answers and presentations in order to handle situation better. This means, that carefully programmed set of answers and presentation previously designed by the patient will be given to them as a helping tool, which they will be able to use while simultaneously going through the healing and preparation process for the upcoming events. With these options featured within the platform, pre experiencing certain situations will help them to handle their emotions much better and face their fears before having to face them in the reality. In this way their adaptability process to certain situations and occurrences will be shorten and based on already experienced events and emotions during the therapy.

4. DISCUSSION

The potential that this technology brings is enormous, and so the possibilities and opportunities to be used in the future are. By developing and customizing the platform for every patient, the healing process can be organized to be much faster than in traditional therapy sessions based on the process of imagination. This approach based on high technology will allow therapists and patients to access certain feelings and emotions, which would potentially be harder to reach without this type of treatments. With technology advancing further every day and with huge investments being laid into this medical branch, it is possible to create this type of platform without big issues. In this sense, personification stands out as the main competitive advantage which comes along with platforms' development. With personalized avatars deployed in healing process, treatments can be made more efficient in terms of overcoming aforementioned

fear of public speech. With familiar faces present in the audience, patients can potentially experience lower amounts of stress and negative feeling related to their fear of performing publicly in various environments and situations. With that being said, the mixture of familiar and unfamiliar faces in virtual environment setting is more beneficial in comparison to generic avatars deployment in therapies. Emotions expressed by both types of avatars used within the application, different settings and environments will serve therapists to create healing sessions with patients in accordance with the extent of the certain fear. By gradually leveling patients' healing, therapists will lead them through series of levels in order for them to overcome their fear of public speaking. That way, fear can be controlled and minimized to aconsiderable scale.

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