CYBERPSYCHOLOGY AND SCHOOLS: A FEASIBILITY STUDY USING VIRTUAL REALITY WITH SCHOOL CHILDREN

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Abstract

This study evaluates the feasibility and treatment acceptability of Virtual Reality (VR) technology applied universally in a school setting. A total of 105 children, mean age of 14.45, in five classrooms completed a paper and pencil measure of trait anxiety during Session 1. In Session 2, participants were randomly selected to participate in either a neutral environment or an anxiety-provoking environment and completed a measure of state anxiety immediately prior to and following their first VR exposure. Following the exposure participants also completed a Likert-Scaled questionnaire regarding treatment acceptability. In Session 3, participants completed Session 2 procedure in the alternate environment. There was a main effect of condition and time on state anxiety scores, controlling for trait anxiety. Participants in the anxiety provoking condition had lower mean state anxiety scores than being in the neutral condition; participants had lower state anxiety levels following the anxiety condition than they did following the neutral condition. All participants' mean state anxiety levels were lower post exposure than pre exposure. There was also a borderline significant main effect of condition on treatment acceptability levels, controlling for trait anxiety. Participants in the neutral condition had a higher level of acceptability than when in the anxiety provoking condition. Results reveal that the implementation of VR technology exposure warrants further research.

Preface

This research was approved by the University of British Columbia's Behavioural Research Ethics Board, certificate number H08-02539. This research was also approved by the specific school district's Superintendent of Schools. Early concept creation of this project was done by Dr.Lynn Miller, R.Psych., and members of the Anxiety Project Lab at UBC. The author, Carolynn Turner, collected data with the support of a research assistant, and the author analyzed and interpreted the data, with the support of UBC's measurement support and Dr.Sterett Mercer, R.Psych.. The author prepared this manuscript.

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To Graeme, Danae, and Dayton,

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Chapter 1: Introduction

It has been well documented that mental health disorders affect both adolescents and adults (Merikangas et al., 2010). Mental health disorders are debilitating if left untreated and can spiral into devastating disability affecting both children and their families. Anxiety is the most prevalent mental health disorder in children, adolescents and adults (Kessler, Berglund, Demler, Jin, & Walters, 2005), affecting nearly one third of children aged 13-18 (Merikangas et al., 2010). Onset can be as early as six years of age and anxiety disorders affect females more frequently than males (Merikangas et al., 2010). Anxiety is the most commonly ignored mental health issue (Kessler et al.). Universal, school-based programs that target anxiety are preventative and cost effective (Miller et al., 2011). These programs can facilitate skill development for those who suffer silently from anxiety.

Cognitive Behavior Therapy (CBT) is the psychological treatment that has been deemed the most efficacious intervention for anxiety and phobias (Bernstein, Layne, Egan & Tennison, 2005; In-Albon & Schneider, 2007). One core component of CBT is gradual, graded exposure (e.g., having the client gradually face fearful stimuli). The premise behind exposure is that people have an opportunity to face their irrational cognitions when exposed to them and realize that expected negative consequences do not occur, and are erroneous. The fundamental aspect of cognitive restructuring is difficult to achieve without exposure (Arntz, 2002). However, exposure is often time consuming and can be expensive, depending on the phobia targeted. For example, a fear of flying may require repeated exposures to short airplane flights to help clients address their feared stimulus (e.g., being on an aircraft), and their subsequent anxiety response, in order to realize that the catastrophic thoughts (e.g., we

might crash and die) are not coming to fruition. These interventions can be difficult to access due to a lack of trained professionals (Andrews & Wilkinson, 2002), and can be both time consuming and expensive to the average Canadian family.

Using Virtual Reality (VR) as a method of delivering exposure holds much promise as a low-cost and viable option for addressing the costs and access issues of in vivo (e.g., real life) exposure. Policy makers acknowledge that evidence-based resources are not widely available, need to be developed, and must be easily accessible to children and families (Baldwin, Ajel, & Garner, 2008). Further, many families are hesitant to seek support outside of the school environment (Braden & Sherrard, 1987). Therefore, a logical intervention site for subsequent implementation is a universal, school-based setting, where the barriers to access are removed and all students receive accessible interventions as part of their academic curriculum (Weist, 2003).

Creating standardized, replicable, and emotionally challenging situations in VR will enable sound experimental research that may contribute to our understanding of anxiety disorders, their causes, treatments, and maintaining factors. Because young people are highly receptive to computer technology, it is anticipated that integrating VR into classrooms will make learning about anxiety fun, exciting, and effective. Through the implementation of this project, Canadian school children may influence and shape the use of a cutting edge, advanced, affordable and effective treatment for anxiety disorders.

1.1 Research Problem

Due to high rates of anxiety and its debilitating nature, a study that evaluates an economical and easily accessible alternative to conventional *in vivo* exposure is warranted.

Childhood anxiety not only affects children themselves, but also their parents, siblings, teachers, school administrators, and the general public. Because of the overwhelming number of non-identified and unsupported children facing anxiety, researchers are encouraged to investigate this safe treatment for universal application.

1.2 Purpose of Study

The purpose of this research project is to assess the treatment acceptability of VR exposure as well as the feasibility of using VR technology universally with children in school classrooms to target anxiety. The mechanism of exposure fundamentally relies on facing a feared stimulus, experiencing the anxiety that ensues, and learning adaptive ways to address that anxiety. Therefore, feasibility in the context of this study, will address whether state anxiety levels are impacted as a result of time, pre or post exposure; condition, neutral or anxiety provoking; and/or gender, male or female, making way for future CBT studies to address adaptive ways of addressing that anxiety. It would be expected that the VR technology exposure would increase levels of state anxiety. Feasibility will also address the implementation issues, cost and logistics of providing VR exposure universally within a school setting. This study will also examine the impact of gender on feasibility and acceptability as it would be expected that girls, who have higher levels of anxiety, would also have higher levels of state anxiety and potentially lower levels of acceptability, resulting from the VR exposure. Further, because higher levels of trait anxiety predict general future anxiety (McNally, 1996) and increases in state anxiety are experienced with greater intensity and frequency (Spielberger, Edwards, Montuori & Lushene, 1970) in those with higher trait anxiety, trait anxiety levels will also be assessed as a covariate.

1.3 Significance of Study

This study will be the first of its kind with this population; as a result, the findings from this study may provide additional information into VR's treatment acceptability and feasibility with children. This feasibility study may also support the growing literature base for VR technology, and support its use in community settings (e.g., schools) where VR technology may provide the necessary exposure for future VR studies to target anxiety disorders.

1.4 Research Questions

This thesis will address the following research questions:

1. Is virtual reality exposure feasible as a universal intervention with children in a school-based setting?
    a. Are there mean differences in state anxiety levels before and after VR sessions?
    b. Are there mean differences in state anxiety levels by intervention condition (neutral or anxiety provoking)?
    c. Are there mean differences in state anxiety levels by gender?
    d. Are there any two-way or three-way interactions between state anxiety levels, condition (neutral or anxiety provoking), or gender?
2. Do children find the intervention to be acceptable?
    a. Are there mean differences in virtual reality technology intervention acceptability by gender?
    b. Are there mean differences in virtual reality technology intervention acceptability by virtual reality condition (neutral vs. anxiety provoking)?

c. Are there any two-way or three-way interactions between acceptability scores and or gender, or condition (neutral or anxiety provoking)?

1.5 Summary

A growing literature base suggests that early intervention can alter anxiety's destructive path and can facilitate the healthy development of children. Typical CBT treatment uses in vivo exposure as one component to help clients experience heightened anxiety, tolerate these symptoms, and create new cognitions around the feared stimuli. However, in vivo exposure provides many challenges and is generally carried out individually. VR provides an encouraging alternate option to in vivo exposure. In virtuo exposure, or exposure which relies on immersion equipment (head mounted display goggles) to allow the client to interact with a tri-dimensional virtual environment, has many advantages. In virtuo exposure can be more convenient, less expensive and has been documented to be just as effective (Garcia-Palacios, Hoffman, See, Tsai, & Botella, 2001) as in vivo exposure in some phobic disorders, when used with adults. This study hopes to provide insight for future studies into VR technology's feasibility with adolescents in a school setting. The literature review in the next chapter will highlight the studies completed on CBT, VR technology and VR's effectiveness for anxiety treatment. The third chapter will describe this study's method using VR with a community sample of five grade nine classrooms (n = 105). Evaluation will include self-report measures to assess students' level of state anxiety prior to and following a brief trial of VR technology. Treatment acceptability (do students enjoy VR?) will also be assessed using a Likert-Scaled measure after students have experienced the VR scenarios.

Chapter 2: Literature Review

2.1 Introduction

Approximately one in three children (Merikangas et al., 2010) have a mental health disorder severe enough to significantly impact their development (Waddell, McEwan, Shepherd, Oxford, & Hua, 2005). Anxiety is the most prevalent mental health disorder affecting children and adults (Kessler et al., 2005). Disorder effects are far-reaching and dramatic; anxiety disorders have been shown to affect social and peer relations (Chansky & Kendall, 1997), academic achievement (King & Ollendick, 1989), and future emotional health (Ollendick & King, 1994). Many adults experiencing anxiety disorders were first affected in early to middle childhood (Pine, Cohen, Gurley, Brook, & Ma, 1998). School settings are appropriate intervention sites for children who are anxious as they provide daily contact with children over time as well as easier access to treatment (Miller et. al., 2011).

Anxiety is characterized by activation of the fight-flight response and irrational and involuntary thoughts (Rakel, 2012). Some individuals have an 'over sensitive alarm' in which this fight, flight, or freeze response activates in response to perceived danger (Baldwin, Ajel, & Garner, 2008). Anxiety, as defined by the *DSM-IV*, is the umbrella term for the following subtypes of disorder (not including those brought on by medical illness or substance use): agoraphobia, panic disorder, separation anxiety, social phobia, obsessive-compulsive disorder, post-traumatic stress disorder, acute stress disorder, generalized anxiety disorder, specific phobia and anxiety disorder not otherwise specified (American Psychological Association, 2000). Social phobia, or the concern of embarrassment or of negative judgment in social situations (APA), is the anxiety disorder that affects adolescents most frequently

(Milfsen et al., 2011). The literature suggests that the developmental trajectory of anxiety disorders can be altered substantially (Kendall & Ollendick, 2004), which invites research for this vulnerable age group to combat anxiety's effects early. However, current school-based research of children who experience emotional disorders reveals that less than one third receive the help they require (Conroy & Brown, 2004). CBT has been identified as the most effective treatment for anxiety. One key component of CBT is the use of exposure. Exposure is "any treatment that encourages the systematic confrontation of [a] feared stimuli, which can be external (e.g., feared objects, activities, situations) or internal (e.g., feared thoughts, physical sensations)" (Kaplan & Tolin, 2011). The goal of exposure therapy is to systematically reduce the person's fearful reaction to the stimulus (Kaplan & Tolin).

Historically, exposure has been carried out either with in vivo exposure or imaginal exposure. In vivo exposure occurs when the client is exposed to live stimuli (e.g., a tarantula for specific fear of spiders). Imaginal exposure occurs when the therapist helps clients to envision the feared situation in their imaginations. Technology has given therapists the ability to offer a controlled virtual setting to conduct exposure treatment called in virtuo exposure. Currently, in virtuo exposure, which employs VR technology, has been shown to be as effective as in vivo exposure with adults (Guiterrez-Maldonado, Magallon-Neri, Rus-Calafell, & Penaloza-Salazar, 2009); however no studies to date have tested VR's feasibility or treatment acceptability with children in classroom settings. VR is anticipated to be as effective at inducing anxiety with children in a classroom setting as it has been with adults. This study will address the treatment acceptability and feasibility of using in virtuo exposure,

universally, in a classroom setting, setting the stage for future studies to use VR technology to target anxiety preventatively.

2.2 Anxiety

Low levels of anxiety are normal, adaptive coping mechanisms designed to help humans be mindful of threat or danger in the environment (Kendall & Ollendick, 2004; Miller et al., 2011). However, normal levels of anxiety can increase in intensity and frequency to the point where anxiety symptoms can interfere with daily functioning (Kendall & Ollendick). As a way to cope with the distress of the anxiety response, many people either avoid situations that lead to heightened anxiety, or avoid the feared stimulus. For example, a child may avoid being around dogs if he or she is frightened of dogs. The avoidance of a feared event prevents a person from confronting the anxiety and learning strategies to address it. If left unaddressed, the child in the fear of a dog example will not learn strategies to remain calm so going to people's homes where friendly dogs reside is possible. Anxiety becomes pathological when its frequency and intensity is excessive, and it causes significant distress impeding an individual's ability to function (Keeley & Storch, 2009). Sometimes this fight or flight response is activated in the absence of a real threat, or this response is irrational and/or excessive. In approximately 20% of the population, anxiety symptoms are outside of the normal developmental range (Kendall & Ollendick). When anxiety impedes a person's functioning it is classified as an anxiety disorder (Kendall & Ollendick). Social phobia is one subtype of anxiety disorder that is defined as the fear of embarrassment or of negative judgment in social situations, which manifests in a person avoiding situations where he or she may act in an embarrassing or humiliating way (APA, 2000). Melfsen et al. (2011)

report social phobia to be one of the most common psychological disorders in children and adolescents, affecting females more frequently than males (Merikangas et. al., 2010). When not effectively treated, social phobia is chronic and follows an unrelenting course (Juster & Heimberg, 1995). Social phobia can result in impaired functioning, depression, and substance abuse (Morris, 2001). The scenarios depicted by the VR technology in this study have been designed to provide virtual exposure to social situations to assess the feasibility and treatment acceptability of the technology, which may be useful for future studies seeking to address treatment or prevention of social phobia.

2.2.1 State vs. trait anxiety. General anxiety can be divided into two main classifications, state and trait. State anxiety is a transitory emotion defined by physiological arousal and feelings of apprehension, dread and tension (Spielberger, 1966), which vary in intensity and shift over time (Spielberger, Edwards, Montuori, & Lushene, 1970). A cognitive realization of threat accompanies state anxiety (Lazarus, 1991). Alternatively, trait anxiety has been defined by Spielberger (1966) as the general predisposition of a person to react to a situation anxiously. Trait anxiety is rooted within personality and relatively stable (Spielberger, Edwards, Montuori, & Lushene, 1970). Trait anxiety predicts general future anxiety (McNally, 1996). State anxiety elevations occur in those who experience stressful situations; those with higher trait anxiety experience state anxiety elevations with greater intensity and frequency (Spielberger, Edwards, Montuori, & Lushene). Further, Crocker, Alderman, & Smith (1988) have substantiated the finding that global trait anxiety is related to the high physiological and cognitive responses of state anxiety.

2.3 Cognitive Behavior Therapy (CBT)

Empirical intervention studies have shown anxious children respond better to CBT than to a no-treatment control in clinical settings (Barrett, Rapee, Dadds, & Ryan, 1996; Kendall, 1994; Kendall et al., 1997). CBT is the preferred choice for anxiety treatment in children and adults (Compton et al., 2004; In-Albon & Schneider, 2007). Both Kendall (1994) and Short, Barrett, and Fox (2001) reported that 64% to 69% of the children who received CBT in their studies no longer qualified as having an anxiety disorder at post treatment and results were maintained at one-year follow-up in both studies. Subsequently Barrett, Farrell, Ollendick and Dadds (2006) conducted a followup study and found gains had also been maintained at 24-month followup. The theoretical underpinnings of CBT treatment maintain that cognitive distortions are central to anxiety (Hudson, 2005) and they mediate the relationship between stressful experiences and anxiety responses. According to Hudson, CBT for children generally includes 1) a skills training component (comprised of affect recognition, cognitive restructuring, relaxation and problem solving skills) and 2) an exposure component (gradual exposure to a feared stimuli). In order to facilitate change in anxiety, a change in cognitions should occur (Hudson). This cognitive component begins with psychoeducation regarding anxiety. Next, the clients test their perceptions that the situations will be dangerous or that they cannot cope in the situation. This challenging of cognitions encourages clients to focus less on their feelings and more on the new behaviors they are learning to use to cope with their anxiety (Freeman, Mahoney, Devito, & Martin, 2004). Disputing distorted interpretations and negative cognitions is crucial to treatment (Beck, 1995; Hope & Heimberg, 1993).

In the behavioural component of CBT, clients are exposed to the feared stimuli and subsequently realize that, in fact, their negative catastrophic thinking has been erroneous (Beck & Emery, 1985). Kendall, Aschenbrand, and Hudson (2003) assert that gradual exposure to the feared stimuli intended to induce change in avoidant behaviour is the central step in the CBT process. This exposure alters the client's cognitions regarding the perceived threatening stimuli and as a result their ability to cope improves (Hudson, 2005). Together, the changes in cognition and behaviour are the fundamental aspects of change in cognitive behavioral therapy (Beck, 1976; Rapee et al., 2000).

CBT has been shown as the most efficacious treatment method for those suffering from anxiety disorders (In-Albon & Schneider, 2007). CBT has been held as the gold standard for treatment after being documented in many large controlled trials as being effective with children and adults (Antony & Swinson, 2000; Dadds & Rapee, 1996; Dadds, Spence, Holland, Barrett & Laurens, 1997; Flannery-Schroeder, Panichelli-Mindel, Southam-Gerow, Henin & Warman, 1997; Howard & Kendall, 1996; Kendall, 1994; Kendall et al., 1997; Kendall et al., 1997; Nathan & Gorman, 1998; Short, Barrett & Fox, 2001; Silverman et al, 1999). Moreover, CBT for anxiety disorders has been shown to be superior to a placebo or wait list (Chambless et al., 1998), and to non-specific psychotherapy (Beck, Sokol, Clark, Berchich, & Wright, 1992).

Although pharmacological treatments have been shown to work faster than other methods, relapse rates are greater when pharmacology is employed as treatment as opposed to CBT (Sadock & Sadock, 2003). Studies show that treatment gains are maintained in long term follow up studies (Kendall, Safford, Flannery-Schroeder, & Webb, 2004; Kendall &

Southam-Gerow, 1996). Further there have been a number of controlled evaluations of CBT by independent research groups that have shown its effectiveness (Barrett, et al., 1996; Cobham, Dadds & Spence, 1998; Silverman et al., 1999). Each of the studies above has included participants with different disorders within the anxiety spectrum. Results from clinical trials substantiate the fact that separation anxiety, generalized anxiety, and social phobia can be effectively treated with CBT (Hudson, 2005). Beidel, Turner, and Morris (2000) specifically addressed the use of CBT with social phobia in children and adolescents, and have subsequently shown that CBT is effective with social phobia in this population. This study will evaluate the feasibility and treatment acceptability of VR exposure implementation with children in the universal context of the school system.

2.3.1 Exposure. Exposure is a central component in CBT. There is evidence that exposure can be so powerful that doing it alone may be sufficient for change (Arntz, 2002). Exposure is defined as any procedure that has the person confront a stimulus that generally elicits undesirable behaviors or unwanted emotional responses (Marshall, 1985). The most common form of exposure is gradual exposure. This exposure occurs when the therapist and client together create a hierarchy that outlines a series of activities or experiments with provocative stimuli in which the person engages. The hierarchy ranks the lowest-level anxiety provoking situations to the highest-level anxiety provoking situations (Scrignar, 1974). The therapist supports the client while "exposing" them to anxiety provoking stimuli, from least to most anxiety provoking stimuli, over several sessions (Bouchard, Mendlowitz, Coles, & Franklin, 2004). For example, when a child is scared of the dark at bedtime, that child may believe that a monster will "get" them when it is dark. By

gradually exposing the child to the dark, the therapist would help the child to see that in fact they will not be taken by a monster if they go to bed in the dark. To continue the example above, this gradual exposure could look something like this: the child and therapist together might decide to expose the child to dimmed light at bedtime to start, then progress to only a lamp on, then to only a night light and finally to the bedroom lights off completely with the door open a crack and the bathroom light on until the child can go to sleep in the dark successfully. Systematic, prolonged and repeated contact with the avoided stimuli is preferable (Bouchard, Mendlowitz, Coles, & Franklin).

Traditional in vivo exposure (e.g., facing a live stimulus) can have challenges such as the cost and convenience of accessing the feared stimulus (e.g., access to a tarantula) and may, therefore, prevent the use of CBT with exposure. Imaginal exposure (where the client imagines the feared stimuli) is also used; however, this approach to exposure can have challenges because it relies on the client's ability and willingness to imagine the feared stimuli (Bouchard, Mendlowitz, Coles, & Franklin, 2004) as well as the therapist's ability to convey the imagined scene. Exposure is considered to be a central and necessary step in the CBT process for reducing anxiety. Both in vivo (real) and imaginal techniques can be used either separately or together.

Exposure provides the stage for corrective information to replace dysfunctional associations and for the formation of new and more functional associations (Bouchard, Mendlowitz, Coles & Franklin, 2004). In order to improve the efficacy of exposure, Bouchard et al. (2004) recommend that there should be an emphasis on processing the fear-relevant information (testing the client's prediction that something negative will happen) and

recognizing that the client's fear in response to the stimuli did not occur (e.g., the monster did not take the child when it was dark). This will allow the client to dispute the faulty cognitions and continue with the graded exposure.

2.3.2 Virtual reality & exposure. Technology has been used as a method to simplify and/or speed up processes and to reduce costs in many disciplines; the field of psychology is no different. Virtual reality is defined as any situation where sensory information is generated by a computer as opposed to the natural environment (Wallach et al., 2009). Virtual reality has been growing in popularity and interest over the last decade as technology has become more user friendly and easier to access for the average person. CBT therapists have recognized that their structured, detailed, and behaviour-specific style of therapy lends itself to computer support (Newman, Consoli, & Taylor, 1997).

CBT with its focus on psychoeducation, cognitive restructuring, relaxation techniques, and exposure lends itself to the systematic nature of technology. Working with children requires flexibility and creativity as well as procedures that garner the child's comprehension and cooperation (Gutierrez-Maldonado, Magallon-Neri, Rus-Calafell, Penaloza-Salazar, 2009). Using VR technology may be a more approachable and reliable way to have children confront their fears and conduct exposure exercises. Exposure through VR occurs when clients navigate and interact with a three dimensional computer-generated (and computer-maintained) environment in real time (Bouchard et al., 2004). The client puts a set of 3D goggles on their head, which produces the feared stimulus via virtual reality technology. To increase the feeling of presence and immersion, the 3D visor (see figure1) can

stimulate visceral and auditory senses, and as the client's head moves, the virtual environment shifts simultaneously (Bouchard et al.).

Figure 1 HMD Goggles

This virtual, or in virtuo, exposure allows a person to interact with a phobic scenario (such as one that includes spiders or heights), in the virtual world, but with the real-life safety of the physical world. This form of treatment may be beneficial for those children who are too anxious or fearful to experience real-life exposure, these children may begin exposure through VR (Emmelkamp, Bruynzeel, Drost, & van der Mast, 2001). Rothbaum et al. (2000) found that when they offered a wait list, VR treatment, or in vivo treatment, 14 of 15 potential clients specifically chose VR treatment. Seemingly, VR is perceived by clients as less threatening than in vivo work, yet it allows clients to achieve at least the same benefits. Furthermore, Gutierrez-Maldonado, Magallon-Neri, Rus-Calafell, and Penaloza-Salazar (2009) found that using VR exposure to improve school phobia led to a significant reduction in anxiety levels in less than half of the sessions used by those employing in vivo treatments.

VR has demonstrated efficacy in treating specific phobias, fear of public speaking and social anxiety, post-traumatic stress disorder, as well as panic disorder with adults (Bouchard, Côté, & Richard, 2007). VR can be used over the long term for more gradual repeated

exposures, and has been shown as beneficial even when used briefly. Harris, Kemmerling, and North (2002) found in their study that just four 15-minute sessions helped university students significantly reduce their public speaking anxiety. Emmelkamp et al. (2002), and Rothbaum, Hodges, Smith, Lee and Prince (2000) both found in virtuo exposure to be effective with adults and Bouchard et al. (2004) found in virtuo to be effective with children. Both groups have shown improvement in anxiety responses, and in the case of Emmelkamp et al. (2002), a six month post-treatment study indicated that gains had been maintained.

2.3.2.1 Benefits of VR. Virtual reality offers many significant benefits over conventional in vivo or imaginal techniques. Bouchard et al. (2004) report VR offers therapists increased control over the feared stimuli, increased safety when the required exposure could be dangerous (e.g., heights), access to potentially expensive exposure needs (e.g., flying), and notably reduced responsibility on the part of the therapist in terms of expenses related to animal fears (feeding and maintaining lab animals).

When working with an anxious client using exposure therapy, if the feared stimulus actually engages in the client's expected outcome (e.g., to have a snake actually bite a client who is scared of snakes), it would most probably negatively impact therapy and could prevent the client from returning. When working with real stimuli (e.g., spiders, heights, the public, etc.), it is almost impossible to be able to manipulate the stimuli to induce only the level of fear agreed upon within the collaborative gradual fear hierarchy. For example, it would be difficult to ensure that a dog comes close to the client and sits because that was agreed upon in the fear hierarchy. VR, on the other hand, provides the therapist a unique ability to control the level of stimuli the client receives. VR allows the therapist to control the

dog's behaviour, bringing the animal closer or further away from the client, depending on the description in the hierarchy. VR allows for systematic repetition of exposure, and duration control. VR also allows for greater convenience for the therapist and the client, as well as complete client confidentiality (Anderson, Jacobs, & Rothbaum, 2004). Moreover, the cost of complicated logistics required for some *in vivo* exposures can be alleviated (Guiterrez-Maldonado, Magallon-Neri, Rus-Calafell, Penaloza-Salazar, 2009) such as multiple flights to address a fear of flying. Finally, VR allows for the client to experience situations that are beyond what may be reproduced in reality on demand (Gutierrez-Maldonado, Alsina, Carvallo, Letosa, & Magallon, 2007), such as extreme turbulence during a flight.

Another benefit of VR exposure, when compared to imaginal exposure, is that some clients may lack the ability to vividly imagine the scenario the therapist is constructing and even if they can, they may be unable or unwilling to remain in the fearful situation. On the other hand, some clients may have an exceptionally vivid imagination and flood themselves at the very thought of the feared stimulus (Wallach, Safir, & Bar-Zvi, 2009). In contrast, the therapist has complete control over the VR scenario and is able to direct the client's self soothing, or determine if the client is ready to face the next stages of the VR environment (Wallach, Safir, & Bar-Zvi). One final benefit of the VR exposure scenario is that VR environments can facilitate the therapist's ability to adjust the stimuli and the environment in ways that may not be physically possible in the real world, and/or can facilitate combinations of stimuli that do not occur frequently (Bohil, Alicaea, & Frank, 2011).

Another benefit of exposure, which has been linked to its efficacy, is attention versus distraction. Mohlman and Zinbarg (2000) conducted a study in which they adjusted the

intensity of attention and distraction with 72 spider fearful adults. When distracted, adults experienced less anxiety; however, when they were more focused, they experienced a greater reduction in overall fear. VR technology has been shown to facilitate the sense of participant presence in the virtual environment; this minimizes avoidant behavior and facilitates emotional involvement in the scenario (Gerardi et al., 2010).

2.3.2.2 Challenges of VR. While research and experience suggest that the benefits of VR are many, it is important to note that there are potential drawbacks to the VR environment. Researchers of VR have found some clients exhibit cybersickness, which is a form of motion sickness (Kennedy, Berbaum, & Drexler, 1994). Cybersickness is thought to occur when there are different perceptions in sense modalities such as auditory, visual, and vestibular (Rizzo & Buckwalter, 1995). After effects are another category to be aware of which "may include such symptoms as disturbed locomotion, changes in postural control, perceptual-motor disturbances, flashbacks, drowsiness, fatigue, and generally lowered arousal" (Anderson, Jacobs, & Rothbaum, 2004). These symptoms dissipate shortly after the HMD goggles with VR environment are removed.

Another challenge described is the social isolation of technology. The isolationist view asserts technology use could exacerbate social phobia because technology creates disengagement, and removes people from face-to-face contact and social integration (Anderson, Jacobs, & Rothbaum, 2004). It is important to note that the use of technology does not replace a competent therapist trained in CBT. As with any tool in therapy, the clinician should use the VR technology as an adjunct to effective therapy, as opposed to the method of therapy itself. The client-therapist relationship should continue to be of primary

importance. A final drawback of the VR environment that Wallach, Safir, and Bar-Zvi (2009) describe is that the VR environment is fairly stagnant, unless additional programming is provided. Bohil, Alicea and Biocca, (2011) caution that the programming requirements to create and maintain the environments can be extensive and prohibitive to individual therapists. Therefore, despite promising research, the uptake of VR to treat anxiety in clinical practice has been slow.

2.3.3 Selected, targeted and universal approaches to CBT. Finally, much research has been conducted around the use of early intervention and preventative approaches (Mrazek & Haggerty, 1994). These approaches show promise with young people in promoting emotional health and resilience, in addition to reducing the frequency of childhood mental disorders (Barrett, Farrell, Ollendick, & Dadds, 2006; Bernstein, Layne, Egan, & Tennison, 2005). Three options are available for preventative approaches: selected, targeted and universal interventions. Selected approaches target those who have been identified as having higher risk of the illness than others (Mrazek & Haggerty). On the other hand, targeted approaches focus on those children exhibiting initial signs and symptoms of a disorder. Targeted approaches are appealing as they are cost effective, efficient and reduce resource use (Miller et al., 2011). The third option is universally applied intervention strategies that focus on improving the lives of children by offering mental health strategies to the whole population as opposed to those who are deemed at risk (Mrazek & Haggerty). Universally applied, preventative intervention strategies are appealing because they offer the opportunity to provide all students with anxiety management techniques, as opposed to pulling out affected children and risking stigmatization. Further it provides some

conveniences in terms of recruitment and scheduling. Drawbacks of universally applied interventions according to Miller et al. (2011) include the significant cost of materials, impact to curricular instruction time, as well as the need for teacher training. However, most of the drawbacks for universal application are the one-time start up costs; the products and training should be viable for subsequent years. Further, because anxiety is so prevalent and destructive, and because social emotional learning is a curricular requirement in British Columbia, universally teaching students skills to combat anxiety in schools during childhood is valuable. This study looks at the effectiveness of providing a program that would be applied in order to disseminate CBT intervention strategies universally.

2.4 Summary

In summary, excessive anxiety works like an "over sensitive alarm" system that goes off in the absence of real danger. CBT has been identified as an evidence-based treatment for this debilitating ailment. Exposure works as the active ingredient of CBT. Assessing the feasibility of using VR to expose children to a feared stimulus, using large-scale designs, in public schools has not been conducted. Support for moving mental health prevention and intervention into the contexts where children function has been increasing (Miller et al., 2011); to bring an innovative and experimental anxiety-intervention medium such as VR into school classrooms is novel in the field. Encouragingly, anxiety disorders have a high rate of treatment success when intervention begins in childhood or adolescence. Moreover, because of the multitude of children who will face an anxiety disorder in their lifetime (anxiety is the most prevalent mental health concern among children, adolescents and adults), providing a

universal feasibility study that sets the stage for future preventative skills in a school setting may be an optimal way to address this debilitating mental health concern.

Chapter 3: Methodology

This chapter reviews the method of the study, including: ethics approval, recruitment of participants, participant attrition, procedure, and details of the measures used.

3.1 Introduction

This study assessed the feasibility and treatment acceptability of using VR technology with children in school classrooms. This study sought to assess whether there were mean differences in children's state anxiety levels by time, condition, or gender, when controlling for trait anxiety measured using the Multidimensional Anxiety Scale for Children (MASC). It also assessed whether there were mean differences in the VR technology treatment acceptability by gender, or condition (neutral or anxiety provoking). Two repeated measures ANCOVAs were conducted, while controlling for trait MASC scores. The first ANCOVA tested for differences in acceptability by condition and gender, as well as for any two-way or three-way interactions. The second ANCOVA tested to see if there were differences in changes in pre or post state anxiety levels by condition, time and gender, as well as any two-way or three-way interactions.

3.2 Ethics Application and Recruitment

The Vice Principal at the Secondary School chosen supported this study by assisting with teacher recruitment. Teachers were recruited by contacting all teachers of grade 9 students within the school. Five teachers expressed interest, and were asked to provide their consent to participate. This study received ethical approval from the Superintendent of Schools in the District on Feb 17, 2012 and from the UBC ethics board (H08-02539) on February 15, 2011.

3.3 Participants

Recruited participants were enrolled in five grade nine classes, ages 13-15, (M=14.45) at a single suburban High School in Abbotsford, British Columbia. Parental consent forms were distributed to 120 students, of which 105 parents agreed to their child's participation. These forms were returned in sealed envelopes and given either to the classroom teacher or the researcher directly. Eligibility required students to be enrolled in a grade 9 class at the participating school, and have their classroom teacher consent to participation in the study. Participants were excluded when assent was removed or when a participant missed one or more sessions. Consent forms were also received from classroom teachers (n = 5). Demographic data are presented in Table 1 and include the following variables: age, and trait anxiety level for valid grade 9 participants (n = 79).

Table 1 Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Age	79	14	15	14.45	0.50
MASC Score	79	5	77	42.81	15.47

3.3.1 Sampling procedures. A convenience sample was recruited by having the administrator of the selected school invite all teachers of grade 9 students during Block A to participate in the study. Data were collected in 2 private locations adjacent to the classroom and pre and post measures were filled out in private adjoining locations. Students were entered into a draw for a minimal gift certificate to the mall for returning parent consent forms by the due date. All students received a group psycho-education lesson on anxiety as well as a pizza party for their participation in the study. As a safety procedure, to address the

possibility of a participant having a panic attack and or experiencing cybersickness, all students were requested to inform the researcher if they felt uncomfortable at any time during the exposure.

3.4 Measures

The study required children to complete measures at multiple time points: one week before the VR technology use (Time 1), the *Multidimensional Anxiety Scale for Children* (MASC; March, 1997), the *Childhood Anxiety Sensitivity Index* (ASI; Peterson & Reiss, 1992), the *Mobility Inventory* (CASI; Chambless et al., 1985), *MODIFIED for Teens* (Miller et al., 2011); immediately before their first VR experience (Time 2), the *State Trait Anxiety Inventory for Children* (STAIC; Spielberger, Gorsuch, & Lushene, 1970); immediately after their first VR experience (Time 3), the STAIC, and the acceptability questionnaire; immediately before their second VR experience (Time 4), the STAIC; and immediately following their second VR experience (Time 5); the STAIC, and the acceptability questionnaire. The CASI and MI modified for teens were administered at time 1, but results were not used in the analysis of this study.

3.4.1 Trait anxiety. In order to assess trait anxiety levels, the Multidimensional Anxiety Scale for Children (MASC) (March, Parker, Sullivan, Stallings, & Conners, 1997) was given prior to the VR exposure. The MASC is a 39 item Likert scale self-report checklist which is easily administered in a school setting in approximately 15 minutes. Each item is rated on a 4 point scale (0 = never true about me, 1 = rarely true about me, 2 = sometimes true about me, 3 = often true about me). The MASC shows excellent internal and test-retest reliability with an internal consistency of .90 (March et al., 1997), and captures clinically

relevant anxiety symptoms at the factor and item level; this approximates DSM-IV pediatric anxiety disorders (Miller et al., 2011). The MASC has demonstrated acceptable levels of both convergent and divergent validity, and has a test-retest reliability of .79 in clinical samples and .88 in school-based samples (March, Sullivan, & Parker, 1999). The MASC provides a total score from summation of responses to questions 1-39 (resulting in scores ranging from 0-117), with higher scores indicating increased anxiety symptoms. All raw scores have been converted to T scores using the MASC manual and anxiety in children is categorized as follows: 45-55, average; 56-60, slightly above average; 61-65, above average; 66-70, much above average; scores above 70 are associated with possible clinical diagnoses of anxiety in a low base rate group (March, 1997). Items left blank were addressed by multiplying the obtained raw score by the total number of items on the scale and then dividing by the total number of items that had responses.

3.4.2 State anxiety. *The State Trait Anxiety Inventory for Children (STAIC)* (Speilberger, 1973) is based on the *State-Trait Anxiety Inventory* and has been modified for children. This measure consists of two separate self report scales, measuring two distinct anxiety concepts: trait anxiety level (fixed as part of the personality) and state anxiety level (varying in intensity and shifting over time) (Speilberger, 1973). The STAIC State Scale has 10 anxiety present items and 10 anxiety absent items (Hedl & Papay, 1982). The measure was originally validated for use with children between grades 4-6; however, follow up studies have deemed it to be successful in discriminating between adolescents with and without an anxiety disorder (Seligman, Ollendick, Langley & Baldacci, 2004). Test-retest coefficients for the trait Anxiety scale (males = .65, females = .71) report higher than those

for the state anxiety scale (males = .31, females = .47) and may reflect unique influences present at the time of retest (Speilberger, 1980). Internal consistency for the STAIC is reasonably good considering it reflects the moderate reliability and stability of the trait anxiety scale (Seligman, Ollendick, Langley & Baldacci, 2004). This measure took 5-10 minutes to complete and scores range from a minimum of 20 to a maximum of 60. Raw scores were converted to normalized T Scores and separated by gender and state versus trait anxiety.

3.4.3 Treatment acceptability. A one-page measure containing both Likert-scaled questions as well as open-ended questions was used to assess treatment acceptability and the feasibility of its implementation following participants' use of VR technology. Likert-scaled questions (e.g., I really enjoyed the Virtual Reality experience) were rated on a scale of 1-7, where 1 is strongly agree, and 7 is strongly disagree. This measure was administered at two time points (post neutral and post anxiety condition) and took 10-15 minutes to complete. Because other questions on the measure could also be attributed to other factors (e.g., presence, or equipment comfort), the acceptability score was measured using the question "I really enjoyed the Virtual Reality experience." Open-ended responses were analyzed using content analysis for key words and their synonyms (e.g., how real the scenario felt). Results from this content analysis were presented as frequencies.

3.5 Procedure

Students completed paper and pencil measures at multiple time points: one week before the VR technology use (Time 1), immediately before their first VR experience (Time

2), immediately after their first VR experience (Time 3), immediately before their second VR experience (Time 4), and immediately following their second VR experience (Time 5).

The researcher visited all five classrooms on one day to briefly describe the study procedures to students, teachers and school administration. At this time, parental consent forms were distributed to students, who were requested to return them in sealed envelopes to their classroom teachers.

Parent consent forms were collected during Time 1 data collection visits. The researcher delivered an assent script (Appendix H) to those children with parental consent for participation in the study. Two children with parental consent declined to participate in the study prior to Time 1. Students were given instructions for each paper and pencil measure and completed the measure on their own before the group proceeded to the next assessment.

3.6 Format

The format was composed of a brief overview on anxiety, the use of virtual reality technology, followed by an overview of anxiety, CBT, and exposure. The study was conducted over four to five class meetings, spaced one week apart, and held during students' regular class, which was 80 minutes in duration. Exposure activities were held adjacent to the school classroom in a private space, with the regular classroom teacher in proximity. The intervention took place individually for each student during the regular school day. Each lesson is briefly outlined below; a more detailed script and lesson plan can be found in Appendix I and session objectives in Appendix K.

3.6.1 Session 1: Brief overview of anxiety, student assessment. In lecture format, the researcher provided a brief introduction to what anxiety is and the format for the study.

Following the lecture, all pencil paper measures were administered. Rather than recording names, students were asked to identify themselves according to the last 7 digits of their home phone number in order to maintain student confidentiality. Standardized assessments (see below) were administered only to students with active parental consent. Those without parental consent were encouraged to do free reading, review homework, or other quiet activities as assigned by their teacher during the assessment period.

3.6.2 Session 2: VR exposure. Two virtual reality head mounted devices (VR HMDs as seen in figure 1 above) connected to two computer terminals with loaded VR scenarios were set up in two private locations adjacent to participating classrooms. The VR equipment was provided from a Canadian Foundation for Innovation award (CFI-1138) and owned by UBC. The researcher demonstrated the proper use of the VR equipment. Two scenarios were available for observation through the HMDs: a classroom with no avatars (e.g., virtual students.) in it, and a classroom with virtual avatars animated by a loop outlined in Appendix L in which avatars use distracting and potentially anxiety provoking behaviours. These two scenarios were designed to comparatively evoke anxiety levels during the VR exposure. A within-subjects design dictated that students were previously and randomly assigned to either the neutral scenario (where the student with the HMD goggles on is at the front of the class, looking out into an empty classroom) or the anxiety provoking scenario (where the student with the HMD goggles on is at the front of the room and students in the classroom are employing anxiety provoking behaviors such as laughing, staring, or falling asleep) prior to the session. Immediately following the instruction in computer and equipment use, students were called up one at a time to a private space to complete the STAIC-S measure of state

anxiety. Then, the student moved to the computer brought into the adjacent classroom by the researcher. The HMD goggles and earphones were placed on the student's head. Each student had sixty seconds to wear the HMD's, observing the scenario, before beginning. While wearing the HMD and being immersed in the scenario (virtual classroom), the student completed an extemporaneous speech for ninety seconds, (to a maximum of 5 minutes), on a previously chosen topic while interacting with the virtual environment previously and randomly selected. The use of an extemporaneous speech maintained equal preparation among participants (e.g., many students chose to talk about their families during the 90 seconds and detailed members of their families and preferences of the members, another common theme was for students to choose something they are passionate about, such as horses, and tell the virtual classroom all about that topic during their 90 seconds). Immediately following the student's VR use, a measure of state anxiety, using the STAIC-S, was taken. Students also completed a Likert-scaled questionnaire measuring acceptability and cybersickness response.

3.6.3 Session 3: VR exposure. Two VR HMDs were connected to two computer terminals with loaded VR scenarios and were brought into adjacent classrooms for a second time. Again students were called up one at a time to complete the STAIC-S to measure state anxiety levels and each student received 90 seconds (to a maximum of five minutes) to use the alternate scenario that they had not received previously. Their experience consisted of a maximum of sixty seconds to explore the environment before their extemporaneous speech, and ninety seconds to discuss their topic of choice. Following the experience using the VR equipment, each student completed a STAIC-S to measure state anxiety levels and a Likert-

scaled questionnaire measuring acceptability and cybersickness responses. Students were asked to complete the Likert-Scale questionnaire on acceptability. Students were instructed to give as much detail as possible; the questionnaires took 10-15 minutes. All questionnaires were collected.

3.6.4 Session 4: VR experience. This class was scheduled to allow for any delays in previous sessions, or to accommodate any students who were sick during Session 2 or Session 3. The procedure for this session was the same as Session 3.

3.6.5 Session 5: Psychoeducation. Session 5 was a psychoeducation lesson, given by the researcher, discussing anxiety disorders in youth, including information on CBT. This lesson was an adaptation of the Living Effectively with Anxiety and Fear Program (Miller et al., 2011), an evidence-based curriculum based on CBT principles that focused on education related to anxiety; the lecture portion of the LEAF program was given to students via power point presentation. The psychoeducation program reviewed information on the following five educational areas related to anxiety: 1) Basic educational information regarding anxiety disorders, 2) Information on how to manage bodily sensations of anxiety, 3) Discussion examining thoughts and beliefs will be taught with a focus on identifying misconceptions that maintain the cycles of anxiety, 4) Overcoming avoidance behaviours, 5) Learning how to maintain gains and anticipate future anxiety.

3.7 Missing data

The study required all measures to be completed at all time points and comparisons could only be made for participants who completed all measures at all time points. Participants not completing a single measure, at any time point, were excluded from the

study as outlined in figure 2. This resulted in lower sample sizes as not all participants completed measures at all time points (due to attrition, absences, assent removal, etc.). No exclusions occurred based on missing individual items in a single measure.

Figure 2 Participant attrition

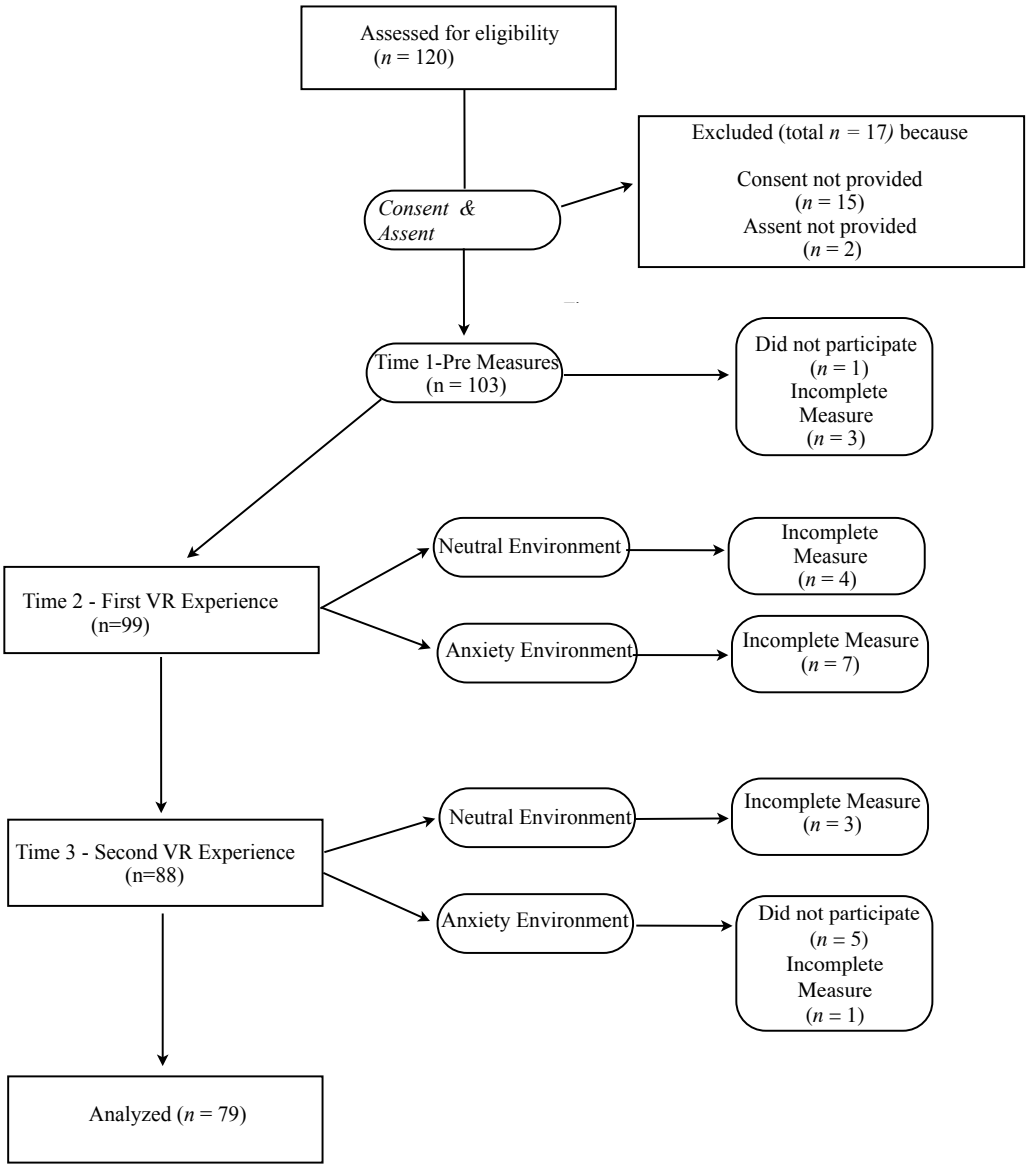

Figure 1. Participant consort flowchart illustrating attrition of child-participants from consent to final data analysis

Chapter 4: Results

This study researched the treatment acceptability of using VR technology with children in school classrooms. Data were analyzed to address whether a) VR exposure is feasible in a school based setting (implementation, cost and logistical issues), b) the virtual environment evokes anxiety and is thus feasible, c) children enjoyed the VR technology use, and d) VR technology intervention acceptability was related to gender or condition (neutral vs. anxiety provoking).

4.1 Overview of Analyses

Frequencies and descriptive statistics for demographic data are presented in Table 1 above. A repeated measures Analysis of Covariance (ANCOVA) was conducted on acceptability scores with gender as the between subject factor and conditions (neutral and anxiety provoking) as the within subject repeating factor with MASC included as a covariate. A similar repeated measures ANCOVA on state anxiety scores was conducted with gender as the between subject factor with conditions (neutral and anxiety provoking) and time (pre and post VR session) as the within subject repeating factors. MASC scores were also included as a covariate. The focus of the repeated measures ANCOVA was to examine all the main effects and interactions between state anxiety levels and time (pre and post exposure), condition (neutral and anxiety provoking) and gender, while controlling for MASC scores.

4.2 Descriptive Statistics

Trait anxiety levels were assessed using the MASC where 6% of participants scored at a level indicating clinical levels of anxiety.

4.3 Data Analysis

In order to assess the feasibility of virtual reality technology, implementation issues, cost and logistical issues were addressed, as well as a repeated measures ANCOVA conducted on state anxiety levels with gender (male and female) as the between subject factor and treatment conditions (neutral and anxiety provoking), and time (pre and post exposure) as within subjects factors. The goal of this analysis was to determine whether VR technology evoked anxiety in participants.

Participants' state anxiety scores are presented in Table 2 by time (pre and post exposure), condition (neutral and anxiety provoking), and gender (male and female).

Table 2: Descriptive Statistics for State Anxiety Levels

Descriptive Statistics for State Anxiety Levels

	Gender	Mean	Std. Deviation	N
STAIC Neutral Pre	Female	33.24	4.53	40
	Male	32.57	3.99	39
	Total	32.91	4.26	79
STAIC Neutral Post	Female	32.30	4.24	40
	Male	32.33	3.76	39
	Total	32.31	4.00	79
STAIC Anxiety Pre	Female	32.45	4.34	40
	Male	32.30	4.12	39
	Total	32.28	4.33	79
STAIC Anxiety Post	Female	32.10	4.32	40
	Male	32.27	4.28	39
	Total	32.19	4.30	79

Repeated Measures ANCOVA has a number of assumptions including, normality, linearity, homogeneity of variance and homogeneity of regression. In order to test linearity, I examined a scatter plot of the residual versus predicted values. Next, to assess the homogeneity of variance, Box's Test of Equality of Covariance Matricies was conducted (F (10, 28302) = 1.44, p = .15) also conducted was Levene's Test of Equality of Error Variance (F(1, 77) = 1.16, p = .28), (F(1, 77) = .13, p = .71), (F (1, 77) = .167, p = .68), (F(1, 77) =2.87, p = .09). All tests conducted were found not significant. Next, to assess the homogeneity of regression assumption the interaction between the between subject factor and the covariate was assessed; this interaction was found not significant (F (1, 75) = .05, p= . 831). Further the interaction between the within subjects factor and the covariate was assessed; these interactions were found significant as below and indicate the homogeneity of regression assumption has been violated with this model. A violation of this assumption shows that the slopes (STAIC versus MASC) differ within groups (time and condition) and hence MASC levels are not adjusted similarly within the groups.

The following results are presented with MASC scores as the covariate. The repeated measures ANCOVA on state anxiety scores found a main effect of conditions F(1, 76) = 5.89, p = .018, η_p^2 = .07, and time, F(1, 76) = 12.06, p = .001, η_p^2 = .14. Participants in the neutral condition (M = 32.61, SD = 4.14) had lower mean state anxiety scores than those in the anxiety provoking condition (M = 33.27, SD = 4.26). All participant mean state anxiety levels were lower post (M = 32.25, SD = 4.20) than pre (M = 32.64, SD = 3.99). There was no main effect of gender, F(1,76) = .74, p = .40, η_p^2 = .010. A significant two way interaction was detected between condition and MASC, F(1,76) = 4.61, p = .04, η_p^2 = .06 and time and

MASC, $F(1,76) = 8.43$, $p = .01$, $\eta_p^2 = .10$, indicating that the homogeneity of regression assumption has been violated. The two-way interactions indicated that MASC scores were more strongly and positively related to post test state anxiety than pre test state anxiety scores and to state anxiety in the neutral conditions more so than the anxiety-provoking conditions. No significant two way interactions were found between conditions and gender ($F(1,76) = .06$, $p = .81$), time and gender ($F(1,76) = 1.52$, $p = .222$), or conditions and time ($F(1,76) = .38$, $p = .54$). In addition no significant three way interactions were found between condition, time and MASC, $F(1,76) = .53$, $p = .47$, $\eta_p^2 = .01$, or between conditions, time and gender $F(1,76) = 1.12$, $p = .29$, $\eta_p^2 = 014$. MASC was significantly related to the dependent variable, state anxiety justifying its use as a covariate $F(1, 76) = 4.61, p = .035$.

In order to address the violation of the homogeneity of regression assumption, post hoc analyses were conducted by running another ANOVA with the MASC omitted as the covariate. The results indicate that fewer interactions are significant when compared to the ANCOVA model. In the ANOVA, the main effect of time remains significant ($F(1, 77) = 4.68$, $p = .03$), but no other main effect or interaction is significant. Because the main effect on MASC is significant and explains 11% of the variance, it is not surprising that a model which excludes the MASC has a poorer fit and is less significant on most effects. Further, another ANCOVA was performed using a median split on MASC. These results were supportive of the original model and found significant two-way interactions between condition and MASC median ($F(1, 75) = 4.18$, $p = .04$), and time and MASC median ($F(1, 75) = 4.22$, $p = .043$). The main effect of MASC was no longer significant.

In order to assess treatment acceptability, a repeated measures ANCOVA was conducted on acceptability with condition (neutral or anxiety provoking), and gender as the factors. Participants' acceptability scores are presented in Table 3 by condition and gender.

Table 3: Descriptive Statistics for Acceptability Scores

Descriptive Statistics for Acceptability Scores

	Gender	Mean	Std. Deviation	N
Neutral Acceptability	Female	3.56	1.534	40
	Male	3.64	1.564	39
	Total	3.60	1.539	79
Anxiety Acceptability	Female	3.68	1.604	40
	Male	3.21	1.609	39
	Total	3.45	1.614	79

Overall, the average acceptability, when controlling for MASC scores, was 3.53 with a *SD* = 1.38. This was ranked on a 7 point Likert-Scale, where 1 is strongly agree and 7 is strongly disagree; a 3 score reflects participants somewhat liked the VR exposure experience and following Time 1 exposure 57.60 % of the participants ranked their acceptability level at or above somewhat agree. At Time 2 exposure 52.60 % of the participants ranked their acceptability level at or above somewhat agree. Frequencies of participants' acceptability scores are presented in Table 4 by time.

Table 4: Frequencies for Acceptability Scores

Frequencies for Acceptability Scores

Scores	Percentages
1 - Strongly Agree	Time 1 - 8.80%
	Time 2 - 6.30%

Scores	Percentages
2 - Agree	Time 1 - 21.30%
	Time 2 - 20.00%
3 - Somewhat Agree	Time 1 - 27.50%
	Time 2 - 26.30%
4 - Neither Agree nor Disagree	Time 1 - 20.00%
	Time 2 - 18.80%
5 - Somewhat Disagree	Time 1 - 12.50%
	Time 2 - 12.50%
6 - Disagree	Time 1 - 7.50%
	Time 2 - 8.80%
7 - Strongly Disagree	Time 1 - 2.50%
	Time 2 - 7.50%

Instances of cybersickness may also be a factor in acceptability results. To address cybersickness, participants were asked to rank the following question on a likert scale of 1 to 7, where 1 is strongly agree and 7 strongly disagree, “I felt sick as a result of the virtual environment.” Frequencies presented in Table 5 show that the majority of participants were not affected by cybersickness (70.1% at time 1, and 63.9% at time 2), some participants were neutral (5% at time 1 and 10% at time 2), and some students were affected by cybersickness (25% at time 1, and 26.3% at time 2). Slightly more students were affected by cybersickness at time 2 than time 1), which is consistent with acceptability data.

Frequencies for Cybersickness

Scores	Percentages
1 - Strongly Agree	Time 1 - 10.00%
	Time 2 - 12.50%
2 - Agree	Time 1 - 7.50%

Scores	Percentages
	Time 2 - 6.30%
3 - Somewhat Agree	Time 1 - 7.50%
	Time 2 - 7.50%
4 - Neither Agree nor Disagree	Time 1 - 5.00%
	Time 2 - 10.00%
5 - Somewhat Disagree	Time 1 - 5.00%
	Time 2 - 3.80%
6 - Disagree	Time 1 - 18.80%
	Time 2 - 21.30%
7 - Strongly Disagree	Time 1 - 46.30%
	Time 2 - 38.80%

The repeated measures ANCOVA revealed a borderline significant main effect of conditions, $F(1,77) = 3.96$, $p = 0.05$, $\eta_p^2 = .05$ when controlling for MASC scores. Participants in the anxiety provoking condition ($M = 3.56$, $SD = 1.53$) had higher acceptability scores compared with their acceptability scores in the neutral condition ($M = 3.68$, $SD = 1.60$). No significant main effect of gender, $F(1,77) = 0.03$, $p = 0.86$, was found, when controlling for MASC scores. There was no interaction detected between condition and gender, $F(1,77) = 1.04$, $p = .312$, when controlling for MASC scores. No statistically significant interaction was found between condition and MASC scores, $F(1,77) = 3.09$, $p = .08$; the MASC covariate was significant, $F(1,77) = 4.42$, $p = .045$. When asked what they liked about the experience, an analysis of qualitative data showed that 25% of the participants liked how real the VR experience felt, 24% liked the tracking feature of the equipment, 15% liked the amount of detail in the scenario, and 10% liked that they felt either less afraid or less judged speaking to the virtual avatars.

Although statistical significance was not achieved, effect sizes suggest there may be meaningful effects for the cases where there were medium effect sizes. The range of effect sizes detected was between 13.70% and 4.90% variance explained. For example, 14% of the variance in the trait anxiety scores can be explained by condition, which is a medium effect size (Cohen, 1992) and 5% of the variance in the acceptability can be explained by the MASC scores.

Chapter 5: Discussion

This study examined the feasibility of virtual reality exposure, universally applied in a school setting and the treatment acceptability of using VR technology with children in schools. This study is unique in that a universally applied study of the feasibility of VR exposure with adolescents in a school setting has never been conducted. Results supported the hypothesis that when participants were in the neutral condition they had lower state anxiety scores than when they were in the anxiety condition (neutral, $M = 32.61$, and anxiety provoking, $M = 33.27$), with 7.2% of the variance accounted for by the condition; this reflects a medium effect size (Cohen, 1992). This data also includes pre VR scores; it is unusual to find a main effect of condition, without finding a condition by time interaction. There were two additional participants in the anxiety condition at time 1 than at time 2, due to attrition, which may have resulted in the order of conditions being imbalanced.

A condition by time interaction was not found indicating that condition had no impact on within-session change in state anxiety scores (neutral $M = 33.41$, anxiety $M = 33.93$); this could potentially be due to the small sample size or to the fact that changes in state anxiety were negligible. Another potential explanation is that only 6% of the participants were flagged as having clinical levels of trait anxiety (MASC scores), which is lower than the population average of 20% (Kendall & Ollendick, 2004). One post hoc observation is that children for this study were taken from regular grade 9 classes at the school; however, this school has a program for students experiencing difficulties in a regular classroom, which consists predominantly of anxious children. Therefore the regular classroom setting, in this particular school, may not be reflective of a typical school without this type of pull-out

program, thus impacting the number of participants who exhibited clinically anxious scores. Further with only 6% of participants scoring at clinical levels of anxiety, there may not have been a sufficient number of anxious children to detect statistical significance for condition (neutral or anxiety provoking). In other words, the intervention was designed to detect changes in state anxiety levels pre and post VR exposure. I hypothesize that those individuals who are not anxious, may not have been impacted by the conditions (neutral and anxiety). As a result, their state anxiety scores in each of the conditions may not have changed. Future studies may want to consider a trial of VR technology as a targeted approach for those indicated as either borderline or clinically anxious as opposed to universally applied. Another alternative is that the anxiety provoking exposure condition may need to have the avatars exhibit anxiety provoking behaviour more intensely, more frequently, or for a longer duration. Another hypothesis is that while adult VR studies have found the virtual environment to facilitate a sense of presence and evoke anxiety, children's exposure to virtual technology has increased dramatically and they may require more significant virtual stimulation to evoke their anxiety levels.

There was also a significant main effect of time (pre $M = 32.64$, post $M = 32.25$) on state anxiety, where 13.7% of the variance can be accounted for by time; this reflects a medium effect size (Cohen, 1992). However, the significance of the main effect of time is unable to be interpreted due to the violation of the homogeneity of regression slope assumption. After the intervention, all participants were less anxious which supports the fact that post exposure reduced participants' anxiety. This reduction in anxiety may be due to the VR exposure itself. However, state anxiety scores dropped following both treatments (neutral

and anxiety provoking), which does not support the hypotheses of this study that state anxiety levels will be related to intervention condition. The non-anxious population may have additional tools internally which allow them to prevent anxiety or to recover from anxiety more quickly than those flagged as clinically anxious; however, with only 6% of the sample indicated as clinically anxious, there is insufficient power for subgroup analysis. While it is not at a statistically significant level, it is relevant to note that those children in the anxiety provoking condition's post scores did not drop as sharply as those in the neutral condition (Mean difference Neutral 0.84, Mean Difference Anxiety 0.49). It is also possible that the STAIC state anxiety measure's questions were too general to capture children's anxiety responses to the conditional manipulation (VR environment neutral or anxiety provoking). The STAIC asks general questions regarding the participants' current anxiety levels. Based on my findings, participants were less anxious going through the VR experience than before they experienced it. This suggests that maybe people are anxious about VR until they undergo it. To test this hypothesis future studies may want to consider asking questions more specific to the participant's anxiety response to the virtual environment (e.g., the virtual avatars laughing). I would also re-design the study to utilize random assignment of participants to a neutral or an anxiety group. Working with two separate groups, a clinically anxious group, and a not clinically anxious group would allow for a more full assessment of the impact of treatment condition. Interestingly, there was no statistical significance for the main effect gender despite the hypothesis of this study. Although females have a higher rate of anxiety than males in the population (Merikangas et al., 2010), this study did not have a sufficient number of anxious participants to affect the

overall interactions between gender and condition. Therefore the slight number of anxious participants is a significant limitation to the study.

Practical factors affecting the feasibility of in virtuo exposure universally in schools include implementation time, financial burden, and logistical issues. The most significant challenge to the feasibility of implementing VR exposure universally is time. Each student required a total of 5 minutes, at a minimum, to engage in the scenario for 2 minutes. This is relatively inexpensive for a handful of students whose needs are targeted, but is excessive to implement universally for those in which the process is not required. The feasibility of universally implementing in virtuo exposure to a single class at a single time point is not plausible as a single computer can only run up to three sets of HMD goggles at a time and if multiple sets of HMD goggles are used, the tracking feature becomes void. The initial set up cost of the equipment for schools would be another prohibitive factor, as this technology does not replace another more expensive system (e.g., in vivo exposure). Further, from a logistics perspective, finding private space within a school varies depending on facility, but proved difficult in this particular study. VR technology implementation is feasible in a school setting, but may be most practical as a targeted intervention, alongside universal psychoeducation regarding anxiety.

Frequencies in Table 4 show overall slightly more than half of the students accepted the intervention (57.6% at time 1 and 52.6% at time 2), some students were ambivalent (20% at time 1 and 18.8% at time 2), and some students did not like the treatment (22.5% at time 1 and 28.8% at time 2). There was small to medium effect size (Cohen, 1992) with a variance explained of 4.9% for acceptability by MASC scores. It is not particularly surprising that

some students did not like the treatment as the exposure was designed to evoke anxiety; therefore, those participants who were more generally anxious, would be more likely to dislike the treatment as they would be more likely to experience greater intensity and frequency of state anxiety levels (Spielberger, Edwards, Montuori, & Lushene, 1970). There were also no statistically significant two-way interactions for conditions by MASC or conditions by gender, which again may be reflective of a small sample size and the number of participants who did not meet clinical cutoffs for anxiety. In order to see the differences targeted in this study, the sample size should be increased for future studies.

Cybersickness is another factor that could potentially have affected acceptability results. Frequencies presented in Table 5 reflect that the majority of participants were not afflicted with cybersickness (70.1% at time 1, and 63.9% at time 2), some students were neutral (5% at time 1, and 10% at time 2), and some students were affected (25% at time 1, and 26.3% at time 2). Interestingly slightly more students were affected with cybersickness at time 2 than at time 1, which is consistent with acceptability results. An analysis of the number of participants engaged in each condition showed that at time 1, 38 participants experienced the neutral condition and 41 participants experienced the anxiety condition; the inverse occurred at time 2.

Other potential limitations of this study were the use of self-reported measures, and the concern that participants might not reveal their honest attitudes, interests, values or personalities (Gay, Mills, & Airasian, 2009). Children may not have been aware enough of their own internal selves to accurately represent their experiences on paper. It is plausible that some children may have responded in ways they perceived as more socially acceptable or

that were more pleasing to the researcher. All participants were made aware that the individual measures were anonymously collected and evaluated in terms of the group response. Another delimitation of the study was that it occurred once weekly over a 5 week period. Because students were required to complete all measures at all time points, if students were absent it was challenging to include them in the balance of the study. This became particularly more difficult for the second exposure as time was dwindling. Future studies may want to consider conducting exposure sessions over a relatively short period of time to maintain participant interest and to reduce attrition. Another limitation of this study was that it included participants from the Greater Vancouver area and therefore, the results have limitations for generalization to other populations. Only measures written in English were used, and as a result this study was limited by the language diversity of students who could participate. Cybersickness was another delimitation. Although the number of participants likely to have experienced this was low, it was possible that some students did not continue to participate in the study or with the VR technology due to cybersickness, resulting in data being ineligible for analysis.

Future research is warranted using a targeted approach within the school system or using a sample that contains both anxious and non-anxious individuals within the school system to further examine the interactions between anxiety levels and intervention condition, anxiety levels and gender, intervention acceptability and gender, acceptability and condition. Although I did not find the statistical significance I was looking for (interaction between condition and time), I still believe there is merit in VR if anxious students are targeted and the state anxiety measure has questions specific to VR exposure. Also the level of anxiety

provoking behaviour depicted by the avatars should be reexamined and potentially redeveloped because it is possible that the state anxiety condition did not produce the expected anxiety provoking stimuli. The intensity of the anxiety condition may not have been sufficient. The exposure experience may not have been long enough to evoke an anxious response. Further, studies into the level of presence experienced by teenagers while engaged in the VR exposure conditions may also be warranted in order to distinguish between whether the anxiety provoking condition itself did not provoke anxiety as anticipated, or whether participants had an insufficient level of presence to evoke anxiety levels. The statistically significant findings and effect sizes suggest future research of VR technology is warranted in a school setting. The lack of statistically significant findings has provided support for the design of future studies examining the use of VR technology exposure in schools.

5.1 Conclusion

Anxiety is a significant mental health concern. Its effects can be far-reaching and long lasting. Moreover, anxiety has high comorbidity rates with depression and other mental health disorders, and can be a problem that continues to grow if not addressed promptly. As counseling psychologists, it is encouraging to remember that anxiety's trajectory can be successfully managed with CBT. Exposing clients to their particular fear and helping them to challenge faulty cognitions in order to create new ones is a challenging process. The ability to do this from the classroom, with increased willingness from clients, through VR technology, offers clients a viable way to address their anxiety. The opportunity to work proactively with children to address these issues through VR is an emerging field, which

offers much promise. This research may provide insight into the viability and treatment acceptability of using VR technology as an opportunity to provide access to services, which may have the power to change lives through the early intervention and prevention of anxiety. Most studies that use VR technology in psychology have looked at an adult population; this is the first study that has examined the impact of VR exposure on anxiety levels with adolescents in a school setting. In addition, this study also did not find a significant difference on anxiety levels by gender, which is not consistent with the field. This suggests that future studies need to examine if gender differences continue to exist. Another contribution of this study is that it found an overall acceptability of VR technology exposure with teenagers. Finally, this study found that VR technology exposure reduced state anxiety scores both from pre exposure to post exposure and while in the neutral condition, participants' anxiety levels dropped more significantly than when they had been in the anxiety provoking condition.

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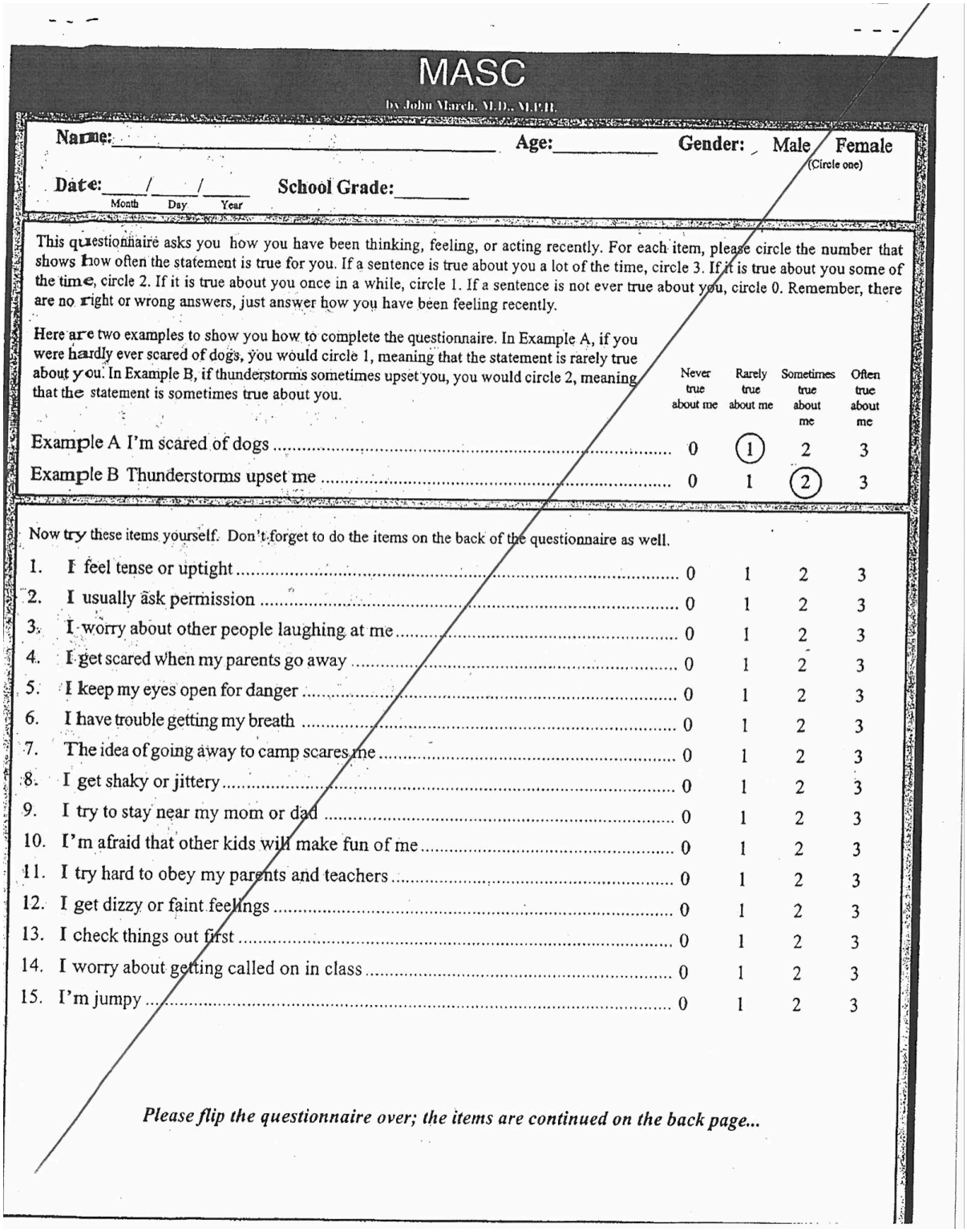
Appendix A: Multidimensional Anxiety Screen for Children



MASC

by John March, M.D., M.P.H.

Name:_____ Age:_____ Gender: Male Female (Circle one)

Date:____/____/____ School Grade:_____
Month Day Year

This questionnaire asks you how you have been thinking, feeling, or acting recently. For each item, please circle the number that shows how often the statement is true for you. If a sentence is true about you a lot of the time, circle 3. If it is true about you some of the time, circle 2. If it is true about you once in a while, circle 1. If a sentence is not ever true about you, circle 0. Remember, there are no right or wrong answers, just answer how you have been feeling recently.

Here are two examples to show you how to complete the questionnaire. In Example A, if you were hardly ever scared of dogs, you would circle 1, meaning that the statement is rarely true about you. In Example B, if thunderstorms sometimes upset you, you would circle 2, meaning that the statement is sometimes true about you.

	Never true about me	Rarely true about me	Sometimes true about me	Often true about me
Example A I'm scared of dogs	0	(1)	2	3
Example B Thunderstorms upset me	0	1	(2)	3

Now try these items yourself. Don't forget to do the items on the back of the questionnaire as well.

1. I feel tense or uptight	0	1	2	3
2. I usually ask permission	0	1	2	3
3. I worry about other people laughing at me	0	1	2	3
4. I get scared when my parents go away	0	1	2	3
5. I keep my eyes open for danger	0	1	2	3
6. I have trouble getting my breath	0	1	2	3
7. The idea of going away to camp scares me	0	1	2	3
8. I get shaky or jittery	0	1	2	3
9. I try to stay near my mom or dad	0	1	2	3
10. I'm afraid that other kids will make fun of me	0	1	2	3
11. I try hard to obey my parents and teachers	0	1	2	3
12. I get dizzy or faint feelings	0	1	2	3
13. I check things out first	0	1	2	3
14. I worry about getting called on in class	0	1	2	3
15. I'm jumpy	0	1	2	3

Please flip the questionnaire over; the items are continued on the back page...

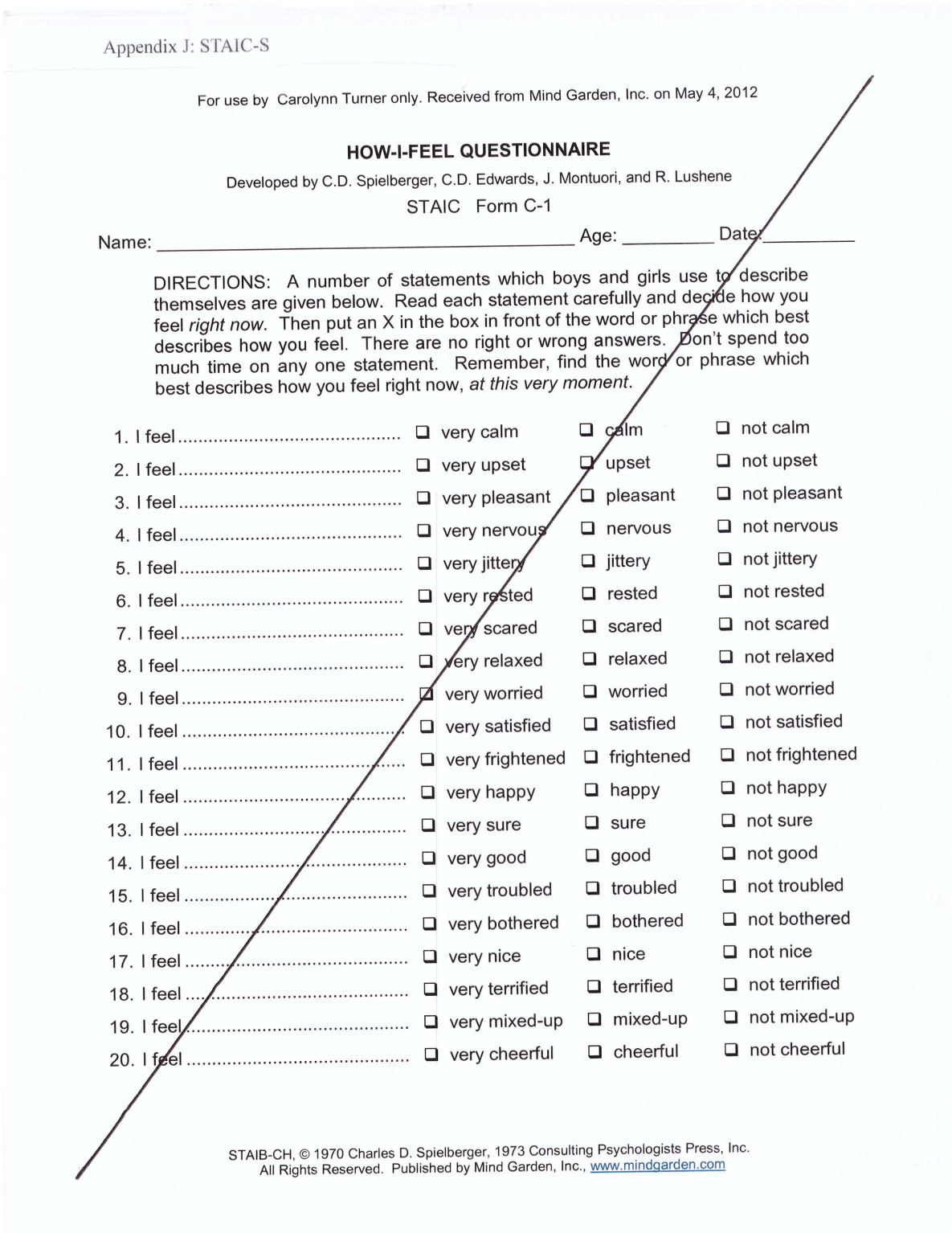
MASC

by John March, M.D., M.P.H.

	never true about me	rarely true about me	sometimes true about me	often true about me
16. I'm afraid other people will think I'm stupid	0	1	2	3
17. I keep the light on at night	0	1	2	3
18. I have pains in my chest	0	1	2	3
19. I avoid going to places without my family	0	1	2	3
20. I feel strange, weird, or unreal	0	1	2	3
21. I try to do things other people will like	0	1	2	3
22. I worry about what other people think of me	0	1	2	3
23. I avoid watching scary movies and TV shows	0	1	2	3
24. My heart races or skips beats	0	1	2	3
25. I stay away from things that upset me	0	1	2	3
26. I sleep next to someone from my family	0	1	2	3
27. I feel restless and on edge	0	1	2	3
28. I try to do everything exactly right	0	1	2	3
29. I worry about doing something stupid or embarrassing	0	1	2	3
30. I get scared riding in the car or on the bus	0	1	2	3
31. I feel sick to my stomach	0	1	2	3
32. If I get upset or scared, I let someone know right away	0	1	2	3
33. I get nervous if I have to perform in public	0	1	2	3
34. Bad weather, the dark, heights, animals, or bugs scare me	0	1	2	3
35. My hands shake	0	1	2	3
36. I check to make sure things are safe	0	1	2	3
37. I have trouble asking other kids to play with me	0	1	2	3
38. My hands feel sweaty or cold	0	1	2	3
39. I feel shy	0	1	2	3

Thank you for completing the questionnaire.

Appendix B: State Anxiety measure



Appendix J: STAIC-S

For use by Carolynn Turner only. Received from Mind Garden, Inc. on May 4, 2012

HOW-I-FEEL QUESTIONNAIRE

Developed by C.D. Spielberger, C.D. Edwards, J. Montuori, and R. Lushene

STAIC Form C-1

Name: _____ Age: _____ Date: _____

DIRECTIONS: A number of statements which boys and girls use to describe themselves are given below. Read each statement carefully and decide how you feel *right now.* Then put an X in the box in front of the word or phrase which best describes how you feel. There are no right or wrong answers. Don't spend too much time on any one statement. Remember, find the word or phrase which best describes how you feel right now, *at this very moment.*

1. I feel	❑ very calm	❑ calm	❑ not calm
2. I feel	❑ very upset	❑ upset	❑ not upset
3. I feel	❑ very pleasant	❑ pleasant	❑ not pleasant
4. I feel	❑ very nervous	❑ nervous	❑ not nervous
5. I feel	❑ very jittery	❑ jittery	❑ not jittery
6. I feel	❑ very rested	❑ rested	❑ not rested
7. I feel	❑ very scared	❑ scared	❑ not scared
8. I feel	❑ very relaxed	❑ relaxed	❑ not relaxed
9. I feel	❑ very worried	❑ worried	❑ not worried
10. I feel	❑ very satisfied	❑ satisfied	❑ not satisfied
11. I feel	❑ very frightened	❑ frightened	❑ not frightened
12. I feel	❑ very happy	❑ happy	❑ not happy
13. I feel	❑ very sure	❑ sure	❑ not sure
14. I feel	❑ very good	❑ good	❑ not good
15. I feel	❑ very troubled	❑ troubled	❑ not troubled
16. I feel	❑ very bothered	❑ bothered	❑ not bothered
17. I feel	❑ very nice	❑ nice	❑ not nice
18. I feel	❑ very terrified	❑ terrified	❑ not terrified
19. I feel	❑ very mixed-up	❑ mixed-up	❑ not mixed-up
20. I feel	❑ very cheerful	❑ cheerful	❑ not cheerful

Appendix C: Acceptability Measure

Appendix D: Student Likert-Scale

Age ____ Gender _____ ID number_____

My Virtual Experience-Student Report

Please circle the number which best corresponds to your experience.

1. Strongly Agree
2. Agree
3. Somewhat Agree
4. Neither Agree nor Disagree
5. Somewhat Disagree
6. Disagree
7. Strongly Disagree

1. I really enjoyed the Virtual Reality experience.

1 2 3 4 5 6 7

2. I enjoyed the Virtual Reality scenario (the picture I saw through the goggles)

1 2 3 4 5 6 7

3. The equipment was uncomfortable.

1 2 3 4 5 6 7

Please describe which parts were uncomfortable and or comfortable

4. The equipment was challenging to use

1 2 3 4 5 6 7

5. a. I felt sick as a result of the Virtual Environment.

1 2 3 4 5 6 7

5. b. Please describe how you felt?

6. What did you like about the virtual reality experience? Please explain in detail.

7. What didn't you like about the virtual reality experience? Please explain in detail.

8. Would you want to try using virtual reality again? Please explain in detail.

Appendix D: Parent Consent

THE UNIVERSITY OF BRITISH COLUMBIA

Department of Educational and Counselling Psychology, and Special Education
2125 Main Mall
Vancouver, BC Canada V6T 1Z4
Tel: (604) 822-8321 Fax: (604) 822-3302
www.ecps.educ.ubc.ca/faculty/l_miller.htm

CONSENT FORM - Parent

Title: Cyberpsychology and Schools Research Project

Principal Investigator: Lynn Miller, Ph.D., R. Psych., Department of Educational and Counselling Psychology, and Special Education, University of British Columbia
Tel. (604) 822-8539

April 2012

Dear Parent,

Your child, as a part of his/her Grade 9 classroom, is invited to participate in the Cyberpsychology and Schools Research Project. The purpose of this project is to assess the use of virtual reality with youth in school classrooms, specifically targeting anxiety. The Virtual Reality system uses a portable headset that people put on, allowing them to be immersed in a three-dimensional computer-generated environment (for example, a person could "peer" over the ledge of a tall building by putting the VR headset on, in order to re-create a fear of heights scenario). Virtual reality applications have shown some success in treating anxiety problems in adults. However, little or no research has been done using virtual reality with young people.

Anxiety disorders (excessive worries) are the most common mental health concern in children, and can negatively impact children's social relationships, academic achievement, as well as family functioning. Research has demonstrated that early education and intervention efforts can be extremely successful in helping children learn to manage anxiety. As young people are highly receptive to computer technology, it is hoped that integrating VR into classrooms will make learning about appropriate management of anxiety fun, exciting, and effective

allow your child to participate, even if your child is not showing signs of anxiety. Your child will submit the consent form to their Grade 9 teacher.

Later this spring, your child will be invited to participate in four to five 80 minute lessons that will take place during regular class time, with the rest of their usual classmates, in place of other social emotional educational activities (prescribed curriculum at each grade level in British Columbia). The program will take place as follows:

Class meeting 1: Overview of Anxiety, CBT & Exposure; Completion of standardized measures
Class meeting 2 & 3: Review of 1st meeting; Graduate student research assistants will take virtual reality equipment into the classroom and allow each student to experience the virtual reality system once for a maximum of five minutes; physiological measures.
Class meeting 4: Detailed overview of Anxiety; Final Q&A; Pizza Party
Class meeting 5: Overflow class to facilitate any additional time requirement

Total study time: 5 hours (with an optional sixth hour to accommodate absent students)

Risks and Benefits: Potential cybersickness is the main risk associated with the use of virtual reality systems, and is similar to motion sickness and can occur during or after immersion in a virtual environment. Cybersickness, if it occurs, is temporary and can include (1) visual symptoms (eyestrains, blurred vision, headaches), (2) disorientation (vertigo, imbalance) and (3) nausea (vomiting, dizziness). However these risks will be significantly minimized by limiting each students' exposure to 10 minutes. All research assistants involved in administering virtual reality will be trained to monitor signs of cybersickness and will end the experience early if a student is experiencing any discomfort. Students may benefit from the classroom instruction on anxiety, increasing their understanding of anxiety and anxiety management.

Confidentiality:
Any information resulting from the research study will be kept strictly confidential. All documents will be identified only by code number and kept in a locked filing cabinet. Participants will not be identified by name in any study reports. Electronic data stored on the computer will be password protected.
If you would like the results of your child's assessments, you may request this in writing from the principal investigator. If your child scores at an elevated level of anxiety, you will be contacted directly by the principal investigator.

Compensation:
Students who return their consent forms on time will have their names in a draw for a gift certificate to the mall. All students will be provided with a pizza party in class at the end of the study. Your child's classroom teacher will receive a $100 stipend to compensate him/her for his/her help in distributing and collecting consent forms, and for the use of his/her classroom and class time.

Inquiries:

If you have any further questions or concerns, please feel free to contact Dr. Miller's Anxiety Projects Research Lab at (604) 822-8321. If you have any concerns about you or your child's treatment or rights as a research participant, please contact the Research Subject Information Line in the UBC Office of Research Services at (604) 822-8598.

Sincerely,

Lynn Miller, Ph. D., R. Psych.

PLEASE DETACH AND RETURN

Parent Consent Form

Title: Cyberpsychology and Schools Pilot Project
I understand that my child's participation in this study is entirely voluntary and that I may withdraw my child from the study at any time.

I confirm that my child does not have a cardiac condition, epilepsy, or psychotic disorder, or have any other known health or other condition that would prohibit their participation in this study.

I have received a copy of this consent form for my own records.

.
Parent/Guardian Name: _____(please print)

Signature: _____

Date: _____

Home Telephone Number: _____

E-mail:_____

Mailing Address: _____

_____

Child's Name: _____ Date of Birth: _____

Teacher's Name: _____

School: _____

Yes / No — My child has a food allergy and will require an alternative to the pizza lunch that will be provided at the conclusion of the study.
If yes, please specify the food allergy: _____

Yes / No — You may contact me in the future in the event that Dr. Miller's lab receives additional funding for research on childhood anxiety.

Please complete this consent form and place it in the enclosed envelope, seal, and return to your child's homeroom teacher. Keep the second copy on this form for own records.

All responses will be held confidential

Version 3 (01/13/11)

THIS COPY IS FOR YOU TO KEEP FOR YOUR OWN RECORDS.

Parent Consent Form

Title: Cyberpsychology and Schools Pilot Project
I understand that my child's participation in this study is entirely voluntary and that I may withdraw my child from the study at any time.

I confirm that my child does not have a cardiac condition, epilepsy, or psychotic disorder, or have any other known health or other condition that would prohibit their participation in this study.

I have received a copy of this consent form for my own records.

.
Parent/Guardian Name: _____(please print)

Signature: _____

Date: _____

Home Telephone Number: _____

E-mail:_____

Mailing Address: _____

_____

Child's Name: _____ Date of Birth: _____

Teacher's Name: _____

School: _____

Yes / No — My child has a food allergy and will require an alternative to the pizza lunch that will be provided at the conclusion of the study.
If yes, please specify the food allergy: _____

Yes / No — You may contact me in the future in the event that Dr. Miller's lab receives additional funding for research on childhood anxiety.

Please complete this consent form and place it in the enclosed envelope, seal, and return to your child's homeroom teacher. Keep the second copy on this form for own records.

All responses will be held confidential

Version 4 (04/13/12)

Appendix E: Teacher Consent

THE UNIVERSITY OF BRITISH COLUMBIA

Department of Educational and Counselling Psychology, and Special Education
2125 Main Mall
Vancouver, BC Canada V6T 1Z4

Tel: 604.822.3131 Fax: 604.822.2684
Tel: (604) 822-8321 Fax: (604) 822-3302
www. ecps.educ.ubc.ca/faculty/l_miller.htm

Consent Form - Teacher

Title: Cyberpsychology and Schools Pilot Project

Principal Investigator: Lynn Miller, Ph. D., R. Psych., Department of Educational and Counselling Psychology, and Special Education, University of British Columbia,

April 2012

Dear Grade 9 Teacher,

You and the students in your classroom are invited to participate in the Cyberpsychology and Schools Research Project. The purpose of this project is to assess the feasibility and possible effectiveness of using virtual reality with youth in school classrooms, specifically targeting anxiety. The Virtual Reality system uses a portable headset that people put on, allowing them to be immersed in a three-dimensional computer-generated environment (e.g., a person could "peer" over the ledge of a tall building by putting the VR headset on, in order to re-create fear of heights scenario). Virtual reality applications have demonstrated efficacy in treating anxiety disorders with adults. However, little or no research has been done using virtual reality with young people. Anxiety disorders (worries) are the most common mental health concern in children, and can negatively impact children's social relationships, academic achievement, as well as family functioning. Research has demonstrated that early education and intervention efforts can be extremely successful in helping children learn to manage anxiety. As young people are highly receptive to computer technology, it is hoped that integrating VR into classrooms will make learning about appropriate management of anxiety fun, exciting, and effective.

Study Procedure:
Please complete the teacher consent form attached and return it in the envelope provided within two weeks. The parents of all of the students in your class will also be asked to consent to their child's participation in this project.

Later this spring, your class will participate in five 80 minute lessons that we expect will take place during regular class time, in place of other social emotional educational activities (which is expected during the social responsibility standards curriculum at

each grade level in British Columbia). The program will take place over a period of 5 class meetings as follows:

Class meeting 1: Overview of Anxiety, CBT & Exposure; Completion of standardized measures
Class meeting 2 & 3: Review of 1st meeting; Graduate student research assistants will take virtual reality equipment into the classroom and allow each student to experience the virtual reality system once for a maximum of five minutes; physiological measures.
Class meeting 4: Detailed overview of Anxiety; Final Q&A; Pizza Party
Class meeting 5: Additional class to facilitate any additional time requirement

All interventions will be supervised by trained graduate students placed in the school building with the classroom teacher present. All assessments will be completed during the school day in large group format, administered by the same trained graduate students.

Your role:
You will be asked to distribute consent forms to your students to take home to their parents, and collect returned consent forms. A graduate student will pick up these forms on Monday April 30, 2012 in the morning before classes begin. The graduate student will also pick up signed teacher consent forms at this time. We are looking for the participation of all students in your class, not just the students that parents may feel exhibit anxiety symptoms. Please refer any inquiries from parents to the research team at (604) 822-8321. You will be required to be present in all class meetings, however the research team will develop and deliver all classroom content (lessons 1-5). Lessons 2 and 3 will require students to have individual, silent work to complete while some students are participating in the intervention.

Your total time involved in participation in project is anticipated to be up to 6 hours (attendance in class).

Compensation:
We would like to offer you a $100 stipend to compensate you for your help in distributing and collecting consent forms, and more generally for allowing us to utilize your classroom and class time for our program. This will be awarded at the end of the project. The students in your class will also receive a pizza party at the end of the 5-day program as a thank you for their participation. In addition, students who return their consent forms by Friday April 27, 2012 will have their name entered into a draw for a mall gift certificate.

Confidentiality:
Any information resulting from the research study will be kept strictly confidential. All documents will be identified only by code number and kept in a locked filing cabinet. Participants will not be identified by name in any study reports. Electronic data stored on the computer will be password protected.

Inquiries:
If you have any further questions or concerns, please feel free to contact Dr. Miller's Anxiety Projects Research Lab at (604) 822-8321. If you have any concerns about your treatment or rights as a research participant, please contact the Research Subject Information Line in the UBC Office of Research Services at the University of British Columbia, at (604) 822-8598.

Sincerely,

Lynn Miller, Ph. D., R. Psych.

All responses will be held confidential

THIS COPY IS FOR YOU TO KEEP FOR YOUR OWN RECORDS.

Teacher Consent Form

Title: Cyberpsychology and Schools Pilot Project

I understand that my participation in this study is entirely voluntary and that I may refuse to participate or withdraw from the study at any time without jeopardy to my teaching position within my school.

I have received a copy of this consent form for my own records.

- I agree to distribute consent forms to my Grade 9 students, collect them once returned, and forward them to the research team.
  _____ Yes _____ No

- I agree to forward parent inquiries to the research team.
  _____ Yes _____ No

- I will not disclose the identity of the students/ parents participating in this study with other school staff (School principal exempt), parents, or students.
  _____Yes _____No

Teacher's Name: _____(please print)

Signature: _____ Date: _____

School: _____

School Telephone Number: _____

School Address: _____

Number of Grade 9 students in your class:_____

Best time to implement 5 classroom sessions:
Best weeks: _____
Best time of day: _____

All responses will be held confidential

Appendix F: Principal Letter to Parents

ROBERT BATEMAN SECONDARY SCHOOL
35045 Exbury Avenue, Abbotsford, BC V2S 7L1
Phone: 604-864-0220 • Facsimile: 604-864-0109

April, 2012

Dear Parents,

I am writing to inform you of an opportunity for your son/daughter to be involved in a new research project offered by the University of British Columbia (UBC) Counselling Program called *The Cyberpsychology and Schools Research Project*.

Anxiety is the most common emotional health problem in children, teenagers, and adults. Feelings of shyness, worry, fear, and anxiety can interfere with children's success in school, both academically and socially. The Cyberpsychology and Schools Research Project will explore the usefulness of virtual reality (VR) with youth in school classrooms, specifically targeting anxiety. Research has demonstrated that early education and intervention efforts can be extremely successful in helping children learn to manage anxiety. As young people are highly receptive to computer technology, it is hoped that integrating VR into classrooms will make learning about appropriate management of anxiety fun, exciting, and effective.

The first step in the *The Cyberpsychology and Schools Research Project* is obtaining consent for your child's participation (please see attached forms). Please take the time to read the enclosed information. Please complete the confidential consent form and return to your child's teacher. If you have any questions, please contact the UBC Anxiety Research Projects Lab office at 604-822-8321.

Thank you for considering your child's involvement in the project.

Yours truly,

Appendix G: Classroom Script

Cyberpsychology and Schools: A Feasibility Study Using Virtual Reality with School Children

Relevant Information for School Visists

Classes are scheduled in 80 minute blocks and occur in alternating format before lunch. All classes have been selected from Block A of the timetable to avoid any duplication of students. The research team will visit one block of kids per day (Monday to Friday) for four to five weeks as outlined below.

Consent Forms

Consent forms will be sent home on Monday April 23, 2012 and will be due back Friday April 27, 2012. for all students who have the consent forms returned by Friday April 27th (participating or not), a draw for a gift certificate to the mall will be given

Session 1: Anxiety Introduction & Measures (Total time expected up to 77 minutes)

Pre-Session Activities

Homework

Teachers will be contacted two days before the scheduled session and asked to have students bring some homework or a silent reading book along with them next class, so that if they finish their measures early, they will have something to do.

During Session Activities

Introduction Script (5-10 minutes)

Hello my name is Carolynn Turner and I am a teacher in this District (in fact I used to teach at this school), but now I am at UBC taking my Master's in Counselling Psychology. I also work in the Anxiety Projects Lab at the University of British Columbia.

First of all I would like to thank you all for participating in the Cyberpsychology and Schools Project. The reason we are here today is to talk about your involvement in the project we are currently doing. Your parents know about this project too. What we are interested in is the use of virtual reality with youth in school classrooms, like yours. Specifically, we are interested in looking at the usefulness of virtual reality in helping young people deal with anxieties (worries and fears). And you know we all have worries and fears sometimes!

The Virtual Reality system uses a portable headset that people put on (show and demonstrate the HMD's), which allows them to interact with a three dimensional computer-generated environment in real time. The virtual experience allows people to interact with different scenarios in the virtual world, while remaining completely safe in the real, physical world. It's kind of like being inside a video game that you control! For example, a person with the Virtual Reality headset could "peer" over the ledge of a tall building, in order to re-create a fear of heights scenario. Another person using the headset could reach out and "touch" a

spider. The idea is that facing something you fear in the virtual world will help you to face it without so much fear in the real world.

We want to investigate how youth, like you, interact with Virtual Reality, and so each of you will have the opportunity to try the Virtual Reality system. Don't worry, we won't make you face anything too scary! We just want to see what you think of the experience or using the equipment and being in the "virtual world".

So here's what we are planning to do:
Our program will take place over four to five class meetings. We plan to meet with your class once per week:

Week 1: We will give you a brief overview of anxiety, CBT and exposure and we will ask you to complete some questionnaires.
Week 2&3: During lessons 2 & 3 we will bring the virtual reality equipment in for you each to try out. We will ask you to complete one last set of questionnaires
Week 4: We will give you some more detailed information on anxiety and then we will have a final Q & A.
Week 5: This is an extra meeting that we may or may not need, depending on how quickly we move through Weeks 2&3.

Now we want to tell you about some of the risks and benefits of participating:

Potential cybersickness is the main risk associated with the use of virtual reality systems, and is similar to motion sickness and can occur during or after your virtual experience. Cybersickness, if it occurs, is temporary. It can include (1) visual symptoms (eyestrains, blurred vision, headaches), (2) disorientation (vertigo, imbalance) and (3) nausea (vomiting, dizziness). So please let us know if you experience any of these things. We will be doing our best to minimize these risks by limiting your exposure to just 5 minutes. I have been trained to monitor signs of cybersickness and will end the experience early if any of you experience any discomfort. We hope that you will benefit from learning about anxiety and that you will enjoy being a part of this study.

We want you to know that any information resulting from the research study will be kept strictly confidential:
That means that we won't show your answers on the questionnaires you fill out to your friends or your teacher. All documents relating to you will be identified only by code number (not your name) and will be kept in a locked filing cabinet at the University of British Columbia.

As a thank you for your involvement, we will provide a pizza party for your entire class at the end of the study.

Last but not least, we want you to know that this program is voluntary. This means you do not have to take part if you do not want to.

Do you have any questions?

We will now begin with a brief lesson which will teach you a little bit about anxiety and after that I will walk you through your homework.

Power Point Presentation (10 minutes)

Here a brief introductory power point presentation, an adaptation of the LEAF program (Living Effectively with Anxiety and Fear), will be presented that defines anxiety, CBT and exposure in a very broad sense.

Question and Answer Period (5 minutes)

Introduction to Measures (2 minutes)

I have a package of several measures I will hand out that you will fill out today. They ask many questions and I am interested in your honest answers, so it does not matter to me what your answer is, just as long as you respond with how you really feel. You will not be marked on these questionnaires. Also, you should be aware that your teacher and your parents will not see these answers and they will be kept completely confidential. In fact, I have already attached your name to a number and you will receive your appropriate package based on your number, so your name will not appear on the measures anywhere (please do not forget, I do NOT want you to write your name on any of the paper I hand out). When you have

finished answering your questions, please turn the measure over and do your homework or read quietly until we are ready to move on to the next one.

Alright, any questions before we get going?

Measures (50 minutes - up to 45 minutes for measure and 5 additional minutes for the transfer of paperwork)

The first measure will be the Multidimensional Anxiety Scale for Children (MASC) and it will take approximately 15 minutes. *Read MASC instructions from top of page to students.* Are there any questions? When your are finished you can turn it over on your desk and read quietly, when all students are complete we will move on to the next measure. The second measure will be the Mobility Inventory (modified for teens), which will take 5-10 minutes. To complete this measure you will *Read MI instructions from top of page to students.* Are there any questions? When your are finished you can turn it over on your desk and read quietly, when all students are complete we will move on to the next measure. When all students are complete, we will move on to the next measure. The third measure will be the Centre for Epidemiological Studies Depression Scale for Children. It will take approximately 5-10 minutes. To complete this measure, you will *Read CES-DC instructions from top of page to students.* Are there any questions? When your are finished you can turn it over on your desk and read quietly, when all students are complete we will move on to the next measure. When all students are complete , we will move on to the next measure.

The final measure for today will be the Childhood Anxiety Sensitivity Index and it will take 5-10 minutes. (When all students are complete, we will move on to the next measure).

Conclusion and Homework (5 minutes)

Alright, thank you so much for your time today. Before I leave, I am going to be assigning you some homework. Next week you will be required to perform an extemporaneous speech. Before I come back next week, I would like you to think about a topic that you can talk about for two minutes and brainstorm six things about it. The topic can be anything that you like, as long as it is school appropriate. So, for example, if I were to be doing it, I would talk about running, and it might begin like this... (give a brief example). Next class you will be asked to talk about this topic to a virtual classroom for two minutes. If you forget to do your homework, you will be requested to do it in a completely impromptu fashion. Do you have any questions? I appreciate all of your time and assistance today and I look forward to seeing you next week. I will also write this note on the board to remind you.

Session 2: VR Exposure (Total time expected 80 minutes)

Pre-session Activity

Two days before this lesson, I will email teachers and request that they remind students to write down six things about a topic they want to talk about during the two minute speech to the VR classroom. I will request that the teacher provide students some individual book work to do during this class. Before the class, have students divided into the neutral environment or the anxiety provoking environment.

During Session Activities

Introduction (5-10 minutes)

Welcome to class today. I hope you have had a good week. Before we begin, were there any questions from last week? Today we have the opportunity to actually try the Virtual Reality Technology that we have been talking about. I would like to introduce_____, and _____. They are members of the UBC School of Kinesiology and will be taking your physiological (body) measures to assess your level of anxiety as you interact with this environment. So I am going to outline the process and then we will get started. Before we do that, are there any questions from last week? So you will notice that we have two computer systems set up in the classroom. Both computers have the virtual classroom loaded on them. This one has a classroom with kids in it, and this one has an empty classroom. You have been previously divided into two groups and will test one of these scenarios out today and the other one next class. Before we get started there are a couple of things you need to know. The first is in regards to the technology. The computer technology is very important to my study, and I would appreciate it if you would treat it very gently. You can take a moment to get the HMD's comfortable and feel free to adjust the velcro as you need. When you are finished, please set the HMD's gently on the desk as they are delicate.

So, we will call you up by name and assign you to a machine. _____ from the UBC school of Kinesiology will get your physiological measures ready to go and you can put your HMD's on and take a look. You will be given a timer with two minutes set on it. You can press start when you are ready to begin talking (saying your 2 minute

extemporaneous speech) and will feel a vibration when it is time to stop. If you forget what you want to talk about, just think of another topic you enjoy and talk about that. We are not assessing the quality of what you say (just remember, it has to be school appropriate). You will have a maximum of five minutes with the technology to both deliver your two minute speech and to look around the environment and note your impressions of it. If at any time you do not feel well, please let us know as soon as possible and we can discontinue the use of the HMD's, at which time you should feel better. You will remember from our first session together that potential cybersickness is the main risk associated with the use of virtual reality systems, and is similar to motion sickness and can occur during or after your virtual experience. Cybersickness, if it occurs, is temporary. It can include (1) visual symptoms (eyestrains, blurred vision, headaches), (2) disorientation (vertigo, imbalance) and (3) nausea (vomiting, dizziness). So please let us know if you experience any of these things. We will be doing our best to minimize these risks by limiting your exposure to just 5 minutes. I have been trained to monitor signs of cybersickness and will end the experience early if any of you experience any discomfort. Also, when you have finished your VR experience, if you received the environment with students in it, you will be given a one page questionnaire to complete on your own at your desk. At the bottom of it, there are two open ended questions, I would appreciate you providing us as much detail as possible in response to those questions. Any questions?

Virtual Reality Opportunity (14 students(per machine) * up to 5 minutes/student=70minutes)

Students will be called by name to experience the VR scenario, but their corresponding Likert-scale measure (if they have an environment with students in it) will have only their corresponding number on it. There will be two systems set up side by side. One system will run the neutral environment and the other system will run the anxiety provoking environment. This will allow the researcher to monitor both systems simultaneously. As each student finishes their turn with the anxiety provoking environment, he/she will be given a one page Likert-scale questionnaire to measure likability and cybersickness. Students will be encouraged to put as much detail into their responses as possible. Likert-scales will be completed independently and will be placed face down on the front desk when students are complete.

Conclusion

Thank you very much for your time today. I look forward to seeing you next week.

Session 3: VR Exposure (Total Time Expected 16 students (per machine) * up to 5 minutes/ student=80 minutes)

Pre-Session Task

Two days before this lesson, I will email teachers and request that they remind students to write down six things about a topic they want to talk about during the two minutes. Request the teacher provide students some individual book work to do during this class. Before the

class, have students divided into the neutral environment or the anxiety provoking environment.

During Session Activities

Did anyone have any questions from last week? Session four will be primarily the same as session three. However students will be using whichever environment they did not use during session three. Students will then fill out their Likert-scale measures for the anxiety provoking environment and again hand them out to the front desk.

Session 4: Psychoeducation & Carry Over (Total Expected Time 35 minutes)

Hello again everybody. Did you have any questions from last week? Today we are going to be learning about Anxiety in greater detail. I am going to give a presentation about it and then we will have a brief question and answer period.

An adapted form of the LEAF (Living Effectively with Anxiety and Fear) program will be delivered here.

Thank you so much for your time and for helping us to further our understanding of the feasibility of the virtual reality system with adolescents.

Session 5: Potential Carry Over

While all time estimates have been made in the most conservative fashion, there is the potential, especially in a large classroom that we may require additional time to complete the VR exposure. This lesson has been set aside to allow for any spill over that may be necessary.

Appendix H: VR Session Objectives

Session	Sessions Outline
1	•Brief Overview of Anxiety •Student Assessment •Multidimensional Anxiety Scale for Children •Mobility Inventory (modified for teens) •ridlines
2	•VR Exposure •Students were previously and randomly assigned to either neutral or anxiety provoking environment •Brief instruction on computer and equipment use, and outline of procedure •Student Assessment •State Trait Inventory Children (Pre) •Heart Rate monitor secured •Baseline Heart Rate identified •VR acclimatization (60 seconds) •Extemporaneous Speech (90 seconds) •Student Assessment •Heart Rate •Equipment Removed •Student Assessment •State Trait Inventory Children (Post)
3	•VR Exposure •Students were previously and randomly assigned to either neutral or anxiety provoking environment •Brief instruction on computer and equipment use, and outline of procedure •Student Assessment •State Trait Inventory Children (Pre) •My Virtual Experience Self Report Measure •Heart Rate monitor secured •Baseline Heart Rate identified •VR acclimatization (60 seconds) •Extemporaneous Speech (90 seconds) •Student Assessment •Heart Rate •Equipment Removed •Student Assessment •State Trait Inventory Children (Post) •My Virtual Experience Self Report Measure
4	•Additional Session scheduled for absences, procedure as in session 2 & 3
5	•Psychoeducation regarding anxiety disorders in youth, and cognitive behavioural therapy

Appendix I: Animation Loop for Avatars

Character	Animation	Duration
Julianna		
	Idle	13.3 s
	Positive	13.3 s
	loop	
Marc		
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Laugh	10.7 s
	Stare	26.7 s
	Idle/interest	13.3 s
	loop	
Seana		
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Stare	26.7 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Laugh	10.7 s
	Stare	26.7 s
	Idle/interest	13.3 s
	loop	
Oceane		
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Sleep	26.7 s
	Laugh	10.7 s
	Stare	26.7 s
	Idle/interest	13.3 s
	loop	

Christelle		
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Stare	26.7 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Stare	26.7 s
	Idle/interest	13.3 s
	Sleep	26.7 s
	loop	
Antoine		
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Stare	26.7 s
	Idle/interest	13.3 s
	Sleep	26.7 s
	loop	
Marc 2		
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Sleep	26.7 s
	Stare	26.7 s
	Idle/interest	13.3 s
	Sleep	26.7 s
	loop	
Antoine 2		
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Idle/interest	13.3 s
	Sleep	26.7 s
	Stare	26.7 s
	Idle/interest	13.3 s
	Sleep	26.7 s
	loop	

Character	Appearance
Antoine	Boy, blue shirt, front row, middle seat
Antoine 2	Boy, brown shirt, back row, left seat
Christelle	Girl, yellow shirt, front row, right seat
Julianna	Teacher, brown dress, front row, left seat
Marc	Boy, black shirt, middle row, right seat
Marc 2	Boy, dark grey shirt, back row, right seat
Oceanne	Girl, orange shirt, middle row, left seat
Seanna	Girl, light pink shirt, middle row, middle seat

Groups (for synchronization purposes)

1	2	3
Julianna	Marc	Christelle
	Seanna	Antoine
	Oceane	Marc2
		Antoine2