Virtual Reality Training in Aid of Communication Apprehension in Classroom Environments

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Abstract—The major goal of this study was to observe the effectiveness of Virtual Reality Training (VRT) in assisting students who suffer from Communication Apprehension (CA). CA seems to be prevalent throughout a large portion of the human population. Apparently, this study has only a few precedents and can be considered a novel step in treatment of CA. Thirty undergraduate volunteer students enrolled at a university in Georgia participated in this study. A virtual auditorium scene for CA training was created. Virtual Auditorium was a simulation of a 48 foot wide, 100 foot long, and 55 foot high auditorium with three sections of chairs that accommodated over 100 spectators. The virtual auditorium program was designed to allow the audience to enter the auditorium one at a time, then by five at a time until the whole auditorium was filled. Also, several audio clips were used to react to and create a desired effect upon the participant. The audio clips included making comments, encouraging the participant to speak louder, ignoring the participant, laughing, holding conversations with others, and clapping hands at the beginning or end of the entire session. An amplifier was used in conjunction with the virtual reality software in order for the participant to hear the echo of their own voice. A Subjective Units of Disturbance (SUD) scale was used for all five sessions to measure the participant's anxiety level. SUD scale ranged from 0 (no anxiety) to 10 (panic-level anxiety). Sessions lasted approximately 40 to 45 minutes. After analyzing the data, the result of this research showed VRT to be effective at reducing CA anxiety. While there was fluctuation in the standard deviation of data, meaning participants responded the VRT at different rates, the average level of anxiety reported during the post-test was significantly less than that of the pre-test. The participants reported experiencing the same symptoms during VRT sessions just as they would experience in a real situation. The symptoms were dry mouth, nervousness, dizzy eyes, sweating, shaking, and increased heart rate. The results indicated that VRT may be an effective method in reducing CA anxiety in participants. In general, VRT was shown to decrease CA anxiety symptoms and increase self-confidence in participants, and also allowed them to get involved in discussions and presentations more frequently.

Index Terms—Communication Apprehension, Virtual Reality Training, Public Speaking.

I. INTRODUCTION

"We live in a physical world whose properties we have come to know well through long familiarity. We sense an involvement with this physical world which gives us the ability to predict its properties well" [26].

This quote describes how we interact with our environment on a daily basis and how we expect for our reactions to be reciprocated by the environment. So what if we are able to replicate these expectations in a different setting than what our senses lead us to believe?

Virtual reality is a technology that enables users to enter a world generated by a computer and allows them to interact with it through sight, sound, and touch [13]. This is but one of a myriad of definitions for virtual reality. In actuality, the meaning of virtual reality is based primarily on one's own perspective, distinctive requirements, and the technology used. But, for the purpose of this study, the above definition will suffice.

As previously stated, though virtual reality can have many factors contributing to its interpretation, there is still one underlying principle present in all of it's applications—the use of a generated environment to give the impression that what is being experienced is, in fact; a real, physical setting. So let's find out how we can put this "mind trickery" to work.

This research is a study and continuation of the positive effect of VRT to aid people who are suffering from CA. Our major focus of VRT is to replicate the usual physical situation that causes anxiety in order to help the participant reduce his or her fear [15,16].

A. Communication Apprehension

Communication Apprehension (CA) is a fear of communication with another person or people [2,8,11,12]. What a person thinks of others as well as him or herself is the basis for CA. The negative effects of what a person thinks are the result of the causes of CA [4]. Furthermore, Gerow introduces and elaborates on attribution theory. Attribution theory is what we conclude when we try to explain the sources of behavior, for example, the behavior of ourselves and the audience. There are two types of attributions: (I) Internal attribution; and (II) External attribution.

Internal attribution is explaining a behavior in terms of our character. Basically, it means explaining one's behavior in the sense of the way we do things. During public speaking, what results in an ineffective presentation is when a speaker's voice is lowered; he or she tends to think the audience will hear him. When there is a reply (from the audience) that says, "I can't hear you," it is

perceived as mockery. External attribution is explaining behavior in terms of an outside character. What make most students nervous are the questions that arise in their minds: "Will they like my presentation?" "Did I dress well?" "Will I give a bad presentation?" Holbrook [8] named seven factors that cause CA:

- low intellectual skills
- speech skill deficiencies
- voluntary social introversion
- social alienation
- communication anxiety
- low social self-esteem
- ethnic/cultural divergence in communication norms

The consequences of communication apprehension can deteriorate student's social skills and also destabilize his or her interpersonal relationships. Communication apprehension simply causes fear of public speaking. Some symptoms of fear of public speaking are dizziness, dry mouth, and rapid heart rate, just list a few. In addition, being nervous could cause a person to look incompetent and frequently limits professional opportunities and denies success to many people [3].

B. Virtual Reality Training

There is a significant body of successful prior virtual reality research in the treatment many psychological disorders. Researchers have suggested its use for illnesses as varied as posttraumatic stress disorder, eating disorders, ADHD and autism [7,17,18.25]. Overwhelmingly, however, VRT's most successful field is in the treatment of phobias such as arachnophobia (spiders), aviaphobia/ aviophobia (flying), acrophobia (heights), and agoraphobia (open spaces) [12,20,21,23,24]. This study is based on earlier research that suggests Virtual reality training (VRT) can not only test but neutralize the consequences of communication apprehension [13,20]. Most people can be nervous to the extent of stammering. James et al. [9] cited that fear of public speaking affects 75% of all people.

It is important to know that VRT is different from traditional methods of training in that it offers a variety of remedial situations in diverse environments. VRT is focused on reducing anxiety reported by a participant with the exposure to the fear-inducing stimulus in an environment conducive to providing strategies to cope with these self-reported phobias [15]. VRT is a more cost-effective and less dangerous method of reproducing real-live situations without physically re-enacting them or simply imagining it [22]. The technology used in VRT is versatile and can be employed in a variety of settings and uses, such as interaction in the workplace, social facilitation/inhibition (which prefers to performance enhancement, of a simple or well learned task, and performance impairment of a complex or novel task, when attempted in the presence of others), and enhancement of interview skills [10,21,27].

C. Research Problems and Significance of the Study

Can virtual reality training ease communication apprehension? When participants are immersed into the virtual reality environment, will they feel the same fear they feel in the real world? The significance of this study is to show that virtual reality is better for solving CA in all aspects of social interaction.

II. METHODOLOGY

The methodology for conducting this study has followed past studies in the field of VRT treatment of public speaking. The sample size, though still small, has been improved over past studies, the virtual auditorium environment has loosely followed the success of earlier studies conducted by North et al. [14] and Harris, Kemmerling, and North [6]. The gradated severity of sessions is a useful tool in any cognitive-behavioral therapy for anxiety disorders [20].

A. Participants

The participants were 30 undergraduate volunteers between the ages of 18 and 31 enrolled in a freshman level course at a University in Georgia. Participation in this study was on volunteer basis. All participants completed an informed consent. Previous studies on the fear of public speaking in particular have included smaller sample sizes; North et al. [14] included 16 participants, Anderson, Rothbaum and Hodges [1] included two in-depth case studies, and Harris, Kemmerling, and North [6] performed a study with 14 subjects. It was our hope that any expansion of the sample size would be beneficial to achieving more useful results.

B. Selection and screening of study participants

Stage I - A set of questionnaires were used in this stage aimed at removing participants with panic conditions and other specific disorders such as substance disorders, major medical illnesses including thyroid disease, and use of medication with significant psychotropic or physiologic effects. Additional screening was conducted using questionnaires in which CA and specific symptoms were presented. The designations of "Duration of at least one year" and "a strong motivation toward overcoming CA" were checked.

Stage II - Participants having symptoms limited only to CA were included in this stage. Stage II also comprised the completion of a questionnaire regarding various demographic variables (sex, geographical region, rural vs. urban, socioeconomic status, experience with computers, computer games and graphics, and/or virtual reality experience, etc.). These demographic variables will be examined and reported on in future studies.

C. Assessment Measures

Two assessment questionnaires were used in this study: (I) The Attitude Towards Public Speaking Questionnaire (ATPSQ), which contains six items that assess attitudes toward fear of public speaking. ATPSQ rates the following dimensions on a 0-10 semantic differential scale: good-bad, awful-nice, pleasant-unpleasant, safe-dangerous, threatening-nonthreatening, and harmful-harmless. (II) In addition, the Subjective Unit of Discomfort (SUD) scale was collected every few minutes during exposure on a 0 (no discomfort) to 10 (panic level anxiety) scale.

D. System Components for the Creation of VR

Virtual reality system components included a Pentium-based computer, a mounted microphone, a head-mounted display (Virtual I/O) with head-tracker sensor, and a

VREAM™ Virtual Reality Development Software Package and Libraries (VRCreator™) in order to create figures and models to produce CA situations.

E. Environment

Using the virtual reality systems development, a virtual auditorium was created. The auditorium seated 100 people, was 100 feet deep, 48 feet wide, and 55 feet high. A wooden podium with a speaker's stand was among the specific features of the facility. An amplifier with direct connection to the virtual reality software and hardware was used in the training session. This arrangement enabled the participants to hear their voices echo, simulating the echo of the real auditorium through a headphone attached to the head-mounted display.

F. Training Plan and Procedure

During the training, the participants were exposed to an audience of 0 to 100 people. Specifically, it involved the following situations:

- Speaking in an empty auditorium
- Speaking in an auditorium with an audience
- Speaking to an audience in which members talked to each other and paid no attention to speaker
- Speaking to an audience whose members laughed at the speaker
- Speaking to an audience in which members continuously asked the speaker to speak louder

The participants were administered five weekly sessions. Each session lasted 40 to 45 minutes, of which 15 to 30 minutes was spent within the virtual environment itself. The length, number, and increasing intensity of the sessions has been shown to be effective in anxiety treatment [6,14,16,20], even over long periods of time [19]. In the first session, participants talked about themselves and their issues related to CA. Next, the participants were given the option of reading eleven irrational and counterproductive ideas aloud. The ideas were taken from Elliss' Rational-Emotive Psychotherapy. SUDs were collected every few minutes from each participant. At the first and the last sessions, (ATPSQ) were completed by all participants.

III. RESULTS

The SUD scores were recorded for each session for each of the 30 participants. The standard deviation fluctuated in the sessions between the pre- and post-tests, but was the lowest in the post-test. The scores decreased over the number of sessions, with the post-test score being smaller than the pre-test score. By conventional criteria, this difference is considered to be extremely statistically significant ($t = 9.046; df = 58, p <0.05$). Participants' average SUD scores from the pre- and post-test are shown in Figure 1. At the post-test stage, participants reported that they were more comfortable in facing their CA symptoms.

The scores for the post-tests were considerably lower than those of the pre-tests. From this observation, the hypothesis that VRT considerably reduced the participant's symptoms was confirmed. In addition, it was observed from Figure 1 that the SUD scores on average gradually decreased over time, with the biggest drop occurring from Session 3 to the post-test.
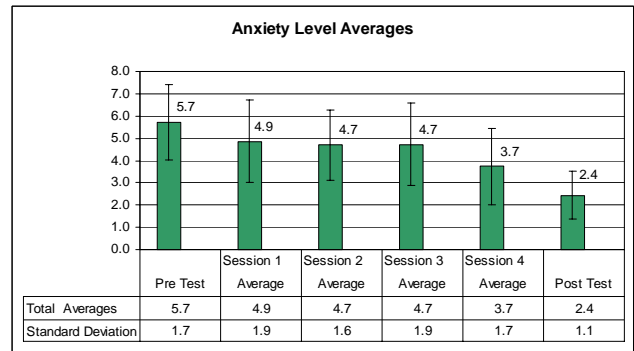

Figure 1. Participants' average SUD scores from the pre-test through the post-test.

IV. CONCLUSION

The purpose of this study was to investigate the use of VRT to help combat CA in students in classroom environments. The study tested if the program used in VRT was comparable to that of what participants would experience in reality and if the participant experienced less anxiety over the time that the sessions were conducted. Overall, the analysis of data showed that VRT did have a significant impact in the reduction of CA.

During the VRT sessions, the participants felt symptoms that would be felt in a real-life situation. The symptoms included dry mouth, nervousness, dizzy eyes, sweating, shaking, and increased heart rate. It was found that the participants experienced less anxiety at the post-test than at the pre-test, thus exhibiting less of the aforementioned symptoms. The SUD scores means showed a steady decline in average scores over time. This supports the hypothesis that VRT can be directly correlated to the reduction of CA symptoms presented in participants. In summary, this research showed that VRT is an effective way to combat CA.

V. DISCUSSION

As proposed under "Research Problems," can virtual reality training ease communication apprehension? When participants are immersed into the virtual reality environment, will they feel the same fear they feel in the real world? The significance of this study was to show that the principles of virtual reality training for use in therapy can be carried over into the treatment of CA in classroom environments.

Based on the analysis of collected data, authors could infer that virtual reality training may ease communication apprehension. It is also cost-effective and easily programmable to suit the participants' individual needs. As the virtual reality environment improves, virtual reality will be used for other phobias and situations [5]. The future of VRT might not, at the time, be immediately foreseeable, but one thing is for certain—that VRT is here to stay and will prove to be valuable to forthcoming generations.

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