THE EFFECT OF VIRTUAL REALITY EXPOSURE ON FEAR OF PUBLIC SPEAKING USING CLOUD-BASED SOFTWARE

by

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ABSTRACT

Anxiety disorders comprise the most common mental disorders faced by the general population. Individuals with anxiety disorders may experience severe limitations in their ability to appropriately engage in occupational, recreational, and social activities; however, accessing a therapist in order to reduce anxiety symptomology can be costly and difficult due to long waitlists. Virtual reality (VR) exposure therapy has been determined to provoke the same level of anxiety as real-life exposure to the parallel circumstance, while reducing face-to-face time with a therapist. However, VR technology is often costly and not easily accessible by either therapist or client. The purpose of this study was to examine the effect of a low cost, easy-to-implement form of VR exposure therapy on a specific social phobia, fear of public speaking, without the aid of a therapist. Participants were randomly placed in three different groups. All three groups engaged in a single psychoeducational session before proceeding in the VR research individually. For the first group (I), a single psychoeducational session was delivered on an individual basis before engaging in the VR exposure, whereas for the second group (G), a single psychoeducational session was delivered to several individuals in a group setting before engaging in the VR exposure. The third group (WL) engaged in a psychoeducational session individually, but did not engage in the VR experience. Participants in I and G completed a 6-session exposure treatment in which VR was used to elicit anxiety. Diverse self-report measures were administered to assess various aspects of confidence, anxiety, and apprehension before session 1 and after session 6. During the exposure, participants independently followed guided instructions to reduce their anxiety with
relaxation techniques. Dropout rates were also recorded. The data were analyzed using an ANCOVA with the pretest scores as the covariate. The data indicated that the exposure treatments significantly reduced participants’ anxiety and increased confidence and positive self-statements in public speaking compared to the waitlist group. It was also determined that there was no significant difference between groups for drop-out rates. The strengths and limitations of the study were discussed and suggestions for future research were recommended.
DEDICATION

Breanna and Kyra

You are my inspiration, my driving force, my life.
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Chapter 1. Introduction

As a group, anxiety disorders represent the most common mental disorder faced by the general population (American Psychological Association [APA], 2000). In fact, the Public Health Agency of Canada (PHAC, 2002) reported that 12% of Canadians are affected by anxiety disorders, according to data from hospitals. The agency stated that the actual number of people affected is likely much higher. Many people are treated in the community outside of the hospital or do not seek treatment, or dropout early, as the therapy can be perceived as anxiety provoking (PHAC, 2002; Schneider, Johnson, Honig, Liebowitz, & Weissman, 1992). Although many people with anxiety do not experience disruptions in their daily routines, they can experience severe limitations in their ability to function in occupational, recreational, academic, and social activities, as they may avoid situations that contribute to or provoke their symptoms (APA, 2013; Bonnewyn, Bruffaerts, Van Oyen, Demarest, & Demyttenaere, 2005). In addition, individuals with anxiety disorders may experience serious physiological symptoms (e.g., increased heart rate, sweating, trembling, dizziness, nausea) that affects their daily functioning.

Although there are effective treatments for anxiety disorders, the reality is that few people obtain them (Grant et al., 2005; Ruscio et al., 2008). For those individuals who seek out treatment, empirically supported therapies can be time-consuming and economically costly (Barlow, Levitt, & Bufka, 1999). Furthermore, due to stigma, restrictive government funding, and incorrect diagnosis, treatment is not always sought or provided by family physicians (Seppa, 1996). This situation is particularly salient in a province such as New Brunswick, where there is a limited supply of family physicians.
and psychologists, and Medicare does not cover the cost of treatment. Therefore, it is essential to find a cost-effective, readily available therapy for the general public.

According to the APA (2013), there are several different types of anxiety disorders, including generalized anxiety disorder (GAD), post-traumatic stress disorder (PTSD), and social anxiety disorders. As Statistics Canada (2006) points out in its Community Health Survey of Mental Health and Well-being, an estimated 1,040,000 Canadians have social anxiety disorder (SAD), making it the most common type of anxiety disorder. SAD is characterized by an intense, consistent fear of one or more social performance situations (APA, 2013; Fehm, Pelissolo, Furmark, & Wittchen, 2005; Liebowitz, Gorman, & Fyer, 1985). Fear of public speaking is a form of social anxiety in which an individual fears giving a speech or lecture in front of an audience. This form of social anxiety is the number one fear among the general population (Burnley, Cross, & Spanos, 1993; Rossi & Seiler, 1989). Fear of public speaking has negative implications for individuals’ lives and well-being, as it can cost some individuals their job and/or relationships, due to avoiding presentations that can lead to promotion or to engaging in such activities as self-medicating with drugs and alcohol (Craske, 1999; Ruscio et al., 2008). For university students, the inability to speak in front of an audience can create a roadblock to finishing a degree (APA, 2013; Tillfors & Furmark, 2007). To further complicate the issue for some students, receiving help for their anxiety can be comprised of being placed on a long waitlist as staff at university centers often have large case loads (Daley, 2015).
The gold standard for treating anxiety disorders is exposure therapy (Craske, 1999; Heimberg & Becker, 2002; Nietzel, Bernstein, Kramer, & Milich, 2003). Although extremely effective, exposure therapy can be time-consuming. It also has a high dropout rate because clients are not able to tolerate the anxiety-provoking situations to which they are exposed (PHAC, 2002; Schneier et al., 1992). Virtual reality (VR) is one method of exposure that provokes levels of anxiety similar to those in real life while allowing the client to remain in a safe environment (Joinson, 1999; Richman, Kiesler, Weisband, & Drasgow, 1999; Wiederhold & Wiederhold, 2005). Research suggests that, due to this feeling of safety, individuals with anxiety are more likely to seek out and complete VR exposure therapy compared to traditional treatments that involve facing fears in real life (Garcia-Palacios, Hoffman, See, Tsai, & Botella, 2001). VR made available online may be an option for individuals who cannot access a psychologist due to location or cost. Online VR therapy would reduce patient-clinician face-to-face time considerably and increase the number of individuals receiving treatment.

Research has suggested that VR can elicit emotion from individuals with a fear of public speaking (Harris, Kemmerling, & North, 2002; Lister, Piercey, & Joordens, 2011; Slater, Pertaub, Barker, & Clark, 2006). When exposure therapy and VR are combined, research also indicates a reduction in the fear associated with public speaking (Anderson, Page, Zimand, Hodges, & Rothbaum, 2005; Harris et al., 2002; North, North, & Coble, 1998). However, the majority of VR exposure therapy studies have been conducted in the presence of a therapist, who has guided the individual throughout the session (Slater et al., 2006). The current study investigated the impact of six sessions of VR exposure
therapy, without the aid of a therapist, on fear of public speaking, for participants who were provided with either an initial individual psychoeducational session or a group psychoeducational session, compared to participants placed on a waitlist. The single psychoeducational session marked the only contact the participants had with the researcher. Therefore, the group setting consisted of the group meeting only for the initial session and subsequently, the VR exposure sessions, one to six, were performed in an individual setting. To facilitate the research, the participants accessed the VR environment from a home computer without the guidance of the therapist during the individual sessions. This structure reduced the cost of the therapy and reduced face-to-face time with the therapist. As VR systems vary in ability and cost (Grady, 2003), this experiment also explored the impact of a less expensive form of VR exposure on the fear of public speaking.

Although the number of people with a fear of public speaking is extremely high, not all individuals require multiple sessions with a psychologist. Initial group information sessions with a psychoeducational exposure therapy component, as opposed to individual psychoeducational sessions, allow more individuals to access VR exposure while reducing time spent in a therapist’s office (Herkov, 2006). In light of the shortage of therapists and long waiting lists in small urban/rural areas and university settings, treating large groups of people with one initial session can decrease face-to-face therapeutic time. This will allow psychologists to spend more time with clients who need individual sessions, while still giving clients who cannot access or afford therapy, a treatment to engage in to reduce anxiety (APA, n.d.).
This dissertation discusses different elements of VR, how VR exposure can elicit anxiety in participants to treat different types of anxiety disorders, and the relevant research outcomes. As exposure therapy and VR have been shown to be effective with several anxiety disorders, this study examined a low cost form of VR exposure therapy for social anxiety, specifically the fear of public speaking. This research also compared the outcomes for the administration of an initial individual psychoeducational session and an initial group psychoeducational session compared to a waitlist group, as well as the dropout rates among the three groups.
Chapter 2. Literature Review

Many occupations require individuals to present ideas to groups of colleagues or clients or to speak publicly in some capacity. For students attending postsecondary institutions, public speaking is part of the academic experience. Unfortunately, many individuals find the prospect of public speaking to be anxiety provoking. For some, just the thought of public speaking creates intense negative feelings. As a result, many individuals avoid any situation, occupation, or academic course that involves presentations or public speaking (Craske, 1999). This, in turn, can impact an individual’s ability to move forward in a career, complete a degree, or in some cases, find employment (APA, 2013; Daly, Vangelisti, Neel, & Cavanaugh, 1989). Clearly, this fear can affect relationships and the overall trajectory of an individual’s life (Katzelnick et al., 2001; Schneier et al., 1994). As with many social phobias, fear of public speaking can be a product of having a negative experience in a public speaking situation. Such an experience can cause an individual to avoid future public speaking experiences in order to evade any negativity or feelings of anxiety (Witt, Roberts, & Behnke, 2006). The most commonly used evidence based treatment for anxiety based disorders, is exposure therapy (Craske, 1999; Heimberg & Becker, 2002; Nietzel, Bernstein, Kramer, & Milich, 2003).

Treatment of Anxiety-Related Disorders with Exposure Therapy

Anxiety disorders are characterized by an anxiety-provoking stimulus that triggers an individual’s apprehension and worry to a greater extent or for a longer time than for the average person (APA, 2013). In order to reduce their level of anxiety, individuals
who suffer from an anxiety disorder avoid any stimulus associated with the anxiety, regardless of how this avoidance impacts their life (Lebow, 2007; Witt et al., 2006). As therapy itself can be anxiety provoking and can feel unsafe, people with an anxiety disorder sometimes avoid treatment altogether or drop out early (Schneier et al., 1992). VR offers a promising alternative for exposure therapy, as it provides a safe, therapeutic environment while still eliciting a level of anxiety similar to that provoked during an in vivo experience (Bush, 2008).

During the late 20th century, exposure therapy emerged as a behavioral intervention to assist in decreasing avoidance behaviors (Freeman, Pretzer, Fleming, & Simon, 2004; Heimberg & Becker, 2002; Heimberg et al., 1998). This therapy involves patients learning and practicing coping skills while being exposed to a feared situation or stimulus (Heimberg & Becker, 2002). Wolpe developed exposure therapy in 1958 (Nietzel et al., 2003). He reasoned that when an individual is in the presence of an anxiety-provoking situation, an alternative response can be introduced to prevent the individual from avoiding or retreating. Through this procedure, the anxiety associated with the stimulus is reduced and therefore weakened.

Wolpe (1958) initially theorized that the alternative response for human participants included interpersonal assertion, deep muscle relaxation, and sexual arousal (which was utilized for anxiety related to sexual or interpersonal issues). Today, deep breathing and progressive relaxation training (PRT) are the most common relaxation techniques (Bernstein, Borkovec, & Hazlett-Stevens, 2000). PRT consists of tensing
specific muscle groups and then relaxing for a short period. The subject focuses on his or her awareness of the muscle relaxing after the forced tension.

One form of exposure therapy, graduated exposure, involves the creation of a fear hierarchy, or a list of activities related to the target fear. The list begins with the least anxiety-provoking situation and moves toward the most anxiety-provoking situation (McGlynn, Smitherman, & Gothard, 2004; Wolpe, 1969). For example, a participant with arachnophobia may begin with exposure to a picture of a spider as the least anxiety-provoking activity on the fear hierarchy. The next level on the fear hierarchy might be standing outside a pet store that sells spiders. Moving through several different levels, the most anxiety-provoking situation on the fear hierarchy could be holding a spider.

In graduated exposure, participants are exposed to each level one at a time. As with all exposure techniques, the intention is to produce anxiety by triggering the fight-flight or freeze mechanism. Engaging this mechanism increases the heart rate, tenses the muscles and causes the individual to experience shallow breathing. The participant is then taught how to diminish the fight-flight or freeze symptoms in the presence of the stimulus. Individuals do not progress to the next level until their anxiety reduces to an acceptable level according to the Subjective Units of Distress Scale (SUDS), a tool for measuring anxiety levels. On the scale, 10 represents the highest level of anxiety, and 1 represents the lowest level (Wolpe, 1969). Therefore, a participant may be at a SUDS rating of 10 when entering a new level; however, he or she will not move to the next level until reaching a SUDS rating of 3 or 4. To reduce anxiety to this level, participants practice relaxation techniques, such as deep breathing or PRT.
An alternative empirically supported exposure technique is called flooding (Zoellner et al., 2009). This technique encompasses exposure to the feared stimulus in only one step, which would involve the individual being exposed only to the most feared experience on the fear hierarchy. The exposure would conclude when the SUDS ratings were reduced significantly. Research has suggested that both interventions are equally effective; however, graded exposure is more widely used due to clients feeling more comfortable during the approach (Moulds & Nixon, 2006; Oat, Alm, Brandberg, & Breitholtz, 2001).

Exposure therapy may be executed in vivo, such that the client experiences the therapy in a real-life situation. It may also be executed in vitro, meaning that the client experiences the therapy through the imagination as the therapist describes each level of the hierarchy (Comer, 1992). In vitro exposure is useful when in vivo exposure is not possible, such as for military members who have PTSD resulting from trauma experienced during deployment or clients who cannot tolerate the in vivo experience. Evidence supports the effectiveness of both approaches—in vivo and in vitro (Foa, Sleketee, & Grayson, 1985; Hunt & Fenton, 2007). However, according to Emmelkamp (1994), in vivo exposure is superior to in vitro exposure.

**Dropout Rates in Exposure Therapy**

As in vivo and in vitro exposure can be anxiety provoking, both can also lead to participants dropping out of treatment early (PHAC, 2002; Schneier et al., 1992). Fernandez et al. (2015) conducted a meta-analysis of 115 studies of cognitive behavior therapy (CBT) based treatments in which the average dropout rate was calculate to be
26.2%. Dropout rates consisted of the participants that did not complete treatment. Salmoiraghi and Sambhi (2010), in a review of 14 research studies involving CBT treatments, found a dropout range of 19% - 50%. Swift and Greenberg (2012), who studied several forms of psychotherapy in a 125 study meta-analysis, observed a dropout rate of 19.7%. Fernandez at al. (2012) concluded that the Swift and Greenberg (2012) study had a stricter exclusion criteria. The study excluded children and adolescents, people with substance abuse issues, and therapies such as e-therapy. Therefore, as these target groups were shown to have large dropout rates, they reduced the average dropout rates by being excluded.

Hembree et al (2003), in a meta-analysis of 25 studies, examined the dropout rates for treatments consisting of different forms of CBT therapy for PTSD including: in vivo and imaginal exposure therapy; stress inoculation therapy (SIT); active control conditions; relaxation training; cognitive processing therapy (CPT); anxiety management training; EMDR; psychodynamic therapy, hypnotherapy and biofeedback. For in vivo and imaginal exposure therapy, the average dropout rate was 20.5%, which was not significantly different from other treatment dropout rates. However, on conducting a pair-wise chi-square analysis, it was determined that the exposure treatment did have a significantly higher dropout rate when compared to the control. Hembree et al. (2003) suggested that this may be due to participants’ inability to tolerate the anxiety provoking situation.

Castro et al. (2014) compared traditional in vivo CBT exposure to VR exposure therapy for patients with chronic agoraphobia. Although both treatments lead to
successful outcomes as suggested by self-report measures, it was determined that the VR group had a lower dropout rate (23.3%) compared to the CBT group (53.3%). Andersson et al. (2005) investigated an Internet-delivered program that consisted of two group exposure sessions and e-mails from the therapist. The results determined the dropout rate from treatment to be 6.25%, which is less than the dropout rate for waitlist participants of 11.4%, as determined by Hembree et al. (2003). Therefore, although in vivo exposure therapy has higher dropout rates, VR exposure has been determined to have dropout rates similar to participants on a waitlist, due to participants feeling safe in the environment (Emmelkamp et al., 2001; Emmelkamp, Bruynzeel, Drost, & van Mast, 2001; Weiderhild & Wiederhold, 2006).

**Introduction to Virtual Reality**

VR involves the interaction between humans and computers such that viewers become active participants in a computer-generated, three-dimensional world (Wiederhold & Wiederhold, 2005). VR has gained acceptance since the 1990s as a treatment for different psychopathologies, such as anxiety, phobias, eating disorders, PTSD, and substance abuse (Sharples, Coob, Moody, & Wilson, 2007). The concept of VR was first recorded in the 1800s. At this time, VR consisted of viewers sitting still in one position in a circular room while the painted walls slowly turned around them, creating a sense of movement (Knight, 2012; Maloney, 1997). Sound effects and music were added to further enhance the experience of immersion. In the early 1900s, simulator rides were created to include the movement of the viewers, who stood on platforms while
the circular outer walls rotated. To indicate the passage of time, “props,” such as smells, sounds, and lighting changes, were added to enhance the experience (Grady, 2003).

The most notable forms of VR, however, began to be developed in 1956, when Morton Heilig created a multisensory simulator, or “theatre experience,” which he called the Sensorama (Knight, 2012). The simulator involved a prerecorded color film with stereo sound. It was subsequently supplemented with emitted odors (gasoline, food, etc.), fans (wind), vibrations (engines), stereo speakers, and a moving chair. The viewer sat in the front of this one-person theatre, and for the price of a quarter, chose one of five 3-D films. The choice of films included a dune buggy ride, a motorcycle ride, a bicycle ride, a helicopter flight, and a belly dancer dancing. This project was the first attempt to produce a VR system with all the components of a real-world environment (Knight, 2012). To date, the term virtual reality has been modified as the complexity of the software escalates. Terms such as virtual environment and virtual world reflect the participant’s ability to interact with the environment, with the latter having the highest levels of interaction capability (Lynn, 2010).

In 1961, the Philco Corporation manufactured the first head-mounted display, named Headsight (Wiederhold & Wiederhold, 2005). This apparatus, which would eventually become essential in VR presentation, consisted of a single cathode ray tube (CRT) element bonded to a helmet. A CRT is a device that uses a beam of electrons to produce an image on a screen. Initially, the head-mounted display was not used in the context of VR, but was used in conjunction with a closed-circuit video system that enabled the observer to remotely view dangerous situations. Cameras were situated in
hard-to-reach places, such as underneath helicopters, thus allowing pilots to inspect the surrounding areas. A magnetic tracking system within the helmet was designed to determine the direction the pilot was facing. After the development of the Headsight, the ability to track the observer’s head movement became an essential component in the creation of VR environments (Wiederhold & Wiederhold, 2005).

The modern form of VR materialized in the 1960s and 1970s as researchers investigated vehicle simulations and 3-D interactive graphics. In 1965, Ivan Sutherland developed a head-mounted display known as the Ultimate Display, which tracked participants’ head movements (Grady, 2003; Knight 2012; Wiederhold & Wiederhold, 2005). The display changed depending on the direction in which the user was looking. Thus, remote viewing was replaced with computer-generated images, which allowed participants to be completely immersed in a 3-D computer-generated environment. The most important element of this system was the fact that each eye had its own CRT element, creating a stereoscopic display. In VR, a CRT is used to reflect an image onto the participant’s eye. These images have high resolutions that can make a scene seem much more realistic to the participant (Grady, 2003; Wiederhold & Wiederhold, 2005).

The first virtual environment utilizing the head-mounted display consisted of a wire-framed room with “north,” “west,” “south,” and “east” written on the virtual walls (Wiederhold & Wiederhold, 2005). In this scenario, participants entered the virtual room by way of the west door and could look out a window in any desired direction. The term “head-mounted display” subsequently was changed to “virtual reality” (Rheingold, 1991). Sutherland would later state that he did not have a clear vision for the head-
mounted display. However, by introducing prototypes, he felt that he had motivated others to take the research to another level; the spin-offs from his head-mounted display concept contributed greatly to VR research (Grady, 2003; Rheingold, 1991). Head-mounted displays are often to date in VR exposure. Although they are effective, this method of delivery is too expensive for potential users (Wiederhold & Wiederhold, 2005).

Myron Krueger expanded the concept of VR when he began to investigate how people interacted with computers. Using new electronic art forms and computer-generated images, he developed a software program to change the images displayed on the computer screen using body movements (Krueger, 1983). Krueger also distinguished himself as one of the first researchers to suggest using VR to treat mental health disorders (Krueger, 1991). He authored books that investigated human-computer interaction, which ultimately led to the idea of using VR in psychotherapy to help patients overcome the inhibitions they normally experienced in real life (Krueger, 1983, 1991).

According to Krueger (1991), some patients might experience a higher degree of safety or comfort when interacting with computers. For example, although participants might experience the same level of anxiety in a virtual environment designed to evoke a fear of heights as they would when standing at the top of a tall building, they maintain a sense of safety because they know the virtual environment they are experiencing is, in fact, on the ground (Joinson, 1999; Richman et al., 1999). This sense of safety led Krueger to suggest that VR would be a useful tool for exposure therapy, as it would allow
patients and therapists to move through a virtual environment and communicate throughout the experience.

VR supports the treatment of pathologies by immersing participants in a computer-generated virtual environment related to the pathology. Essentially, it replicates the situations which generate participants’ emotions in the real world. Participants gain sensory information from the virtual environment instead of the natural environment that physically surrounds them (Wallach, Safir, & Bar-Zvi, 2009). This method of treatment has many positive attributes that real-life situations cannot replicate. For example, VR is extremely flexible in its presentation, as it can create an infinite number of environments to stimulate all senses, including visual, auditory, and olfactory (Plancher, Gyselinck, Nicolas, & Piolino, 2010). This stimulation allows for an immersive sense of presence that cannot be replicated by imaginary exposure, and it is comparable to the time and monetary investment in vivo exposure (Powers & Emmelkamp, 2008).

**Virtual Reality, Anxiety, and Exposure Therapy**

Many studies have examined the use of VR to provoke anxiety. It is important to note, however, that VR alone is not a therapy; rather, it is a tool that can be used to elicit anxiety during exposure therapy for either research or therapeutic purposes (Alsina-Jurnett, Carvallo-Beciu, & Gutierrez-Maldonado, 2007; Kim et al., 2008; Roth & Armstrong, 1993). Researchers have evaluated the use of VR to determine its effectiveness in provoking anxiety for the treatment of the following issues: obsessive-compulsive disorder (OCD), test anxiety, eating disorders, panic disorders, post-traumatic stress disorder (PTSD), and fear of flying.
Kim et al. (2008) investigated the use of VR for participants with OCD. An individual with OCD is characterized by frequent and repetitive obsessions or compulsions that are intense enough to cause significant distress or impairment (APA, 2013). Obsessions can be defined as intrusive and persistent thoughts, ideas, or images that cause marked distress, whereas compulsions can be described as excessively repeated behaviors meant to reduce stress. As some individuals with OCD find exposure too aversive, Kim et al. (2008) investigated the ability of VR to assist in provoking an anxiety response for people with OCD while avoiding the stress of being exposed to real-life situations. As VR contains the safety factor of not being real, individuals with OCD are less likely to drop out of therapy before treatment is completed (Garcia-Palacios et al., 2001; Schneier et al., 1992).

To investigate the ability of VR to elicit anxiety for people with OCD, Kim et al. (2008) used a head-mounted display to deliver VR images to participants. For the purposes of the study, the researchers created a virtual environment that was similar to the average home. Participants were exposed to the virtual environment in three different phases: training, distraction, and the main phase. During the training phase, participants performed tasks in the virtual environment to prepare themselves for the next two phases. These tasks included everyday activities, such as getting ready for work, opening the window, turning on the gas burner, and turning on a light switch. The distraction phase contained tasks that were completely unrelated to the training and target phases. During this phase, participants brought specific objects (e.g., an umbrella, a cell phone, a pocketbook) into the virtual house. When the task was accomplished, the relevant objects
disappeared from the environment. The second phase was to distract the participants from thinking about the previous environment and lead them into the main phase. During the main phase, participants were instructed to check the status of such objects as the light switch, the window, the gas, and the front door (e.g., whether they were on or off, open or closed). Participants also were instructed to go to the end of the hallway when they were finished checking, at which point they were asked if they wanted to end the task.

The results indicated that the group with OCD spent a significantly longer time checking the objects than the group of participants without OCD (the control group). There was also a significant, positive correlation between the anxiety experienced by people with OCD checking the objects, their OCD symptoms, and their feeling of immersion within the VR environment. Overall, the study also showed that the group with OCD was able to decrease their anxiety by engaging in exposure therapy. This finding suggested that VR is a viable method of eliciting anxiety for people with OCD symptoms and can be used to create a safe environment. The sense of security that participants with OCD experience when using VR may make them less likely to drop out of therapy and more likely to continue with the full course of treatment (Garcia-Palacios et al., 2001; Schneier et al., 1992).

Other studies have considered the role of VR in alleviating test anxiety, which has been suggested to impair an individual’s ability to write a test effectively by 15% to 20% (Cheng, Hardy, & Markland, 2009; Hembre, 1988; Zeidner, 1998). One study showed that, on school district assessments for math and reading, students with high test anxiety were a full year behind the required academic level compared to students with low test
anxiety, who were a full year ahead of the required academic level (Hill & Sarason, 1966; Paris, Lowton, Turner, & Roth, 1991). Alsina-Jurnett et al. (2007) studied VR as a way to provoke anxiety in university participants with test anxiety. Participants were placed in a high- or low-anxiety group based on scores measured on the Test Anxiety Inventory (Spielberger, 1980). Using a head-mounted display to present the images, the authors produced three virtual exposure scenarios for personal computers that were presented to participants: (a) home, (b) metro (subway), and (c) the test-writing environment (university). Each scenario comprised several different environments. For example, the home scenario included an apartment with a bedroom, hallway, bathroom, dining room, corridor, and kitchen. The participants were allowed to move through the scenario in the same manner they would the evening before an exam. Participants could turn lights on and off, sit down at a desk to study, dress, or eat breakfast. This format was the same in the metro and university scenarios, where participants could engage in activities that were similar to those they would encounter in real life.

The results indicated that exposure to the virtual environment created a significantly more intense emotional response to all three scenarios for the high-anxiety group. However, the highest level of anxiety occurred in the metro environment, as measured by the State and Trait Anxiety Inventory (STAI). This finding suggests that their anxiety did not peak during the test-writing period itself but rather during transport to the test setting. Thus, by using VR, the researchers discovered that the highest anxiety was not experienced during the presentation of the target stimulus but prior to the exposure of the target (test writing). This finding may inform therapists in determining
the most anxiety-provoking situations; in this specific case, the metro virtual environment could be explored to a greater extent, with repeated exposure and without the extra cost and effort of going to a real metro.

VR also has been utilized to create environments which represent situations that cause significant anxiety or emotions for individuals with eating disorders (Gutierrez-Maldonado, Ferrer-Gacia, Caqueo-Urizar, & Moreno, 2010; Roth & Armstrong, 1993). According to Slade and Brodie (1994), body image distortion is the primary factor that initiates and perpetuates eating disorders (Edman, Yeates, & Aruguete, 2005; Stice & Shaw, 2002). Body image distortion is among the criteria for diagnosing bulimia and anorexia (APA, 2013). Research conducted in vivo has addressed the effects of exposure to eating, photographs of high- and low-calorie foods, and facing the scrutiny of others (Cash, Cash, & Butters, 1983; Crisp & Kalucy, 1974; Heilbrun & Flodin, 1989; Laberg, Wilson, & Eldredge, 1991; McKenzie, Williamson, & Cubic, 1993; Wardle & Foley, 1989). However, these variables can be difficult to control in an in vivo environment (Groesz, Levine, & Turnen, 2002; Haimovitz, Lansky, & O’Reilly, 1993; Heinberg & Thompson, 1995). VR allows therapists and researchers to control variables within the environment to a greater extent than other methods of exposure such as guided imagination, exposure to photographs, and real-life exposure (Gutierrez-Maldonado, Ferrer-Gacia, Caqueo-Urizar, & Letosa-Porta, 2006).

Gutierrez-Maldonado et al. (2006), using a head-mounted display to present the virtual images, investigated the ability of virtual environments to produce an emotional response in women diagnosed with an eating disorder. In the study, the VR environment
initially consisted of a neutral living room setting to familiarize the participants with the equipment. The other scenarios consisted of high and low anxiety-provoking situations. For example, one of the kitchen environments contained low-calorie foods; the other presented high-calorie foods. A restaurant scenario also was used to present an environment with high-calorie foods and another with low-calorie foods. The final VR environment consisted of a swimming pool setting in which participants were exposed to people represented by avatars. The participants then were required to expose their own virtual bodies in bathing suits. In each scenario, the presence of avatars was random; some scenarios included avatars of other people whereas other scenarios did not. After exposure to each environment, participants were administered the STAI and the Barcelona Depression Questionnaire (Hawkins, Richards, & Granley, 2004).

The results indicated a significant increase in anxiety in the kitchen and restaurant environments that contained high-calorie foods and in the swimming pool scenario. There was no significant difference between the scenarios that exposed participants to avatars of other people and those that did not. In other words, the presence of avatars did not provoke an anxiety response. There was also a significant difference in participants’ scores on the depression scale between the neutral and high-calorie environments but no significant difference on the depression scale between environments with or without avatars. This finding suggests that the high-calorie scenarios provoked an emotional response regardless of whether avatars of other people were present or not. Therefore, although eating disorders may be related to anxiety about judgment by others, the
presence or absence of others in a virtual environment does not appear to have an effect on participants’ emotional state or level of anxiety.

The one exception was the swimming pool scenario, where exposing one’s body to the scrutiny of others provoked anxiety. In this situation, the presence of others in the social situation elicited an emotional response. This result suggests that utilizing VR with eating disorders can allow researchers to pinpoint anxiety-provoking situations more accurately because researchers have greater control over the variables of the exposure. Although it long has been assumed that people with eating disorders are affected by the perceived judgment of others, researchers can test the accuracy of this conclusion by controlling the environments to which participants are exposed. Unlike VR exposure, which allows researchers to examine how each specific situation contributes to an individual’s anxiety, in vivo exposure does not allow researchers to extensively control external variables. Therefore, in vivo exposure might not allow researchers to pinpoint the anxiety-provoking situations necessary for treatment.

Research also has been conducted on the use of VR exposure as part of a treatment plan for panic disorder with agoraphobia. An individual with agoraphobia can be characterized as having a fear of crowds, of being outside the home or on a bridge, of being in a place with no escape, or of being in a place where there is no help if a panic attack occurs (APA, 2013). Epidemiological data indicates a lifetime prevalence of 3% to 5% (Botella et al., 2007; Kircher et al., 2013; Wittchen, 2005). Because panic disorder with agoraphobia can limit an individual’s ability to be mobile, it can decrease a person’s quality of life (Schmidt & Telch, 1997). Although cognitive behavioral therapy (CBT),
including exposure therapy, has been found to be efficacious (Barlow, 2002; Barlow, Raffa, & Cohen, 2002; Botella et al., 2004), there are several limitations that must be addressed. For instance, people with panic disorder with agoraphobia do not always seek help (Bebbington, 2000). In addition, approximately 25% of people with panic disorder with agoraphobia undergoing CBT either drop out or refuse treatment because they find the program aversive (Marks, 1987).

Vincelli et al. (2003) investigated the effectiveness of VR exposure in treating agoraphobia by randomly assigning participants to one of three groups. The two treatment groups consisted of a CBT group, which utilized traditional CBT techniques, and an experiential cognitive therapy (ECT) group, which combined traditional CBT techniques and VR exposure. A third group consisted of a wait-list control group. For ECT, the participants were exposed to four different environments using a head-mounted display: a supermarket, an elevator, a large square, and a subway ride. Then they were instructed to rank the environments in terms of how much anxiety each provoked, from least to greatest. Once a hierarchy was determined, the participants were exposed to each scenario in order of how the scenarios were ranked, commencing with the least anxiety provoking environment. The researchers increased the level of stimulation by increasing the number of people in the environment, by creating a smaller or narrower space, and by moving the participants farther from the virtual exits.

Vincelli et al. (2003) also conducted CBT during the sessions for all the groups. The therapy included discussing recent panic attacks, identifying and reviewing negative thoughts related to the anxiety and/or panic attack, cognitive restructuring through
exposure, and face-to-face time with the therapist. Participants also were taught cognitive
strategies, such as decreasing their vigilance for feelings of arousal and reducing their
chronic anticipation of a recurrent panic attack. The participants were instructed to
conduct in vivo exposure without the therapist present. The CBT group utilized the CBT
techniques but did not engage in the VR exposure. The results indicated that both the
CBT and ECT groups showed significant clinical improvement such that the number of
panic attacks was reduced to zero. However, ECT was able to produce these results using
33% fewer treatment sessions, suggesting that ECT is a more cost-effective therapy than
CBT alone (Vincelli et al., 2003).

Understanding the ability of VR to illicit anxiety, researchers examined the use of
VR exposure in treating PTSD, a complex anxiety disorder characterized by development
of anxiety following a traumatic event. Such events include man-made and natural
disasters, war, assault, and motor vehicle accidents (APA, 2013). Research has indicated
that exposure therapy is an effective way to treat PTSD (Wiederhold & Wiederhold,
2010); however, in vivo treatment can be dangerous and difficult in such situations, and
imaginal exposure may not elicit the desired amount of anxiety. Research has suggested
that VR can provoke anxiety in people with PTSD while maintaining a physically safe
environment (Rothbaum et al., 1995; Walshe, Lewis, O’Sullivan, & Kim, 2005;
Wiederhold & Wiederhold, 2005).

PTSD has been recorded in 12% of hospitalized soldiers following deployment in
Iraq (Grieger et al., 2006). Wood et al. (2007) investigated the use of VR with this
population and introduced VR-graded exposure therapy (VGRET) in a single case study
concerning a soldier who had been exposed to an improvised explosive device while driving a Humvee during his deployment. The soldier was given ten 90-minute sessions. The first two were dedicated to discussing the traumatic events and symptoms and to learning relaxation techniques. The goals of the VGRET also were discussed, such as gaining control and learning to tolerate intrusive thoughts and bothersome stimuli. During these first two sessions, the soldier was instructed on the concept of attentional retraining, which is used to heighten attentional focus on a subject or certain thoughts, whether comfortable or uncomfortable. In other words, if the soldier was feeling worried or anxious, he was instructed to enhance those feelings by focusing his attention on them. Similarly, if he was experiencing calm or peaceful feelings, the increase in focus would enhance these feelings.

For the first eight sessions, only 20 minutes were dedicated to VGRET (Wood et al., 2007). The remaining time was spent reviewing the previous week’s work, introducing new meditation and attentional retraining instructions, and debriefing at the end of the session. During each exposure to the VR environment, the soldier was allowed to remain in a virtual safe or neutral area at the beginning of the session. Later, he moved into the areas where elements within the virtual environment increased his anxiety level. During the exposure, the clinician instructed the soldier to use different methods of relaxation and attention refocusing to reduce his physiological symptoms. The soldier was encouraged to use these methods during the week between sessions. Overall, he used VGRET for approximately one-quarter of the time he spent in therapy.
The results of the study indicated that the soldier experienced a reduction in PTSD symptoms (Wood et al., 2007). He reported feeling engaged in the VR environment and said that engaging in combat practices in a “safe” environment helped him develop his attentional refocusing skills and practice relaxation techniques. The soldier initially described needing to take a 1- to 2-hr walk after a session in order to decompress. By the 10th session, he no longer needed to decompress. This finding suggests that exposure to a combat situation using VR not only allowed the soldier to experience the anxiety-provoking situation but also provided him the opportunity to practice relaxation techniques. Thus, VR provides the necessary environment for exposure and replicates similar levels of anxiety while keeping the individual safe.

Finally, VR has been studied in the context of flying. Before 9/11, fear of flying affected 10% to 40% of the population (Agras, Sylvester, & Oliviu, 1969; Van Gerwen & Diekstra, 2000). Since 9/11, commercial airline usage has decreased 10% to 30%, which has had a major impact on the air travel industry (Ito & Lee, 2004). Researchers have found that 20% of individuals who fly depend on sedatives or alcohol to treat their anxiety during the flight (Griest & Griest, 1981; Howard, Murphy, & Clarke, 1983; Mohrman, 2013). Psychological treatments that have been tested for fear of flying include exposure and relaxation treatments (Beckham, Vrana, May, Gustafon, & Smith, 1990; Haug et al., 1987; Howard et al., 1983; Van Gerwen, Spinhoven, Diekstra, & Van Dyck, 2002). However, these treatments may be limited to areas with airports and may be both expensive and time-consuming. By comparison, VR exposure can simulate an
airplane environment without subjecting the individual to the cost of an actual flight or the need to be near an airport.

Rothbaum, Hodges, Smith, Lee, and Price (2000) examined the use of VR exposure as part of a treatment plan for people who exhibit fear of flying. Participants were divided into one of three groups: (a) standard exposure (SE), (b) VR exposure (VRE), and (c) control. The two treatment groups received relaxation and cognitive restructuring training for the first four sessions. For the subsequent four sessions, the SE group was transported to a nearby airport for exposure to preflight stimuli, such as the waiting area, the ticket booth, and parked airplanes. They were then placed on a standing aircraft and shown imagery related to takeoff and landing. The VR group used a head-mounted display that simulated an aircraft environment. The simulation consisted of sitting in the plane, taking off, and landing in stormy and calm weather. The exposure also incorporated the noises usually experienced during a flight, such as the sound of flight attendants, airplane engines, weather, and vibrations. The participants sat in each exposure environment until their anxiety decreased, at which time the next scenario was introduced.

The results revealed no significant difference between the SE and VRE groups in terms of the ability to reduce their symptoms compared to the control group. There was also no significant difference between the SE and VRE groups and the control group in terms of the number of participants who flew on an airplane after the treatment. Although the treatments produced the same results, VRE therapy had several advantages. First, it was administered in the therapist’s office, whereas the in vivo treatment consisted of
traveling to the airport and did not involve simulated takeoffs or landings. Second, during an actual flight, a session would be limited to one takeoff and one landing. With VRE, however, several of these events can be included in one session.

**Limitations**

Although the literature review suggests that VR is effective in eliciting anxiety as well as being an effective component to reducing anxiety in an exposure therapy treatment plan, there are several limitations to the research. For example, in all the research studies discussed, a therapist was present during VR exposure (Alsina-Jurnett et al., 2007; Kim et al., 2008; Roth & Armstrong, 1993; Vincelli et al., 2003; Wood et al., 2007). Although the studies indicated that VR could elicit the same level of emotion during exposure as in vivo exposure, it does not reduce therapy time, as a therapist was available to implement the procedure. However, by reducing therapist contact to one psychoeducational session, and by allowing participants to execute VR exposure on their own time, therapists may reduce the cost of therapy in terms of time and money (e.g., travel time, therapist time, client fees).

Farrand and Woodford (2013), in a 14 article meta-analysis examining self-help for anxiety and depression, found that anxiety was reduced when a self-help CBT program was implemented. The CBT programs investigated were based on behavioral or cognitive changes, and ranged in 4 to twelve sessions in duration. The programs were delivered by written word or by use of the internet. The sessions ranged from having no therapeutic support to allowing minimal guidance for participants. Although a small effect size, the research suggested that anxiety and depression symptoms were reduced when compared
to waitlists and face-to-face treatments. Kraaij et al., (2010) studied the use of cognitive behavioral self-help programs for people with HIV. Depression symptoms were measured utilizing the depression subscale of the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). The study determined that CBT self-help did significantly reduce depressive symptoms, without the aid of a therapist, compared to a waitlist group. The authors determined that this method of help allowed a large number of people, who would be restricted by geography and social issues, to have access to help with their depression symptoms. Botella et al. (2010) examined the efficacy of self-administered internet-based treatment vs therapist lead treatment for the fear of public speaking. The results indicated there was no significant differences between the groups in the ability to reduce anxiety and negative cognitions around fear of public speaking. Therefore, internet self-help can potentially be a low cost method to achieve positive outcomes (Kraaij et al., 2010).

In the research studies discussed, VR therapy was delivered using high-cost head-mounted displays and software (Gutierrez-Maldonado et al., 2006; Rothbaum et al., 2000; Wood et al., 2007). Virtual reality systems can reportedly range from $5,000 to 1-2 million dollars (Grady, 2003; Wiederhold & Wiederhold, 2005). Software costs can range for $3,000 to $15,000 with Kaiser-Electro-Optics devices, I-glasses, or other head-mounted display devices costing from $1,000 to 20,000 (Wiederhold & Wiederhold, 2005). The hardware necessary to present VR environments can be purchased for as little as $5000.00. However, there are a number of issues associated with running various software programs. For example, Windows operating system popups and anti-virus
software can interfere with the ability of the PC to run VR software effectively. Also, incompatibility of VR software programs with specific graphic cards, audio systems, and device drivers, may increase the cost of utilizing the system by practitioners, as different software packages may require different computers. Researchers are currently attempting to correct these issues. However, because the upgrades themselves may not run on older computer systems, newly upgraded systems may need to be purchased to run the most recent versions of available software (Grady, 2003). Investigating the effectiveness of a less expensive method of VR exposure may eliminate this issue.

**Virtual Reality and Fear of Public Speaking**

Lister et al. (2011) examined VR software that was less expensive and more readily accessible to clinicians than traditional head-mounted VR systems. In the study, participants were exposed to an 8-minute video of real people sitting in a classroom waiting for a lecture to start. During the exposure, the participants wore shutter glasses to view the 3-D video on a television, a less expensive method of introducing the VR environment than using head-mounted displays or more complicated software.

The virtual audience members performed different activities, such as shuffling papers, coughing, talking to other audience members, and leaving the room. The participants were instructed to watch the video while standing at a podium with a speech provided to them. When the audience appeared to settle down and look at the speaker (participant) as if waiting for the lecture to begin, the participant was instructed to read for 2 minutes from a selected book. The participant was then asked to stand in front of the video audience for another 2 minutes until the video ended.
The results indicated a main effect in pre-exposure versus post-exposure skin conductance measurements, such that skin conductance increased after performing VR public speaking tasks. The results also indicated a main effect in pre-exposure versus post-exposure heart rate, such that participants’ heart rate measurements increased after exposure to the virtual audience. This finding indicated that physiological changes similar to those experienced during episodes of anxiety occurred during VR exposure (Lister et al., 2011). The State and Trait Anxiety Inventory (STAI) results indicated that state anxiety significantly decreased from pre-exposure to post-exposure, a finding that aligns with the results of the Self-Statement During Public Speaking (SSPS) scale, in which negative thoughts toward public speaking also significantly decreased during exposure. Overall, the results suggested that introducing participants to a virtual audience elicited an emotional response; however, participants were only exposed to the VR video and were not instructed to reduce their anxiety levels. Further research is necessary to determine the effect of introducing relaxation techniques during exposure to a VR audience.

**Increasing the Benefits of VR Exposure**

Although researchers have examined the use of VR for treating fear of public speaking, the effects of introducing and educating a group of individuals about exposure therapy before using VR exposure software, without the involvement of a therapist, has not been investigated. Furthermore, as the number of available therapists is limited, performing a psychoeducational session in a group, with several participants, can greatly increase the number of people who receive treatment for fear of public speaking. It
should also be noted however, that the fear of public speaking is a form of social anxiety, which is described as an intense, consistent fear of one or more social performance situations (APA, 2013; Fehm, Pelissolo, Furmark, & Wittchen; 2005; Liebowitz, Gorman, & Fyer, 1985). Dijk, Buwalda and de Jong (2012) studied the fear of blushing, also a specific type of social anxiety (Bögels & Reith, 1999; Chaker & Hoyer, 2007). The study was based on a psychoeducational group intervention in a course based setting, as opposed to a therapeutic environment. Patients were described as participants and therapist as teachers. The Blushing, Trembling and Sweating Questionnaire (BTSQ) (Bögels & Reith, 1999), was administered before the beginning of the course and after the end of the course, which consisted of six weekly sessions. Participants were told during the sessions that they would not be engaging in therapy with the group, and that at no time would personal stories be a requirement for group participation. The course consisted of explaining the theory of the causes of blushing and exercises for participants to practice at home. The study determined that a decrease in fear of blushing was achieved as indicated by a significant reduction in points for the BTSQ. Although a cognitive group was not used as a control in the study, a difference of 30 point on the BTSQ, was comparable to the reductions reported in individual's scores who engaged in cognitive groups (Bögels & Voncken, 2008; Mulkens et al., 2001). Participants in the group also expressed that the group experience was positive, indicating that the psychoeducational group approach was perceived as safe enough for individuals with a social anxiety to effectively engage in a group setting (Dijk, Buwalda, & de Jong, 2012).
Choi et al. (2005) conducted a study in which group psychoeducation proceeded individual VR exposure for three of four sessions, for participants with panic disorder. A fourth session involved in vivo exposure with a therapist. The study reported significant changes in anxiety as reported by the State and Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970), Panic Belief Questionnaire (Greenberg, 1989), and Anxiety Sensitivity Index (Reiss, et al., 1986). Although the psychoeducation was performed in a group setting, it did not appear to effect the outcomes of the VR exposure as indicated by the significant reduction in anxiety. Therefore, according to the research performed by Choi et al. (2005), having other participants in the room during a psychoeducation session, did not increase the anxiety level in participants nor did it hinder the participants from learning skills to reduce anxiety.

The current study, as show in Figure 1, will investigate the effects of an individual and group psychoeducational session, followed by individual exposure sessions, on the outcomes of the VR exposure for fear of public speaking. A therapist/researcher will only be present for the initial psychoeducational session.

![Figure 1: Configuration of research design for administering individual and group psychoeducational sessions](image-url)
Research Questions and Hypotheses

Summary and research goals. The purpose of the present study was to examine the effectiveness of a less expensive form of VR exposure therapy in decreasing participants’ anxiety caused by fear of public speaking, in which the exposure therapy were administered without the aid of a therapist’s guidance throughout the exposure sessions. The study also examined the effectiveness of VR exposure on fear of public speaking following the administration of either one psychoeducational session in an individual or group setting compared to a waitlist control setting. Although decreasing time with the therapist to one psychoeducational session can reduce face-to-face therapy time and subsequently decrease the cost of treatment for patients, presenting the introductory session to several individuals at once can further increase these benefits (Botella & García-Palacios, 1999; Joinson, 1999; Lister et al., 2011; Richman et al., 1999; Wiederhold & Wiederhold, 2004).

In this study, the cost of treatment was further reduced by using a less expensive method of VR exposure. Whereas many researchers have used head-mounted displays to study VR exposure therapy (Vincelli et al., 2003), this study used the participants’ home PCs, thereby eliminating the need for expensive equipment or more than one session with the therapist. The introductory session conducted by the therapist consisted of psychoeducation on exposure therapy and relaxation techniques, as well as instruction on how to operate the software from a home computer.
For this experiment, participants were randomly placed into one of three groups: (a) I group, in which all experimental instructions and psychoeducation on VR exposure therapy were given in confidence on a one-to-one basis; (b) G group, in which participants were given the experimental instructions and psychoeducation on VR exposure therapy in the presence of others; or (c) WL group, the wait-list (control) group in which participants were given psychoeducation only. Each group (excluding the WL group) was asked to perform VR exposure daily over a one-week period, for a total of six exposures. The sessions were labeled Session 1 (the first treatment session) to Session 6 (the last treatment session).

All three groups of participants filled out the following self-report questionnaires before Session 1 and after Session 6: (a) Personal Report of Confidence as a Speaker (PRCS; Paul, 1966), (b) Self-Statements During Public Speaking (SSPS; Hofmann & DiBartolo, 2000), (c) the State and Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970), and (d) Personal Report of Communication Apprehension (PRCA-24; McCroskey, 1982) and e) the Fear Questionnaire (FQ; Marks & Mathews, 1979). Spiegler and Guervremont (2003) found that anxiety is influenced by an individual’s thoughts, feelings, and behavior (avoidance) of the feared stimulus. For the current study, the PRCA-24 was used to measure communication apprehension using participants’ thoughts toward different types of communication settings, such as groups, meetings, or public speaking (McCroskey, 1982). By contrast, the SSPS scale was used to assess negative and positive self-talk about public speaking (Hofmann & DiBartolo, 2000). The
STAI was used to examine the participants’ state and trait anxiety, and the FQ was used to examine avoidance behaviors.

During each individual session within the 2-week period, the participants in the I and G groups also rated their anxiety using the Subjective Units of Distress Scale (SUDS). Unlike the other self-reported measures, which were recorded before the first and last sessions only, the SUDS ratings were recorded before and after each individual session. Based on the experimental design and the literature review, several research questions and hypotheses were developed.

**Research Question 1.** Does VR exposure therapy decrease anxiety related to fear of public speaking, as shown by a decrease (increase) in self-reported scores after six therapy sessions?

*Hypothesis 1.* The mean PRSC scores of the G group and I group at the posttest, will be significantly different from the mean PRSC scores of the WL group at the posttest after adjusting the posttest means for differences among the groups at the pretest.

*Hypothesis 2.* The mean SSPS (positive) scores of the G group and the I group at the posttest will be significantly different from the mean SSPS (positive) scores of the WL group at the posttest, after adjusting the posttest means for differences among the groups at the pretest.

*Hypothesis 3.* The mean SSPS (negative) scores of the G group and the I group at the posttest will be significantly different from the mean SSPS (negative) scores of the WL group at the posttest after adjusting the posttest means for differences among the groups at the pretest.
**Hypothesis 4.** The mean STAI scores of the G group and the I group at the posttest will be significantly different from the mean STAI scores of the WL group at the posttest after adjusting the posttest means for differences among the groups at the pretest.

**Hypothesis 5.** The mean PRCA scores of the G group and the I group at the posttest, which will be significantly different from the mean PRCA scores of the WL group at the posttest after adjusting the posttest means for differences among the groups at the pretest.

**Hypothesis 6.** The mean avoidance subscale scores of the FQ of the G group and the I group at the posttest will be significantly different from the mean avoidance scores of the WL group at the posttest, after adjusting the posttest means for differences among the groups at the pretest.

**Research Question 2.** Is there a decrease in anxiety as measured by the SUDS ratings recorded before Session 1 and after Session 6, as well as at the beginning and end on each individual session?

**Hypothesis 7.** The I group will consistently show a reduction in SUDS ratings between individual sessions; therefore, there will be a significant within-subjects effect on the mean SUDS scores across the six repeated measures.

**Hypothesis 8: The G group will consistently show a reduction in SUDS ratings between individual sessions; therefore, there will be a significant within-subjects effect on the mean SUDS scores across the six repeated measures.**

**Research Question 3.** Is attrition higher when participants engage in the VR exposure therapy compared to a waitlist group?
Hypothesis 9. The I Group and G group will have dropout rates consistent with the WL groups.
Chapter 3. Method

Participants

For this experiment, each group consisted of 35 participants, as shown in Table 1.

Table 1

| Age and Gender Demographics of Participants who completed the treatment, for the I, G, and WL groups |
|-------------------------------------------------|-------------------------------------------------|
|-----------|-----------|-----------|-----------|--------|-------|
| I-Group   |           |           |           |        |       |
| Female    | 19        | 1         | 2         | 0      | 22    |
| Male      | 10        | 0         | 0         | 0      | 10    |
| G-Group   |           |           |           |        |       |
| Female    | 17        | 3         | 2         | 2      | 24    |
| Male      | 6         | 1         | 1         | 1      | 9     |
| WL-Group  |           |           |           |        |       |
| Female    | 26        | 1         | 0         | 0      | 27    |
| Male      | 5         | 1         | 0         | 0      | 6     |

Table 1 shows the distribution of age and gender for the present research. It was determined that three participants for the I group and two participants for the G group did not complete the post-questionnaire. In the WL group two participant did not complete the post-questionnaire. Six of the recruited participants were from the community, whereas 99 of the participants were recruited from the PSYC 1000 pool, indicating that 96% of the participants were students. Students were given bonus points towards their psychology class for participation. Four of the seven participants who did not complete the study responded to the researcher’s emails, to which they indicated that their lack of time to commit to the study was their main reason for dropping out. Only participants who completed both the pre- and post-questionnaires were included in the study. The
number of participants recruited was based on calculations estimating a large effect size of $f = 0.40$, alpha = 0.05, and beta = 0.80.

According to Paul (1960), participants who scored 20 or above out of 30 on the PRCS scale exhibit a high level or clinical level of anxiety. The current study determined that 51.6% of the I group was determined to have a clinical level of anxiety towards public speaking compared to 64.5% of the G group. Alternatively, the waitlist group only consisted of 35% of participants with a score of 20 or above.

Cohen (1988) suggested that $f = 0.1$ could be considered to represent a small effect; $f = 0.25$, a medium effect size; and $f = 0.40$, a substantial effect size. In a meta-analysis consisting of 21 studies of the effect of VR exposure on different anxiety disorders, Parsons and Rizzo (2007) indicated statistically large effects, ranging from .87 to 1.79 (Cohen’s $d$). The researchers also noted that the number of participants in VR exposure studies ranged from 4 to 30 (Parsons & Rizzo, 2007). Cohen (1992) suggested fixing the power at .80 ($b = .20$), with an alpha of .05, which is commonly used for research purposes.

**Procedure**

There were three groups, with 35 participants randomly assigned to each group. Participants in the I group had an individual meeting for the psychoeducation session. The G group had a group psychoeducation session, and the WL group (the control group) received a psychoeducation session, but was placed on the waitlist for treatment. For randomization purposes, the groups were each designated a number: the I group was
Group 1, the G group was Group 2, and the WL group was Group 3. Each group number was written on 35 pieces of paper (a total of 105 pieces) and placed in an envelope.

To recruit participants, notices were placed on billboards in counseling centers and other general public areas. Students enrolled in psychology classes were given information about the research and asked to contact Heather Lister if they were interested. As participants consented to participate in the research, they were given a code that was randomly picked out of the envelope (e.g., G-2, indicating G group, Participant 2 or I-3, indicating I Group, Participant 3).

The participants in the I group met individually with the researcher and were given the informed consent (see Appendix A). They were then asked to read and sign it. The researcher then provided instructions on how to use the VR software, which could be accessed online from the participants’ home computer. Each participant received a login name and password to enter the site. During the introductory session, the participants also received psychoeducation about anxiety and exposure therapy, and were asked to fill out a demographic sheet (see Appendix D) and a set of four self-reported questionnaires. During this session, participants were instructed on how to document their SUDS for the VR exposure session on the provided record sheet (see Appendix K). Participants recorded their SUDS ratings before and after the VR exposure exercise and were instructed to perform the daily routine for six sessions over a 1-week period. Six sessions has been determined to be an adequate number of sessions in which change in therapy has occurred (Draper et al., 200). At the end of the week, the four questionnaires that were administered in the introductory session were re-administered at the participants’
homes without the researcher present. Participants then returned to the research lab for a debriefing session (see Appendix K).

The G group underwent the same procedure, except for the psychoeducation session. For the psychoeducation session, between 4 and 8 participants received the psychoeducation at the same time. As with the I group, this session included signing the informed consent (see Appendix B), information on how to run the VR software and how to record the SUDS ratings, and psychoeducation on anxiety and VR exposure therapy. The same demographic sheet and four questionnaires administered in the psychoeducation session for the I group were administered to the G group and readministered after the 1-week period of six VR sessions. At no point did the participants receive one-on-one time with the researcher.

The WL group engaged in two sessions that consisted of the psychoeducation session and administering the questionnaires only. The participants received an informed consent to read and sign (see Appendix C). Participants filled out the same demographic sheet and four questionnaires, that were administered for the I and G groups, before and after the 1-week period. After the second set of questionnaires was administered, the participants returned to the lab and were debriefed. At this time, they were offered the same access to the VR exposure software received by the participants in the I and G groups.

**Measures**

It has been estimated that fear of public speaking affects 77% of the general population (Furmark, Tifors, & Everz, 1999); however, there are only a few scales
available that specifically measure public speaking anxiety (Hook, Clifford, & Valentiner, 2008). The following scales specifically aim to measure fear of public speaking.

**Personal Report of Confidence as a Speaker (PRCS).** The PRCS is the most direct and most commonly used measure of public speaking anxiety (Hofmann & DiBartolo, 2000). It measures participants’ ability to assess their thinking about public speaking using a 30-item true-or-false inventory developed by Paul (1966). The scale is a shortened version of Gilkinson’s (1942) original assessment of fear of public speaking and is useful for screening participants for fear of public speaking as well as for change before and after treatment. According to Klorman, Weerts, Hastings, Melamed, and Lang (1974), the shortened version of the PRCS showed high internal reliability, with values of 0.92 for women and 0.91 for men (Lombardo, 1988); however, the test-retest reliability is unknown. Daly (1978) determined that the PRCS had sufficient convergent validity when compared to 12 measures of social and speech anxiety, ranging from .52 to .97.

**Self-Statements During Public Speaking (SSPS).** The SSPS assesses fearful cognitions experienced during public speaking. The perception of self-statements typically experienced during public speaking was assessed using a 10-item questionnaire with a 5-point Likert scale. Developed by Hofmann and DiBartolo (2000), the SSPS consists of five positive self-statements (P) and five negative self-statements (N) involving speech-related thoughts rated on a 5-point Likert scale. Although the number of items is too limited to assess a full range of cognitions associated with public speaking anxiety, the scale is useful for denoting changes in cognitions after treatment (Hofmann
Cronbach’s alpha is high for both SSPS-P (alpha = .84) and SSPS-N (alpha = .83) (Hofmann & DiBartolo, 2000).

Hofmann and DiBartolo (2000) determined convergent and discriminant validity to be highest with the PRCS. The correlations between the PRCS and the SSPS-P and the SSPS-N subscales are as follows: $r = -.58$ (positive statements) and $r = .67$ (negative statements), $p < .01$ (for P and N). According to research performed by Osorio, Crippa, and Laureiro (2013), the SSPS scale is more sensitive to clinical cases. Anderson et al., (2005) also utilized the SSPS scale in a study investigating the use of virtual reality for exposure in CBT for fear of public speaking in which change in both negative and positive thought patterns were detected.

**Personal Report of Communication Apprehension (PRCA-24).** The PRCA-24 (McCroskey, 1982) measures communication apprehension, which is defined as the intensity of the fear or anxiety associated with either real or anticipated encounters in which oral communication will be needed. This scale not only measures changes in views surrounding public speaking but also addresses dyadic situations (e.g., job interviews), small group discussions, and meetings or classes (McCroskey, 1982). The communication apprehension scores are determined by calculating the sums of responses across four contexts of communication (public, small group, meeting, and interpersonal) rated on a 5-point Likert scale. A score for each context, as well as an overall communication apprehension score, can be calculated.

According to McCroskey, Beatty, Kearney, and Plax (1985), the PRCA-24 is internally consistent, with a high reliability of 0.93–0.98. Rubin, Graham, and Mignerey
(1990) also reported that the measure was stable across time, with test-retest coefficients greater than .80. According to Ayres and Hopf (1990), PRCA-24 scores reflect changes achieved due to therapy. A number of studies have shown that the content validity of the PRCA-24 is strong (McCroskey, 1982; McCroskey et al., 1985).

**State-Trait Anxiety Inventory (STAI).** The STAI is a self-report questionnaire assessing general trait and current state anxiety (Spielberger et al., 1970). The STAI consists of two scales, each containing 20 items. One scale contains items related to state anxiety whereas the other contains items related to trait anxiety. The total score determines which of the two types of anxiety is prevalent. The items are answered on the basis of a 4-point scale and address such areas as apprehension, tension, worry, and nervousness. For this scale, internal consistency was observed with a Cronbach’s alpha value of 0.83 to 0.89 for each of the 40 items, and a Cronbach’s alpha of 0.86 was observed for the total scores (Spielberger et al., 1970). According to Gros, Simm, Antony, and McCabe (2007), the STAI has a high test-retest reliability of 0.88. The STAI also displays evidence of high concurrent validity with the IPAT Anxiety Scale (Cattell & Scheier, 1963) and the Taylor Manifest Anxiety Scale (TMAS; 1953) with correlations ranging from .73 to .85. Evidence also indicates convergent and divergent validity with a correlation of .70 to the Cornell Medical Index, an index that measures medical symptoms that are linked with high STAI scores.

**Fear Questionnaire.** The FQ (Marks & Mathews, 1979) includes three 5-item subscales: global phobic avoidance; associated anxiety; and main phobia level of avoidance. The scores for each item range from 0 to 40. The total phobia score, which
ranges from 0 to 120, is the sum of the scores on the three subscales. According to Marks and Mathews (1979), the FQ and its subscales have a high test-retest reliability of 0.85 to 0.89. Research also has established that the FQ has a strong internal consistency of 0.76 to 0.84 (Cox, Swinson, Parker, & Kuch, 1993). Arrindell and Buikhuisen (1992) reported that the FQ generally is unaffected by social desirability response bias. According to Zuuren (1988), each of the scales on the FQ has sufficient internal consistency when comparing the scores of people with social phobia, agoraphobia, and simple phobia. The current study will be examining the main phobia level of avoidance subscale.
Chapter 4. Results

For this study, only participants that completed the treatment were included in the study. Therefore, there were no missing variables or data cleaning necessary. On inspection of the distribution for normality, it was determined that there were no outliers. In a preliminary analysis of the data, a repeated-measure MANOVA was conducted, with the posttest scores entered as the dependent variable and group as the independent variable, indicating that the assumption of homogeneity of variance was violated. Box’s test produced a significant value ($p \leq 0.05$). Therefore, an ANCOVA was conducted in which the posttest scores were entered as the dependent variable, the pretest scores as the covariate, and the three groups as the fixed factors. It is essential that the theoretical assumptions of the ANCOVA are satisfied in order for the results to be valid (Miller & Chapman, 2001; Rutherford, 2001). The assumptions are as follows: (1) for each independent variable, the relationship between the dependent variable ($y$) and the covariate ($x$) is linear; (2) the lines expressing these linear relationships are all parallel; and (3) the covariate is independent of the treatment effects (Miller & Chapman, 2001). Violating these assumptions invalidates the ANCOVA; therefore, only the results that met the assumptions are presented below. A planned contrast was also conducted to determine if there was a significant difference between the I group vs WL group and the G group vs WL group in which posttest scores were entered as the dependent variable.
According to Dimitrov and Rumrill (2003), an ANCOVA may be used to determine if there are significant differences between pretest and posttest scores before and after a treatment is used for two or more groups of participants. ANCOVA is effective in situations in which there are differences between the scores of the groups at the pretest that, in turn, will affect the outcome of the posttest scores. ANCOVA is used to calculate the differences between pretest scores and to adjust posttest mean scores accordingly. Therefore, on analysis, ANCOVA compares the mean posttest scores of the groups with the assumption that the mean score of each group was exactly the same at the pretest.

Although the hypothesis did not suggest the G and I groups would be significantly different, for informational purposes, the mean posttest scores were compared and an independent sample t-test (which assumes equal variances, but does not assume that the sample sizes are equal in each group), was performed. The t-tests were performed using the original means. This was due to the adjusted means not having a standard error which is needed in order to perform a t-test. An issue that can occur when conducting several t-tests in one study is that Type I error rate (i.e., the chance of determining the test to be significant at the .05 level, when it is not significant) is elevated. Therefore, a Bonferroni correction (Abdi, 2007) can be conducted in order to avoid an elevated risk of Type I errors. This involves reducing the significance level from the conventional level of alpha = .05 to alpha = .05/n (where n = the number of tests performed). The alpha level used for the six t tests is, therefore, .05/6 = .008.
Research Question 1

As the majority of the results met the assumptions, ANCOVA was chosen as the optimal method to address Research Question 1: Does VR exposure therapy decrease anxiety related to fear of public speaking, as shown by a change in self-reported scores after exposure to the virtual audience? Hypothesis 1 states that the mean PRCS scores of the G group and I group at the posttest will be significantly different from the mean PRCS scores of the WL group at the posttest after adjusting the posttest means for differences among the groups at the pretest.

For the purposes of performing an ANCOVA for Hypothesis 1, the PRCS posttest scores were entered as the dependent variable, the pretest scores as the covariate, and the three groups as the fixed factors.

Correlation between the pretest and posttest scores with homogeneity of regression slopes was reflected by the plot of the posttest scores vs. the pretest scores stratified by the three groups in Figure 2.
Figure 2. PRSC posttest scores vs. PRSC pretest scores

As indicated by Levene’s test $F(2, 94) = 2.01; p = .139$, the assumption of homogeneity of variance was not violated. According to the results, there was a significant difference between the mean posttest scores of the three groups at $\alpha = .05$, $F(2, 93) = 6.12, p = .003$. However, the effect size (partial $\eta^2 = .116$) was relatively small. Figure 3 displays the mean posttest scores assuming a constant mean group score at the pretest ($M = 18.69$) as calculated by the ANCOVA.

Planned contrasts revealed that the mean PRCS posttest scores for the I group, $p = 0.001$, 95% CI $[-6.46, -1.69]$, and the G group, $p = 0.018$, 95% CI $[-5.37, -0.53]$, were significantly lower when compared to the mean PRCS posttest score for the WL group. A $t$ test performed on the posttests for the I and G group indicated that there was not a significant effect for group, $t(61) = -1.71, p = .092$. The results of the ANCOVA supported Hypothesis 1, as the mean PRSC scores of the G and I groups were both
significantly lower than the mean PRSC score of the WL group.

Figure 3. PRSC scores at the posttest after adjusting for group differences at the pretest.

Hypothesis 2 stated that the mean SSPS-P scores of the G group and I group at the posttest will be significantly different from the mean SSPS-P scores of the WL group, after adjusting the posttest means for differences among the groups at the pretest. For the purposes of performing the ANCOVA for Hypothesis 2, the posttest scores for the SSPS-P statements were entered as the dependent variables, the respective pretest scores as the covariates, and the three groups as fixed factors. Correlation between the pretest and posttest scores with homogeneity of regression slopes was reflected by the plot of the posttest scores vs. the pretest scores stratified by the three groups in Figure 4.
As indicated by Levene’s test, $F(2, 93) = .19; p = .832$, the assumption of homogeneity of variance was not violated. There was a significant difference between the mean posttest scores of the three groups at $\alpha = .05$, $F(2, 92) = 6.99, p < .001$. However, the effect size (partial $\eta^2 = .132$) was relatively small. The mean posttest scores assuming a constant mean group score at the pretest ($M = 14.08$) are presented in Figure 5.
Planned contrasts revealed that the mean SSPS-P posttest scores for the I group, $p = 0.003$, 95% CI [0.96, 4.71], and the G group, $p = 0.046$, 95% CI [0.03, 3.82], were significantly higher when compared to the mean SSPS-P posttest score for the WL group. A $t$ test performed on the posttest scores for I and G group indicated that there was not a significant effect for group, $t (60) = 1.01$, $p = .315$. The results of the ANCOVA supported Hypothesis 2, as the mean SSPS-P scores for the I and G groups at the posttest were significantly higher than the mean SSPS-P score of the WL group.

Hypothesis 3 stated that that the mean SSPS-N scores of the G group and I group at the posttest will be significantly different from the mean SSPS-N scores of the WL group after adjusting the posttest means for differences among the groups at the pretest.
For the purposes of performing the ANCOVA for Hypothesis 3, the posttest scores for the SPSS-N statements were entered as the dependent variables, the respective pretest scores as the covariates, and the three groups as the fixed factors. Correlation between the pretest and posttest scores with homogeneity of regression slopes was reflected by the plot of the posttest scores vs. the pretest scores stratified by the three groups in Figure 6.

![Figure 6. SSPS posttest scores vs. SSPS pretest scores](image)

As indicated by Levene’s test, \( F(2, 93) = 1.03, \ p = .360 \), the assumption of homogeneity of variance was not violated. The results suggested that there was a significant difference between the posttest scores, \( F (2, 92) = 3.04, \ p = .042 \), with a small effect size \( (\eta^2 = .062) \). The mean posttest scores, assuming a constant mean group score at the pretest \( (M = 10.96) \), are presented in Figure 7.
Figure 7. SSPS-N scores at the posttest after adjusting for differences at the pretest.

Planned contrasts revealed that the mean SSPS-N posttest score for the I group, \( p = 0.025 \), 95% CI [-4.43, -0.31], was significantly lower than the mean SSPS-N posttest score for the WL group.

A \( t \) test performed on the posttest scores for the I and G group indicated that there was not a significant effect for group, \( t(60) = -2.05 \), \( p = .044 \). The results of the ANCOVA partially supported Hypothesis 3, as the mean SSPS-N score of the I group at the posttest was significantly lower than the mean SSPS-N score of the WL group.

Hypothesis 4 stated that that the mean STAI scores of the G group and I group at the posttest will be significantly different from the mean STAI scores of the WL group, after adjusting the posttest means for differences among the groups at the pretest. For the purposes of performing the ANCOVA for Hypothesis 4, the posttest scores for STAI
state anxiety were entered as the dependent variable, the pretest scores as the covariate, and the three groups as the fixed factors. Correlation between the pretest and posttest scores with homogeneity of regression slopes was reflected by the plot of the posttest scores vs. the pretest scores stratified by the three groups in Figure 8.

![Figure 8. STAI posttest scores vs. STAI pretest scores](image)

As indicated by Levene’s test, $F(2, 91) = .395; p = .675$, the assumption of homogeneity of variance was not violated for the state condition. There was a significant difference between the mean posttest scores of the three groups at $\alpha = .05$, $F (2, 90) = 3.19, p = .045$. However, the effect size (partial $\eta^2 = .066$) was very small. Figure 9 displays the mean posttest scores, assuming a constant mean group score at the pretest ($M = 38.21$) as calculated by the ANCOVA.
Figure 9. STAI state scores at the posttest after adjusting for group differences at the pretest.

Planned contrasts revealed that the mean STAI state posttest scores for the I group, $p = 0.127$, 95% CI [-8.77, 1.11], and the G group, $p = 0.310$, 95% CI [-2.39, 7.46], were not significantly lower than the mean STAI state posttest score for the WL group. A $t$ test performed on the posttest scores for the I and G group indicated that there was not a significant effect for group, $t(59) = -2.17$, $p = .034$. The results of the ANCOVA did not support Hypothesis 4 as the mean STAI state scores at the posttest did not show a significant difference between the groups.

Hypothesis 5 that the mean PRCA (public speaking) scores of the G group and I group at the posttest will be significantly different from the mean PRCA (public speaking) scores of the WL group after adjusting the posttest means for differences among the groups at the pretest.
For the purposes of performing the ANCOVA for Hypothesis 5, the posttest scores for the PRCA public speaking subscale were entered as the dependent variable, the pretest scores as the covariate, and the three groups as the fixed factors. Correlation between the pretest and posttest scores with homogeneity of regression slopes was reflected by the plot of the posttest scores vs. the pretest scores stratified by the three groups in Figure 10.

![Figure 10. PRCA posttest scores vs. PRCA pretest scores](image)

As indicated by Levene’s test, $F(2, 92) = .014; p = .986$, the assumption of homogeneity of variance was not violated. There was a significant difference between the mean posttest scores of the three groups at $\alpha = .05$, $F(2, 91) = 4.42$, $p = .015$. However, the effect size (partial $\eta^2 = .088$) was relatively small. The mean posttest scores, assuming a constant mean group score at the pretest ($M = 22.23$), are presented in Figure 11.
Figure 11. PRCA (public speaking) scores at the posttest after adjusting for group differences at the pretest.

Planned contrasts revealed that the mean PRCA public speaking posttest score for the I group, \( p = 0.004 \), 95% CI [–4.96, –0.99], was significantly lower than the mean PRCA public speaking posttest score for the WL group. A \( t \) test performed on the posttest scores for the I and G group indicated that there was not a significant effect for group, \( t(60) = -1.40, p = .166 \). The results of the ANCOVA partially supported Hypothesis 5, as the mean PRCA public speaking score of the I group at the posttest was significantly lower than that of the WL.

Hypothesis 6 stated that the mean avoidance scores for the FQ of the G group and I group at the posttest will be significantly different from the mean avoidance scores for the FQ of the WL group, after adjusting the posttest means for differences among the groups at the pretest. For the purposes of performing the ANCOVA analysis for
Hypothesis 6, the posttest scores for avoidance were entered as the dependent variable, the pretest scores as the covariate, and the three groups as the fixed factors. As indicated by Levene’s test, \( F(2, 96) = 28.93; p = .000 \), the assumption of homogeneity of variance was violated and therefore the results of the avoidance subscale scores were not analyzed.

**Research Question 2**

This section presents the evidence to address Research Question 2: Is there a decrease in anxiety as suggested by the SUDS ratings recorded before Session 1 and after Session 6, as well as at the beginning and end on each individual session for each group. To examine Research Question 2, a mixed-model ANOVA with repeated measures was conducted on the SUDs score, before and after the six sessions, in which the SUDS ratings were entered as the dependent variable and time (pre, post) and the three groups as the independent variables. This model was justified because (a) there were more than two measures of the dependent variable (time and session), and (b) the variance of the SUDs scores was divided into three sources. These three sources were as follows: (a) within-subjects variance due to the two repeated measures collected from each participant before and after each session.; (b) within-subjects variance due to the 12 repeated measures collected from each participant over time; and (c) between-subjects variance, due to the differences between I and G group.

According to the results, the SUDS scores changed significantly over time \( F(1.92, 117.16) = 65.90, p < .001 \) with a small effect size \( (\eta^2 = .08) \). There were significant differences in the SUDS scores before and after the sessions, \( F(1, 61) = 89.35, p < .001 \), with a large effect size, \( \eta^2 = .59 \). Although it was not hypothesized due to
a lack of literature support, it was determined that there was no significant differences in the SUDS scores between the groups, and there were no significant interactions. This suggests support for Hypothesis 7, which stated that the I group will show a reduction in SUDS ratings between individual sessions; therefore, there will be a significant within-subjects effect on the mean SUDS scores across the six repeated measures. It also supports Hypothesis 8, which stated that the G group will show a reduction in SUDS ratings between individual sessions; therefore, there will be a significant within-subjects effect on the mean SUDS scores across the six repeated measures.

Figures 12 and Figure 13 demonstrate the significant within-subjects effects on the mean SUDS scores before and after the six sessions for each group. The bar charts show (a) how the mean SUDS scores declined progressively across time over the six sessions for each group setting and (b) how there was a consistent decrease in the scores after each session compared to before each session.
Figure 12. Mean SUDS scores prior to and after exposure to a virtual audience for I group.

Figure 13. Mean SUDS scores prior to and after exposure to a virtual audience for G group.
Research Question 3

This section presents the evidence to address Research Question 3: Is attrition higher when participants engage in the VR exposure therapy compared to a waitlist? Hypothesis 9 stated that the I and G group would have a participation rate consistent with the WL groups. To analyze this hypothesis, a chi-square test was conducted. After the Pearson’s $\chi^2$ computation was conducted, it was determined that there was no significant association between the number of the students in each setting and the frequencies of dropping out ($\chi^2 (2) = 1.894, p = .388$). The cross-tabulation is presented in Figure 9. Overall, assignment to a particular treatment group did not affect the dropout rate.

Table 2

Cross-tabulation of Frequencies of Dropping Out vs. Frequencies in Three Settings

<table>
<thead>
<tr>
<th></th>
<th>Setting</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I (One-to-one Instruction)</td>
<td>(G) Group</td>
</tr>
<tr>
<td>Dropped out</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Not dropped out</td>
<td>31</td>
<td>32</td>
</tr>
<tr>
<td>Total</td>
<td>35</td>
<td>35</td>
</tr>
</tbody>
</table>
Chapter 5. Discussion

This study aimed to examine the effectiveness of a VR-based exposure intervention as a means of reducing public speaking anxiety. Analysis of the results indicated that the intervention was effective in many respects, as many of the self-reported questionnaires indicated a significant improvement in participants’ overall thoughts, behavior, and apprehension around the fear of public speaking.

Based on a comprehensive review of the literature, this study was the first to investigate the effect of VR exposure on fear of public speaking using a low cost method of VR, without the direct intervention of a therapist. It was also the first to compare the administration of a single psychoeducation session to two different groups (individual session and group session), prior to exposure to a virtual audience, to a waitlist group. The main finding was that participants in the I groups when compared to the WL group, showed a significant difference in their subjective thoughts regarding ability to speak publicly. The results also indicated that participants in the G group did differ from the WL group significantly in their subjective thoughts regarding ability to speak publicly, however, for self-reports measuring apprehension, anxiety and negative thoughts about self towards public speaking, the G group did not significantly differ from the WL group.

Research Question 1

The results supported Hypothesis 1, as the mean PRCS scores of the G and I group were significantly lower than the mean PRCS scores of the WL group. This is consistent with the findings of Anderson et al. (2013) in which a significant difference on the PRCS was determined after VR exposure to a virtual audience. Anderson et al. (2013)
investigated the difference between an in vivo exposure group and a VR exposure group compared to a waitlist group. An ANCOVA was used to determine outcomes on the PRCS, which showed a significant difference between the VR group and the waitlist, as well as the in vivo exposure group and the waitlist. The effect size for the decrease in the PRCS scores for the current study was relatively small compared the Anderson et al. (2013) study which, subsequently, used a clinical population for the research. As the PRCS is composed of only 30 questions, a non-clinical population will record a lower baseline level at pretest compared to the clinical population. This is congruent with a meta-analysis by Kraaij, et al. (2010) investigating change in depression and anxiety symptoms when utilizing self-help treatments. Although change was observed, the study suggested that the small effect sizes determined for depression and anxiety may have been due to a failure or inability to recruit individuals with scores within clinical levels at baseline. This may account for the small effect size in the current study as the population was composed of a clinical, participants with high fear of public speaking, and non-clinical, participants, with medium to low fear of public speaking, combination.

Therefore, the decrease in anxiety measured by the PRCS scores, in the current study, may be smaller than a pure clinical population.

The Anderson et al. (2013) study also included a high level of therapist involvement in which the therapist continually manipulated the scenarios throughout the sessions. In the current study, the exposure was completely self-administered, which may have decreased the level or intensity of involvement in the actual exposure itself, as a therapist was not present to observe participants engagement in the exposure. Therapists were also
not present to monitor whether the relaxation techniques were being performed properly by participants. As the PRCS is the most commonly used scale in determining changes in anxiety related to fear of public speaking (Hook et al., 2008), the results also indicated that delivering the psychoeducational information in a group setting did not hinder participants from increasing their confidence in public speaking.

The results partially supported Hypotheses 2 and 3 by suggesting that after exposure to a virtual audience, participants who met in individual and group initial psychoeducational settings, increased their positive self-statements compared to the waitlist group. However, only participants who met with the researcher in an individual setting decreased their negative self-statements. The lack of significant results for the participants in a psychoeducational group setting, are inconsistent with the results of the study by Wallach et al. (2009), in which outcomes were compared for participants who received both VR and CBT exposure to the waitlist group. For the Wallach et al. (2009) study, the negative statements towards public speaking were significantly lowered after exposure, however, all the participants in the Wallach et al. (2009) study reported having clinical levels of anxiety when thinking about public speaking. Also, with the aid of a therapist, cognitive components, such as cognitive restructuring, were used to replace participants’ thoughts with responses that were viewed as more rational. In the present study, neither the researcher nor any other member of the team had any interactions with the participants after the initial psychoeducational session. Furthermore, participants with clinical and non-clinical levels of fear of public speaking were included in the research.
As Osorio, Crippa, and Laureiro (2013) determined SSPS to be more sensitive to clinical cases, and as the SSPS-N is only comprised on 10 questions, a combined clinical/non-clinical population would potentially indicate very little change in self-statements (partial $\eta^2 = .062$). For example, the non-clinical population would not express a large difference in negative self-statements such as "I'm going to bomb this", before and after the VR exposure. For positive self-statements however, the results indicated a significant difference for the I and G group when compared to the WL group, suggesting VR exposure can be effective in creating change in positive self-statements in combined clinical/non-clinical samples. As Moser (2014) determined that changing negative self-talk can take more time and effort than increasing positive self-statements, it is understandable that without the aid of a therapist to challenge thoughts, the rate of change for negative self-statements may be small.

It should also be noted, that according to figure 7, there is a difference, from pretest to posttest in mean scores of the SSPS-N, in the G group. Although the difference is not significant, the graph does suggest that there is a decrease in participants’ negative self-statements towards public speaking. Examining the characteristics of the entire group more thoroughly, as well as the effects of clinical vs nonclinical populations, may bring further insight into the lack of significance between the groups.

Hypothesis 4, which suggested that the mean STAI scores of the G group and I group would be significantly different from the mean STAI scores of the WL group, was not supported, as the differences between the I and G group and the waitlist group were determined to not be significant. This is inconsistent with the finding of the Choi et al.
(2005) who found a significant reduction in STAI state scores after performing Experiential Cognitive Therapy for panic disorders. STAI scores were measured pretreatment and after four 2-hour sessions, each consisting of group psychoeducation, followed by individual VR exposure. The fourth session consisted of an in vivo exposure to a tower, bus and cable car. As with many of the studies to date, cognitive therapy was administered with the VR exposure to a clinical population (Anderson et al., 2005; Andersson et al., 2013; Vincelli et al., 2003; Wallach et al., 2009). In the Choi et al. (2005) study, a reduction in STAI scores indicated that administering group psychoeducation, before the individual VR exposure, did not appear to affect the outcome of the research. It should be noted, however, that the research also included a fourth in vivo session, in which participants were exposed to real life situations, and therefore, it is hard to determine which therapeutic approach (cognitive therapy, VR exposure, or in vivo exposure) contributed to the reduction of anxiety, as only a t-test was performed.

Another factor influencing the STAI results may include participants discussing the fear of public speaking in the group setting. During this session, the participants expressed experiencing anxieties that were potentially normalized by the overall group, thereby, eliminating their feelings of isolation. This finding was consistent with the research of Siddle et al. (2006), who found that group settings decreased participants’ hopelessness. Although the current research was not group therapy, and group cohesion not formed, returning home to fill out the STAI may have sparked fears in participants about being alone and without support. Therefore, the increase in current anxiety could potentially be a reflection of answering the questions without group support.
Hypothesis 5, which suggested that the mean PRCA scores of the G group and I group would be significantly different from the mean PRCA scores of the WL group, was partially supported for the subscale of public speaking. Participants who met with the researcher individually for the initial psychoeducational setting had significantly lower scores for the public speaking scale than the participants who did not receive the treatment; however, the effect size was relatively small. Anderson et al. (2005) also utilized the PRCA while investigating VR exposure for fear of public speaking. The study concluded a significant difference for pre and posttest scores for the PRCA with a large effect size of 1.1 (Cohen’s d). However, the study was comprised of 8 individuals, all who met the diagnostic criteria for social phobia, with a strong component of fear of public speaking. Although the PRCA is the instrument most widely used to measure communication apprehension, as it allows researchers to obtain subscores in the area of public speaking, dyadic interaction, small groups, and large groups, it is also less dependable than other measures due to the small number of items on each subscale (McCroskey, 1982). For Anderson et al. (2005), the scale was sufficient to determine change within a clinical population. For the current research, with a combined clinical/non-clinical population, although change in apprehension did occur, the change was relatively small. For researchers interested in examining public speaking anxiety alone, the Personal Report of Public Speaking Anxiety may be a better and more accurate choice over the public speaking subscore from the PRCA as the scale is comprised of a larger number of items (McCroskey, 1982).
Although the results indicate that the difference between the mean pre and posttest scores are not significant, figure 11 does suggest a reduction in apprehension towards public speaking after the VR exposure. As Kraaij (2010) does suggest that utilizing clinical vs non-clinical populations can produce significantly different results for anxiety and depression measures, the combination of the clinical/nonclinical sample may have reduced the mean difference between the scores. As stated in the methods section, the PRCS is used as a screening tool for fear of public speaking, in which it has been determined that a score of 20 and above represents a high level of anxiety towards public speaking (Paul, 1960). This may suggest that the higher clinical population in the G group contributed to significantly higher pretest scores, which would indicate that a greater change in the posttest scores would be needed in order for the group to be significantly lower that the waitlist group. Therefore, although the means were corrected to be equal at pretest in the ANCOVA, this did not account for the variability in clinical vs non-clinical population.

The main phobia level of avoidance subscale of the FQ was also not analyzed due to the violation of the ANCOVA assumptions, therefore, the change in avoidance behaviors could not be evaluated. According to Mizes and Crawford (1986), the FQ revealed significant differences among the sexes and different age groups in their self-reports. For example, college woman reported more fears than college men, as did adults vs. high school-age participants. The variety of ages and genders represented among participants in the current study, may have contributed to the variation in the scores; hence, the ANCOVA assumptions were violated. Michelson and Mavissakalian (1983)
suggested that the FQ was very good in reporting concerns for people with phobias; however, there was no normative information for the non-clinical or general population. As it is not likely that a group of people with public speaking anxiety will be restricted to a specific age or gender, future research might include an alternative measure such the Multidimensional Experiential Avoidance Questionnaire (MEAQ) (Gámez, Chmielewski, Kotov, Ruggero, & Watson, 2011). Although the FQ was utilized due to it being administered in other studies investigating anxiety (Marks & Mathews, 1979; Teachman, Marker, & Clerkin, 2010; Olges, Lambert, Weight, & Payne, 1990), the MEAQ is a 62-item self-report which also measures multiple dimensions of experiential avoidance, including distress aversion, behavioral avoidance, distraction and suppression, repression and denial, procrastination, and distress endurance. It exhibits convergence with other measures of experiential avoidance while allowing for examination of a larger range of avoidance experiences (Gámez et al., 2011). A brief version of the questionnaire has been validated using university student and community members. The internal consistency was rated high and there did not appear to be a gender or age bias within the results, which may be a better fit for future studies (Gamez et al., 2014).

**Research Question 2**

The SUDS ratings supported the hypothesis that the treatment groups would show a decrease in anxiety after each individual session and after the six exposure sessions. As Figures 7 and 8 indicate, the mean SUDS ratings declined consistently from session to session for both treatment groups, before and after the individual session, as well as from before the first session to after the last session. The VR exposure did elicit anxiety in
participants, as shown by their SUDS ratings after each individual session. If participants did not feel threatened by the presence of a virtual audience, then the SUDS rating would have indicated no threat (“0”) after the first session.

The participants’ perceived threat before each exposure indicated that the virtual audience, like a real audience, did provoke anxiety. This finding was inconsistent with the study by Harris et al. (2002), in which their SUDS ratings did not significantly change over time. As the authors suggested, the lack of change in their study may have been due to the changing intensity of the speeches over the sessions (the speech in Session 4 was harder and required more concentration than in Session 2). The lack of change in the SUDS ratings may also indicate that Harris et al. (2002) did not create a fear hierarchy in their study, as suggested by Wolpe (1969) for reducing anxiety, but introduced novel situations for the participants for each session. The current research did not allow for an increase or decrease in speech intensity as the assignment was for participants to read the same speech of their choosing for each exposure. Therefore, the variable of speech difficulty was not introduced, and participants were able to reduce their anxiety over several exposures. Future research may examine the effect of allowing participants to reduce their anxiety using the same speech over several sessions, and when the SUDS ratings have lowered to an acceptable level (2-3), introduce a new speech to examine how the SUDS ratings are affected by the novel situation.

**Research Question 3**

The results supported the hypothesis that there would be no difference in dropout rates between the treatment groups and the waitlist control group. Hembree (2003)
determined that on average 20.5% of participants drop out of treatment early when engaging in different types of exposure therapy for PTSD. The authors also determined that other treatments such as supportive counselling, waitlist, and relaxation elicited an average dropout rate of 11.4%, which may suggest that participants are more likely to tolerate this type of intervention. In the current study, the I group exhibited an 11.4% dropout rate and the G group an 8.5% dropout rate. This may indicate that VR is more tolerable for exposure therapy than the traditional in vivo and in vitro treatments, which is consistent with research conducted by Castro et al. (2014). Castro et al. (2014), in a study examining the effect of VR exposure on agoraphobia, determined that VR exposure therapy had a lower dropout rate compared to other treatments. The authors suggested that VR exposure may be more conducive with treatment compliance as it is less anxiety provoking that real life situations. This is also supported by several studies in which VR was determined to create a safe environment for participants, while maintaining the ability to elicit anxiety equal to in vivo situations (Emmelkamp et al., 2001; Emmelkamp, Bruynzeel, Drost, & van Mast, 2001; Weiderhild & Wiederhold, 2006).

In contrast to the research discussed in the literature review, this study showed that outside of a computer and the internet, no other software or expensive equipment such as a head-mounted display is necessary to deliver effective VR exposure therapy. Although the cost of the software would be variable, it could potentially range from $0.00 - $1000.00. Therapists could chose to either send individuals to a specific application, with the cost being placed on the client, or the therapist could potentially buy a license for the software and direct a client to the website for free. Future research may examine the
difference between utilizing a PC and other modes of delivering the VR, such as tablet or smartphone, which would allow clients to access software or applications wherever data or cell service is available.

Several factors may have influenced the small effect size in the current study. As the researcher placed participants in the three different groups randomly, it was not discovered until after the research was conducted that the clinical to non-clinical participant ratio was quite different for each group. The G group reported a higher level of participants in the clinical level of anxiety for public speaking compared to the I group, which subsequently reported a higher clinical level of anxiety compared to the waitlist group. Farrand and Woodford (2013) suggested, in a meta-analysis on CBT self-help for anxiety, depression and physical symptoms, that larger treatment effects were established when participants reported higher levels of severity at baseline. As the current study contained groups with unequal levels of clinical/non-clinical populations, the imbalance of severity may have also had an impact on the differences between the groups before and after treatment. Therefore, the different levels of severity within the groups, would cause the groups to experience change in mean scores at different rates, thereby, in the current study, causing small effect sizes.

The scales utilized in the current study may have also influenced the effect sizes. Six scales and inventories for this study were chosen to measure a change in thoughts, feelings, and behaviors surrounding the fear of public speaking. Although the 6 tests have been used in several studies examining exposure and the fear of public speaking in past research, the scales appear to be sensitive to clinical populations and, therefore, are not as
rigorous when administered to non-clinical populations (Hook et al., 2008; McCroskey, 1982; Osorio, Crippa, & Laureiro, 2013). Although a difference from pre to posttest was suggested in several of the measures, the sensitivity of the scales may have impacted the effect sizes, causing the study to be considerably underpowered.

To increase effect size and improve power, utilizing a therapist in administering the VR exposure therapy may be beneficial (Farrand and Woodforth, 2015). Bower and Gilbody (2005) indicated that utilizing paraprofessionals to guide participants through the treatment, may also reduce time and monetary costs, while reducing symptomology significantly. The current study did not compare self-administered VR exposure to therapist supported VR exposure; however, understanding the perfect balance of professional help and self-administration, in order to obtain personal gains and maintain a low cost, would be beneficial to this research and may increase effect sizes.

As stated in the result section, a comparison was made between the I and G group for all scales by performing a t-test. There were no significant differences between the I and G group for any of the variables, however this should be observed with caution. As six test were utilized, in order to avoid a Type I error, a Bonferroni correction was implemented, creating a significant level of .008. Therefore, this analysis may be at risk for a Type II error, the failure to reject the notion that there is no significant difference between the I and G group. Although the t-test indicated no significant differences between groups for an alpha of .008, it was determined on observation, that there were significant differences, for the self-reports in research question 1, when using an alpha of .05.
It was also determined that the I group reported a significant difference when compared with the waitlist for the SSPS-N, STAI and the PRCA, however, the G group reported a lack of significant differences for the same measures. Therefore, differences were noted between the I and G group at posttest. The ANCOVA performed accounted for the difference in scores at pretest, however, it did not account for the different levels of severity among the participants. Therefore, the clinical differences of severity would impact the level of significance between the groups. As suggested by Farrand and Woodford (2015), selecting participants with similar levels of severity, would have created more balanced groups at baseline.

**Limitations**

**Design and internal validity.** Similar to previous studies, this research was limited by several factors, including the sample population. As 95% of the participants were from a pool of Psychology 1000 classes and were granted bonus points for their participation, they experienced an additional level of motivation for engagement in the research project, but perhaps not for change in fear of public speaking. Therefore, the findings may not be generalized to the clinical population, as recruiting from the Psychology 1000 pool allowed participants of all levels of anxiety and motivation to engage in the research.

The original research design was to be performed in a clinical setting, such as University of New Brunswick (UNB) Counselling Services; however, the participation rate \((N = 0)\) was so low that the Psychology 1000 pool and the local community were accessed in order to collect data. Posters were placed in community settings and in the
counselling services waiting room, with a phone number and email for participants to contact the primary investigator. To recruit participants from the Psychology 1000 pool however, the researcher attended several introductory psychology classes and explained the research and benefits (bonus points) in person. As 95% of the participants were Psychology 1000 students and 5% from the community, describing the experiment in person may have been the factor that improved the recruitment rate. Viewing a poster that contained the words Fear of Public Speaking, may have elicited anxiety in participants without understanding the full context of the experiment. Reaching out to the Psychology 1000 classes and explaining the research in detail, may have reduced anxiety substantially. However, the level of motivation to change fear of public speaking among Psychology students receiving bonus points, was not examined. As positive treatment outcomes for CBT have been linked to client motivation (Antony, Ledley, & Heimberg, 2005; Arkowitz, Westra, Miller, & Rollnick, 2008; Drieschner, Lammers, & van der Staak, 2004), determining the level of student motivation by utilizing the Change Questionnaire (CQ; Miller & Johnson, 2008), may have provided more insight into small effect sizes in the current study.

Another limitation to the study is the lack of consistency in the clinical/nonclinical population. The imbalance may have contributed to the small effect sizes by creating different levels of severity and due to the fact that the measures chosen can be sensitive to clinical populations. Larger effect sizes may have been achieved if participants were admitted into the research following a structured clinical interview, as oppose to self-
reported symptoms. This would have created a more consistent population sample at pretest for all groups (Farrand & Woodford, 2015; Gellatl et al., 2007).

It should be noted, that although the effect sizes in the current study are small, they do suggest a change in fear of public speaking. As the measures, with the exception of the PRCS, do not have clinical cut-off points, it is difficult to determine if the changes from pre to post-test are clinically significant. However, as one purpose of the current research was to find a method of easily accessible and low cost exposure, the study did suggest a treatment that can be accessed online and does potentially show benefits. Furthermore, this allows individuals who cannot access psychological services due to financial situations, geographical location or time constraint, to engage in the therapy.

**Future Directions**

To date, there have been few studies on the effects of using VR as a method of exposure to address fear of public speaking. Therefore, much research on the topic is still needed to make any lasting conclusions. Although the use of VR in conjunction with CBT has been examined as a method for reducing public-speaking anxiety (Safir, Wallach, & Bar-Zvi, 2012; Wallach et al., 2009), the present study examined the use of VR in an exposure treatment plan with the only contact with the researcher being one psychoeducational session. Further research might examine the effect of eliminating the single psychoeducational session and exposing participants only to the software, which provides the necessary instructions for relaxation techniques and psychoeducational information on exposure theory. Research has suggested that internet-based self-help interventions are effective for such disorders as panic disorder, depression, smoking
cessation, alcohol abuse and social anxiety (Carlbring et al., 2005; Carlbring et al., 2007; Christensen, Griffiths, & Jorm, 2004; Cobb & Graham., 2005; Cunningham et al., 2009; Titov et al., 2014). Increasing client autonomy with self-help interventions could potentially reduce wait-list times further at agencies such as community mental health centers or private practices, where waitlists are long (Cunningham, Lefkoe, & Sechrest, 2006).

Although most research surrounding anxiety and VR addresses a clinical population, the nonclinical population in this study experienced significant changes in confidence as a public speaker after engaging with the software. Although the effect size was small, it may suggest that all levels of anxiety benefit from the VR exposure to some degree. Therefore, extending the psychoeducational session and VR exposure to large groups of people, such as organizations or groups of employees, will benefit everyone involved—not just those with extreme anxiety toward public speaking. This may be of particular interest for agencies such as a university counseling centers, in which group psychoeducational sessions can potentially meet or reduce the therapeutic demand by providing treatment to a larger number of student clients without increasing the client load on counselors (Cunningham, Lefkoe, & Sechrest, 2006; Daltry, 2015). As most students undergo orientation sessions, it is common that within the first week of their first year for students to be introduced to library, department, and several others resources. Introducing students to software in a large group setting, that can aid them in delivering presentations with less stress, may not only eliminate the need to make appointments with counseling services for some, but may also reach students who are not considering
getting help in this area. Therefore, delivering or introducing the software to first-year students during a class or orientation may act as a proactive action to reduce the number of students either avoiding classes with presentations or attending counseling services on a regular basis. For those who are uncomfortable with group settings or the idea of individual therapy, introducing students to a method of exposure therapy that can be accessed directly from the counselling center website will also potentially reduce wait times.

As the number of people who actually receive help for social anxiety is low (Ruscio et al., 2008), allowing students to access the therapy directly for the internet may increase the number of people who receive services, without increasing case loads.

For future studies the effect of a booster session should also be considered. This would consist of reviewing skills learned as well as the VR exposure for one session. To understand if booster sessions help maintain positive outcomes of therapy, Gearing, Schwalbe, Lee, and Hoagwood (2013) investigated the effect of a booster session after 6 months in CBT treatment for children and adolescents with anxiety disorders. They determined that therapy that included a booster session 6 months after termination sustained the treatment effects for longer than without a booster session. Baker and Wilson (1985) determined that booster sessions did not aid in reducing relapse or in decreasing depressive symptoms, but did reportedly help maintain the gains previously achieved. In the current research, a booster session would not require scheduling an appointment with a therapist; it would simply require logging onto the VR exposure website, thereby maintaining the low cost (time and monetary) of therapy, while maintaining any gains achieved. Future research should include examining the effects of
one booster session in a VR setting to further investigate the monetary and time advantages or disadvantages of an added session.

Conclusion

VR exposure therapy creates a safe environment in which individuals can experience a feared stimulus and effectively habituate to the situation to reduce their anxiety (Garcia-Palacios et al., 2001; Schneier et al., 1992). Although the current study exhibited a small effect size, change in confidence and self-reports for the fear of public speaking was achieved in a clinical/non-clinical population. The VR utilized in this study provided a low-cost, effective tool to aid in the administration of exposure therapy. For clients who cannot access therapy due to location or financial reasons, VR exposure software provided on the internet can teach individuals techniques that may ease their anxiety and help them engage in activities or occupations that they may have previously avoided. However, by presenting information to large target groups, such as first year university students, those who may not have sought help with their apprehension or fear towards public speaking, may be exposed to and have access to psychoeducational information and software about anxiety that would have not typically been available. As a result, VR exposure therapy may potentially improve the social, academic, and vocational well-being of many individuals.
References


Appendix A

Informed Consent (VR - I)

You have been invited to take part in an experiment that is being performed by Heather Lister, graduate student, from the Psychology Department at the University of New Brunswick.

In this experiment, we are interested in creating a better understanding of treatments for public speaking anxiety. The researcher will give you information on how to operate virtual reality (VR) software at home. You will initially be asked to fill out four scales that will assess your attitudes and anxiety levels toward public speaking. During the next 2 weeks, you will be asked to perform a daily treatment plan at home that will take approximately 30 minutes. This will include sitting in front of your computer and privately giving a speech to a virtual audience while recording your anxiety levels at different times during a session. You will also be instructed to perform relaxation exercises at appointed times. At the end of the 2 weeks, you will be asked to fill out four scales that will assess your attitudes and anxiety levels toward public speaking, as well as one that will describe your virtual experience. At this time, you also will be given a debriefing form that will describe the experiment in greater detail.

As this study is designed to look at public speaking anxiety, you may experience some associated feelings of anxiety while completing the questionnaires. The level of anxiety experienced is not likely to be greater than any anxiety felt when standing in front of a class performing a presentation. Participants using the VR exposure software may experience anxiety in the course of completing the tasks. Again, the level of anxiety experienced is expected to be no more than would be felt when presenting a seminar or group project as assigned by a professor in a university course. In the event that your participation in this study causes significant anxiety or you become distressed, you may contact the UNB Counselling Services at (506) 453-4820 for assistance with managing your anxiety.

For confidentiality purposes, participants will be given a unique identification code in order to keep a record of the data collected for each individual. This will be the only identifying feature of the data collected. Your code will not be directly connected with your e-mail address or other contact information. Your contact information (e-mail, phone number, and mailing address) will be used solely for the purposes of study communication and follow-up.

If you are interested in the results of this experiment, please include your e-mail address or your mailing address, and the results will be sent to you.
Participation in this experiment is voluntary. You are free to withdraw from this research at any time or to decline to answer any question, for any reason, without penalty. If you have any questions or concerns about the experiment, you may contact Heather Lister by e-mail at h.lister@unb.ca or Darren Piercey at 452-6135 or by e-mail at piercey@unb.ca. You may also contact the chair of the Psychology Department, Dr. Sandra Byers, at 458-7803 or by e-mail at psychair@unb.ca, or Dr. David Clark, chair of the Psychology Department Ethics Committee, at (506) 452-6225 or by e-mail at clark@unb.ca.

I have read the informed consent and I agree to take part in the experiment that is being performed by Professor Darren Piercey. I understand that my participation is voluntary and that I am free to withdraw at any time and for any reason without penalty.

Name: ___________________________
Signature: ________________________
Date: ____________________________
E-mail: __________________________
Appendix B

Informed Consent (VR - G)

You have been invited to take part in an experiment that is being performed by Heather Lister, graduate student, from the Psychology Department at the University of New Brunswick.

In this experiment, we are interested in creating a better understanding of treatments for public speaking anxiety. You will initially be asked to independently fill out four scales in a room with other students. This form will assess your attitudes and anxiety levels toward public speaking. The researcher will then address the group with information on how to operate the VR software at home. During the next 2 weeks, you will be asked to perform a daily treatment plan at home that will take approximately 30 minutes. This will include sitting in front of your computer and privately giving a speech to a virtual audience while recording your anxiety levels at different times during a session. You also will be instructed to perform relaxation exercises at appointed times. At the end of the 2 weeks, you will be asked to fill out four scales that will assess your attitudes and anxiety levels towards public speaking, as well as one that will describe your virtual experience. At this time, you will also be given a debriefing form that will describe the experiment in greater detail.

As this study is designed to look at public speaking anxiety, you may experience some associated feelings of anxiety while completing the questionnaires. The level of anxiety experienced is not likely to be greater than any anxiety felt when standing in front of a class performing a presentation. Participants using the VR exposure software may experience anxiety in the course of completing the tasks. Again, the level of anxiety experienced is expected to be no more than would be felt when presenting a seminar or group project as assigned by a professor in a university course. In the event that your participation in this study causes significant anxiety or you become distressed, you may contact the UNB Counselling Services at (506) 453-4820 for assistance with managing your anxiety.

For confidentiality purposes, participants will be given a unique identification code in order to keep a record of the data collected for each individual. This will be the only identifying feature of the data collected. Your code will not be directly connected with your e-mail address or other contact information. Your contact information (e-mail, phone number, and mailing address) will be used solely for the purposes of study communication and follow-up. Contact UNB Counselling Services at (506) 453-4820 for assistance with managing your anxiety.

If you are interested in the results of this experiment, please leave your e-mail address or your mailing address, and the results will be sent to you.
Participation in this experiment is voluntary. You are free to withdraw from this research at any time or to decline to answer any question, for any reason, without penalty. If you have any questions or concerns about the experiment, you may contact Heather Lister by e-mail at h.lister@unb.ca or Darren Piercey at 452-6135 or by e-mail at piercey@unb.ca. You may also contact the chair of the Psychology Department, Dr. Sandra Byers, at 458-7803 or by e-mail at psychair@unb.ca, or Dr. David Clark, chair of the Psychology Department Ethics Committee, at (506) 452-6225 or by e-mail at clark@unb.ca.

I have read the informed consent and I agree to take part in the experiment that is being performed by Professor Darren Piercey. I understand that my participation is voluntary and that I am free to withdraw at any time and for any reason without penalty.

Name: ___________________________

Signature: ________________________

Date: ____________________________

E-mail: __________________________
Appendix C

Informed Consent (WL)

You have been invited to take part in an experiment that is being performed by Heather Lister, graduate student, from the Psychology Department at the University of New Brunswick.

In this experiment, we are interested in creating a better understanding of treatments for public speaking anxiety. You will initially be asked to fill out four scales that will assess your attitudes and anxiety levels toward public speaking. After a 2-week period you will again be asked to fill out four scales that will assess your attitudes and anxiety levels toward public speaking. At this time, you also will be given a debriefing that will describe the experiment in greater detail.

As this study is designed to look at public speaking anxiety, you may experience some associated feelings of anxiety while completing the questionnaires. The level of anxiety experienced is not likely to be greater than any anxiety felt when standing in front of a class performing a presentation. In the event that your participation in this study causes significant anxiety or you become distressed, you may contact the UNB Counselling Services at (506) 453-4820 for assistance with managing your anxiety.

For confidentiality purposes, participants will be given a unique identification code in order to keep a record of the data collected for each individual. This will be the only identifying feature of the data collected. Your code will not be directly connected with your e-mail address or other contact information. Your contact information (e-mail, phone number, and mailing address) will be used solely for the purposes of study communication and follow-up.

If you are interested in the results of this experiment, please leave your e-mail address or your mailing address, and the results will be sent to you.

Participation in this experiment is voluntary. You are free to withdraw from this research at any time or to decline to answer any question, for any reason, without penalty. If you have any questions or concerns about the experiment, you may contact Heather Lister by e-mail at h.lister@unb.ca or Darren Piercey at 452-6135 or by e-mail at piercey@unb.ca. You may also contact the chair of the Psychology Department, Dr. Sandra Byers, at 458-7803 or by e-mail at psychair@unb.ca, or Dr. David Clark, chair of the Psychology Department Ethics Committee, at (506) 452-6225 or by e-mail at clark@unb.ca.
I have read the informed consent and I agree to take part in the experiment that is being performed by Professor Darren Piercey. I understand that my participation is voluntary and that I am free to withdraw at any time, and for any reason, without penalty.

Name: __________________________

Signature: ________________________

Date: ____________________________

Email: ____________________________
Appendix D

Demographics

ID No.:_____
In what year were you born?_____
What is your gender?_____

What is the highest level of education you have completed?
☐ Some high school
☐ High school
☐ Some university
☐ University
☐ Master’s degree
☐ Doctoral degree
☐ Professional degree
☐ Prefer not to answer

What is the highest level of education your parents have completed? (Select from above.)
Mother: ___________________
Father: ____________________
Siblings: (Please indicate sex and date of birth; use back if necessary)
_____________________________________________________________
_____________________________________________________________

Employment status (Choose all that apply.)
Are you currently . . . ?
☐ Employed for wages
☐ Self-employed
☐ Out of work and looking for work
☐ Out of work but not currently looking for work
☐ A student
☐ Retired
☐ Unable to work
Appendix E

Personal Report of Confidence as a Speaker

(Paul, 1966)

This instrument is composed of 30 items regarding your feeling of confidence as a speaker. After each question there is a “true” and a “false.” Try to decide whether “true” or “false” most represents your feelings associated with your most recent speech, then put a circle around the “true” or “false.” Work quickly and don’t spend much time on any one question. We want your first impression on the questionnaire. Now go ahead, work quickly, and remember to answer every question.

1. I look forward to an opportunity to speak in public. T F
2. My hands tremble when I try to handle objects on the platform. T F
3. I am in constant fear of forgetting my speech. T F
4. Audiences seem friendly when I address them. T F
5. While preparing a speech, I am in a constant state of anxiety. T F
6. At the conclusion of a speech, I feel that I have had a pleasant experience. T F
7. I dislike to use my body and voice expressively. T F
8. My thoughts become confused and jumbled when I speak before an audience. T F
9. I have no fear of facing an audience. T F
10. Although I am nervous just before getting up, I soon forget my fears and enjoy the experience. T F
11. I face the prospect of making a speech with complete confidence. T F
12. I feel that I am in complete possession of myself while speaking. T F
13. I prefer to have notes on the platform in case I forget my speech. T F
14. I like to observe the reactions of my audience to my speech. T F
15. Although I talk fluently with friends, I am at a loss for words on the platform. T F
16. I feel relaxed and comfortable while speaking. T F
17. Although I do not enjoy speaking in public, I do not particularly dread it. T F
18. I always avoid speaking in public if possible. T F
19. The faces of my audience are blurred when I look at them. T F
20. I feel disgusted with myself after trying to address a group of people. T F
21. I enjoy preparing a talk. T F
22. My mind is clear when I face an audience. T F
23. I am fairly fluent. T F
24. I perspire and tremble just before getting up to speak. T F
25. My posture feels strained and unnatural. T F
<table>
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<tr>
<th>Number</th>
<th>Statement</th>
<th>T</th>
<th>F</th>
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<tbody>
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<td>26</td>
<td>I am fearful and tense all the while I am speaking before a group of people.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>27</td>
<td>I find the prospect of speaking mildly pleasant.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>28</td>
<td>It is difficult for me to calmly search my mind for the right words to express my thoughts.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>29</td>
<td>I am terrified at the thought of speaking before a group of people.</td>
<td>T</td>
<td>F</td>
</tr>
<tr>
<td>30</td>
<td>I have a feeling of alertness in facing an audience.</td>
<td>T</td>
<td>F</td>
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</tbody>
</table>
Appendix F

Personal Report of Communication Apprehension (PRCA-24)

(McCroskey, 1982)

DIRECTIONS: This instrument is composed of 24 statements concerning feelings about communicating with other people. Please indicate the degree to which each statement applies to you by marking whether you strongly agree (1-SA), agree (2-A), undecided (3-U), disagree (4-D), or strongly disagree (5-SD).

Work quickly; record your first impression.

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>U</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I dislike participating in group discussions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. Generally, I am comfortable while participating in group discussions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. I am tense and nervous while participating in group discussions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. I like to get involved in group discussions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Engaging in a group discussion with new people makes me tense and nervous.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. I am calm and relaxed while participating in group discussions.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. Generally, I am nervous when I have to participate in a meeting.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. Usually I am calm and relaxed while participating in meetings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. I am very calm and relaxed when I am called upon to express an opinion at a meeting.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. I am afraid to express myself at meetings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. Communicating at meetings usually makes me uncomfortable.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. I am very relaxed when answering questions at a meeting.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. While participating in a conversation with a new acquaintance, I feel very nervous.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. I have no fear of speaking up in conversations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. Ordinarily I am very tense and nervous in conversations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16. Ordinarily I am very calm and relaxed in conversations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17. While conversing with a new acquaintance, I feel very relaxed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>18. I’m afraid to speak up in conversations.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19. I have no fear of giving a speech.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20. Certain parts of my body feel very tense and rigid while giving a speech.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21. I feel relaxed while giving a speech.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22. My thoughts become confused and jumbled when I am giving a speech.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23. I face the prospect of giving a speech with confidence.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24. While giving a speech, I get so nervous I forget facts I really know.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Appendix G

State and Trait Anxiety Inventory

(Spielberger, Gorsuch, & Lushene, 1970)

STAI Form Y-1

No._________________________________________________________Date________

Age___________  Sex: M_____ F______

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel right now, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer that seems to describe you present feelings best.

1. I feel calm………………………………………………………………… 1 2 3 4
2. I feel secure……………………………………………………………… 1 2 3 4
3. I feel tense……………………………………………………………… 1 2 3 4
4. I feel strained…………………………………………………………… 1 2 3 4
5. I feel at ease…………………………………………………………….. 1 2 3 4
6. I feel upset……………………………………………………………… 1 2 3 4
7. I am presently worrying over possible misfortunes………………… 1 2 3 4
8. I feel satisfied…………………………………………………………… 1 2 3 4
9. I feel frightened………………………………………………………… 1 2 3 4
10. I feel comfortable…………………………………………………….. 1 2 3 4
11. I feel self-confident………………………………………………… 1 2 3 4
12. I feel nervous…………………………………………………………… 1 2 3 4
13. I am jittery................................................................. 1 2 3 4
14. I feel indecisive..........................................................1 2 3 4
15. I am relaxed............................................................. 1 2 3 4
16. I feel content............................................................1 2 3 4
17. I am worried.............................................................1 2 3 4
18. I feel confused........................................................... 1 2 3 4
19. I feel steady.............................................................. 1 2 3 4
20. I feel pleasant........................................................... 1 2 3 4
STAI Form Y-2

No.________________________________________________________ Date: _______________

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer that seems to describe how you generally feel.

21. I feel pleasant.................................................................................1 2 3 4
22. I feel nervous and restless.................................................................1 2 3 4
23. I feel satisfied with myself.................................................................1 2 3 4
24. I wish I could be as happy as others seem to be............................1 2 3 4
25. I feel like a failure.............................................................................1 2 3 4
26. I feel rested.......................................................................................1 2 3 4
27. I am calm, cool, and collected......................................................... 1 2 3 4
28. I feel that difficulties are piling up so that I cannot overcome them.....1 2 3 4
29. I worry too much over something that really doesn’t matter.......... 1 2 3 4
30. I am happy.......................................................................................1 2 3 4
31. I have disturbing thoughts...............................................................1 2 3 4
32. I lack self-confidence.....................................................................1 2 3 4
33. I feel secure.....................................................................................1 2 3 4
34. I make decisions easily...................................................................1 2 3 4
35. I feel inadequate.............................................................................1 2 3 4
36. I am content.................................................................................... 1 2 3 4
37. Some unimportant thought runs through my mind and bothers me....1 2 3 4
38. I take disappointments so keenly that I can’t put them out of my mind 1 2 3 4

39. I am a steady person…………………………………………………………………… 1 2 3 4

40. I get in a state of tension or turmoil as I think over my recent concerns and interests………………………………………………………………………………….. 1 2 3 4
Appendix H

Self-Statements During Public Speaking

(Hofmann & DiBartolo, 2000)

Please imagine what you have typically thought to yourself during any kind of public speaking situation. Imagining these situations, how much do you agree with the statements given below? Please rate the degree of your agreement on a scale between 0 (if you do not agree at all) to 5 (if you strongly agree with the statement).

Do not agree | 0 | 1 | 2 | 3 | 4 | 5

1. What do I have to lose? It’s worth a try………………… 0 | 1 | 2 | 3 | 4 | 5

2. I’m a loser……………………………………………… 0 | 1 | 2 | 3 | 4 | 5

3. This is an awkward situation but I can handle it ……… 0 | 1 | 2 | 3 | 4 | 5

4. A failure in this situation would be more proof of my incapacity…………………………………… 0 | 1 | 2 | 3 | 4 | 5

5. Even if things don’t go well, it’s no catastrophe……… 0 | 1 | 2 | 3 | 4 | 5

6. I can handle everything………………………………… 0 | 1 | 2 | 3 | 4 | 5

7. What I say will probably sound stupid………………… 0 | 1 | 2 | 3 | 4 | 5

8. I’ll probably “bomb out” anyway……………………… 0 | 1 | 2 | 3 | 4 | 5

9. Instead of worrying, I could concentrate on what I want to say

10. I feel awkward and dumb; they’re bound to notice…… 0 | 1 | 2 | 3 | 4 | 5
Appendix I

Fear Questionnaire

(Marks & Mathews, 1979)

No:  
Date:  
Age:  
Sex:  

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>would not avoid it</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>slightly avoid</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>definitely avoid</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>markedly avoid</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>always avoid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
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</tbody>
</table>

Choose a number from the scale above to show how much you would avoid each of the situations listed below because of fear or other unpleasant feelings. Then write the number you choose in the space opposite each situation.

1. Main phobia you want treated (describe in your own words)  
2. Injections or minor surgery  
3. Eating or drinking with other people  
4. Hospitals  
5. Travelling alone or by bus  
6. Walking alone on busy streets  
7. Being watched or stared at  
8. Going into crowded shops  
9. Talking to people in authority  
10. Sight of blood  
11. Being criticized  
12. Going alone far from home  
13. Thought of injury or illness  
14. Speaking or acting to an audience  
15. Large open spaces  
16. Going to the dentist  
17. Other situations (describe)  

18. How would you rate the present state of your phobic symptoms on the scale below?  
   Please circle one number between 0 and 8.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>No phobias</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slightly disturbing/not really disabling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definitely disturbing/disabling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Markedly disturbing/disabling</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Very severely disturbing/disabling</td>
<td></td>
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</tr>
</tbody>
</table>
Please circle one number between 0 and 8.

Now choose a number from the scale below to show how much you are troubled by each problem listed, and write the number in the space opposite.

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardly at all</td>
<td>Slightly troublesome</td>
<td>Definitely troublesome</td>
<td>Markedly troublesome</td>
<td>Very severely troublesome</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 19. Feeling miserable or depressed |
| 20. Feeling irritable or angry |
| 21. Feeling tense or panicky |
| 22. Upsetting thoughts coming into your head |
| 23. Feeling you or your surroundings are strange or unreal |
| 24. Other feelings (describe_______________________________) |
Appendix J

Virtual Audience Exposure Recording Form

(Wolpe, 1958)

No______________________________   Start Date:_________________

Instructions: Please record your SUDS Ratings on a 0–10 scale (where 0 = no discomfort and 10 = maximal discomfort, anxiety, and panic) before and after you experience the virtual exposure. The system will tell you at which point to record your ratings.

Week 1

<table>
<thead>
<tr>
<th>Date and time</th>
<th>Before recording</th>
<th>After recording</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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Appendix K

Debriefing for Virtual Reality and the Fear of Public Speaking

Thank you so much for your participation in our study evaluating the effects of virtual reality (VR) exposure on the fear of public speaking. We appreciate your willingness to assist in furthering our understanding of public speaking anxiety and strategies that may be useful in addressing it. We would also like to take this opportunity to provide you with more information regarding anxiety and our study’s purpose and design.

Our study was designed to determine the impact of VR exposure on the experience of the fear of public speaking. We hypothesized that the use of the VR exposure program would reduce feelings of public speaking anxiety in the participants who used it compared to those who did not. We also examined the effect of the initial information session being performed in an individual, one-to-one session as opposed to in a group session. Self-reports related to anxiety—specifically public speaking anxiety—were administered to establish a baseline to which the effects of VR exposure could be compared. Participants were randomly assigned to either a VR-individual group, VR-group group, or a control wait-list group. Every participant had an equal chance of being assigned to any of the groups. If you were placed in the control wait-list group and would like to access the VR exposure program, please contact Heather Lister at hlister@rogers.com.

After the VR groups completed the VR exposure, the self-reports were readministered to all three groups in order to examine the effects of the virtual exposure on the experience of public speaking anxiety for the VR-Individual group and the VR-Group group compared to the baseline and wait-list groups.

Attached, please find a list of additional resources that you may find useful in understanding and coping with anxiety.

If you have requested to be notified with study results, you will receive them in the manner you have selected for study communication when they become available.

Again, thank you for your time. Please feel free to contact us with any feedback or final questions about the study. If you wish to speak with someone not directly involved in the research study, you may contact Dr. David Clark, chair of the Department of Psychology Ethics Review Committee at the University of New Brunswick, at 506.452.6225 or clark@unb.ca. You may also contact the chair of the Psychology Department, Dr. Sandra Byers, at 506.458.7803 or by e-mail at psychair@unb.ca.

Sincerely,
Heather Lister, M.Ed., Ph.D. Candidate
Web Resources

Anxiety Disorders Association of America, http://www.aada.org


Books

*The Mindful Way Through Anxiety: Break Free from Chronic Worry and Reclaim Your Life*, by Susan M. Orsillo, PhD, and Lizabeth Roemer, PhD

Why Zebras Don’t Get Ulcers (3rd ed.), by Robert M. Sapolsky

*The Relaxation Response*, by Herbert Benson, MD

*Beyond Anxiety and Phobia: A Step-by-Step Guide to Lifetime Recovery*, by Edmund J. Bourne, PhD

*The Anxiety and Phobia Workbook*, by Edmund J. Bourne, PhD


*The Anxiety and Worry Workbook: The Cognitive Behavioral Solution*, by David A. Clark, PhD, and Aaron T. Beck, MD
Curriculum Vitae

Heather Lister

UNIVERSITIES ATTENDED

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University of New Brunswick, Fredericton, NB
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*Full Accreditation, Canadian Psychological Association

2005–2006 MEd, Counselling Psychology
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2003–2005 BA (Honours), Psychology
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PUBLICATIONS


CONFERENCE PRESENTATIONS