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UTILIZING VIRTUAL REALITY THERAPY IN THE TREATMENT OF GENERALIZED ANXIETY DISORDER IN COLLEGE COUNSELING CENTERS

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BY

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Utilizing Virtual Reality Therapy in the Treatment of Generalized Anxiety Disorder in College Counseling Centers

By

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Abstract

Anxiety is a leading mental health concern among college students. A growing number of students are presenting with symptoms of generalized anxiety disorder (GAD), which is one of the most common anxiety disorders. As demands for treatment of this disorder increase, counseling centers are also facing limited funding for providing such services. The result is that there is a need to provide more cost effective, and empirically supported approaches to treatment. Therefore, implementing a program that will allow students to utilize already accessible technology to teach themselves how to combat anxiety is merited. Virtual reality therapy (VRT), is one such technology and it has been found to be an effective treatment for GAD and a wide variety of other mental health disorders. VRT has not been implemented in a college counseling center for treatment of GAD to this author's awareness. Therefore, a proposal for utilizing a VRT in college counseling centers for the treatment of GAD in college students is warranted to address the noted increasing needs for services. The origins, assessment, and treatment of GAD are outlined in this project. A brief overview of VRT efficacy and nature therapy is also reviewed. A novel, 11 session, proposed protocol for utilizing VRT in the treatment of GAD in college counseling centers is also detailed.

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Section I: Introduction

Statement of the Problem

College students are a rising population, with nearly 20 million students in the US seeking postsecondary education, which means a growing number of students are in a place to obtain mental health treatment while attending a university (Xiao et al., 2017). Many mental disorders have onsets at an early age and college students often face specific environmental difficulties, which puts them at an increased risk for developing mental health issues (Xiao et al., 2017). The Center for Collegiate Mental Health (2015) reports that between Fall 2009 and Spring 2015 student utilization of the counseling center had an average increase of 30 – 40%, although overall enrollment only increased by 5%, suggesting an increase in the use of counseling center services.

Recent data suggests that student's self-reported levels of anxiety continue to increase (Center for Collegiate Mental Health, 2019). One study reported 61.8% of students who sought services in a college counseling center in 2018 reported concerns with anxiety, making it the most common reason for seeking services (Center for Collegiate Mental Health, 2019). More specifically, 41.5% of the 61.8% of these students with anxiety concerns reported symptoms of generalized anxiety (Center for Collegiate Mental Health, 2019). With such a significant and steady increase in anxiety related concerns, there was an increasing realization that college counseling centers would likely require more resources to support these demands (Xiao et al., 2017). The status of collegiate mental health has been described as being in "crisis" due to the rising population of college students, coupled with increased anxiety among these students and a heavy strain on the resources that counseling centers have been allocated (Xiao et al., 2017).

Not only are college students facing increasing concerns, college counseling centers are also facing their own struggles. Since the 1980's, when counseling centers switched their service provisions from career counseling to psychotherapy, counseling centers have faced budget constraints that have limited their ability to provide such services (Gallagher, 2012). Counseling center services are often provided free of charge and their money comes from Student Health service fees that accompany tuition, which poses problems with a limited allocated annual budget, despite increased demands (Gallagher, 2012). Given their restricted budget, counseling centers often face a lack of personnel resources which would be needed to implement novel interventions for the treatment of disorders, such as GAD.

The purpose of this project is to introduce a novel protocol for treating GAD in college students, receiving treatment in a counseling center setting. Specifically, this project proposes the integration of virtual reality therapy (VRT) with traditional intervention methods. This project will review the effectiveness of VRT in treating GAD and how it may be adapted for this purpose as a cost efficient treatment in college counseling centers. It is hypothesized that this proposed VRT program may increase treatment adherence and outcomes. It is also hypothesized that students may be more likely to utilize such an intervention as it coincides with the interest in technology and its application for younger generations.

Significance of Issue

An alarming 86% of all college students diagnosed with a mental illness, end up dropping out of college prior to graduating (Salzer, 2012). The average college withdrawal rate for students who do not have a mental illness is 45%, which highlights the detrimental effects that mental illness can have on college success (Salzer, 2012). University administrations have become increasingly focused on student retention rates as they represent student success within

the university, thus, student mental health has become a part of the focus in increasing retention rates (Scofield et al., 2017). It has been documented within research that higher retention rates were present in students who received counseling center treatment than students who did not receive such services (Scofield et al., 2017). Specifically, 75% of students being seen at counseling centers registered for the next semester of classes, when only 68% of the overall student population registered for the following semester (Scofield et al., 2017).

Symptoms that accompany many mental illnesses that may hinder a student's ability to engage on campus include concentration, motivation, and social interactions (Salzer, 2012). A significant 70% of participants in one particular study on retention reported that their personal issues negatively impacted their performance in academics (Lee, Olson, Locke, Michelson & Odes, 2009). A promising 60.7% of those students indicated that they believed their counseling center services helped improve their academic performance (Lee et al., 2009).

There is a significant amount of research that demonstrates the positive effect counseling centers have on college students' wellbeing, with demonstrated increases in social and emotional wellness (Scofield et al., 2017). Research has also revealed that positive social and emotional health is correlated with improved academic performance (Scofield et al., 2017). Regardless of the demonstration of positive impact from services received at counseling centers, funding is still often insufficient despite reported increase in demands yearly, with use of counseling centers growing five times faster than university enrollment (Scofield et al., 2017). This makes it more difficult for counseling centers to meet the needs of students with mental illness and requires personnel to look for novel interventions that can address widely reported concerns, such as generalized anxiety disorder.

Purpose

The purpose of this project is to propose a novel VRT intervention for the treatment of GAD in college counseling centers. Particularly, this VR component would work as an adjunct to traditional therapies, like cognitive behavioral therapy (CBT) and mindfulness-based meditation (MBM), for treating GAD in counseling centers within university communities. This VRT component will utilize guided meditations and diaphragmatic breathing exercises to help students build relaxation skills, and reduce overall levels of arousal, which is a key component in treating GAD symptoms.

Although there is evidence that VRT can be effective in treating GAD, there is little to no documentation of it being formally implemented in a counseling center setting to address GAD in students. Given the prevalence of anxiety cases seen in college counseling centers, as well as the lack of funding available to meet such high demands for treating it, VR could provide a cost-effective addition to services. VRT has the potential to help counseling centers increase retention rates and increase students' sense of well-being, which has been well documented to affect academic performance.

The proposed protocol in section III of this paper is proposed to address anxiety related symptoms found in students who meet the criteria for GAD and is designed to be implemented in a college counseling center. Utilizing VRT therapy may be an effective adjunct to therapy for university students who may be more motivated to participate due to interest in new technology. It is hypothesized that employing a VRT adjunct to therapy will reduce symptoms associated with GAD in college students over the course of 11 sessions.

Section II: Literature Review

Etiology of Generalized Anxiety Disorder

There is a wealth of research on the etiology of GAD which results from a combination of biological, psychological, and environmental factors, which are highlighted below. Anxiety and fear related emotional responses are critical for humans to survive (Parsons & Rizzo, 2008). However, when these responses become excessive, they can have detrimental effects on one's functioning (Schienle, Hettema, Cáceda, & Nemeroff, 2011). Thus, the Diagnostic and Statistical Manual of Mental Disorders, fifth edition outlines the criteria for GAD which is shown in Figure 1 (American Psychiatric Association, 2013).

A. Excessive anxiety and worry (apprehensive expectation), occurring more days than not for at least 6 months, about a number of events or activities (such as work or school performance).
B. The individual finds it difficult to control the worry.
C. The anxiety and worry are associated with three (or more) of the following six symptoms (with at least some symptoms having been present for more days than not for the past 6 months):

    1. Restlessness or feeling keyed up or on edge.
    2. Being easily fatigued.
    3. Difficulty concentrating or mind going blank.
    4. Irritability.
    5. Muscle tension.
    6. Sleep disturbance (difficulty falling or staying asleep, or restless, unsatisfying sleep).

B. The anxiety, worry, or physical symptoms cause clinically significant distress or impairment in social, occupational, or other important areas of functioning.
C. The disturbance is not attributable to the physiological effects of a substance (e.g., a drug of abuse, a medication) or another medical condition (e.g., hyperthyroidism).
D. The disturbance is not better explained by another mental disorder (e.g., anxiety or worry about having panic attacks in panic disorder, negative evaluation in social anxiety disorder [social phobia], contamination or other obsessions in obsessive-compulsive disorder, separation from attachment figures in separation anxiety disorder, reminders of traumatic events in posttraumatic stress disorder, gaining weight in anorexia nervosa, physical complaints in somatic symptom disorder, perceived appearance flaws in body dysmorphic disorder, having a serious illness in illness anxiety disorder, or the content of delusional beliefs in schizophrenia or delusional disorder).

Figure I: Generalized Anxiety Disorder Diagnostic Criteria. *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). Copyright 2013 by the American Psychiatric Association.

Biological Factors. It is important that we consider the genetic and neural mechanisms relevant in the development of GAD. It has been well documented that the amygdala, a limbic structure that processes emotional situations, is central to fear responses in both humans and animals (Kim et al., 2011). MRI studies have demonstrated that subjects who are diagnosed with GAD have significantly larger amygdala volumes (De Bellis, 2000). Furthermore, people with anxious or fearful traits demonstrate increased amygdala activation (Beesdo et al., 2009). Foell, Palumbo, Yancey, Vizueta, Demirakca and Patrick (2019) conducted a study of twins using MRI technology that demonstrated that participants with a high threat sensitivity also have less amounts of amygdala gray matter. This suggests that the volume of gray matter in the brain may be of use as a biomarker for anxiety disorders (Foell et al., 2019).

There is indication that the right dorsal medial prefrontal cortex (DMPFC) also plays a role in the development of GAD, as studies have found the DMPFC has a larger volume in individuals with GAD and is correlated with high scores on the Penn State Worry Questionnaire (PSWQ) (Hettema et al., 2012). The DMPFC has also been found to be associated with cognitive emotion regulation and outcome anticipation, thus altered activation in this region may contribute to affect regulation issues found in individuals with GAD (Schienle et al., 2011). Paulesu et al. (2012) conducted a functional magnetic resonance imaging (fMRI) study in which he observed the activation in the DMPFC and amygdala in both GAD patients and control patients. This study revealed that both groups demonstrated activation in those areas during the "worrying" activity, but the group who was diagnosed with GAD had different postworry states, where the activation continued, suggesting that GAD patients have difficulty stopping their worrying process (Paulesu et al., 2012). Another key issue in patients with GAD is their

experiencing of anticipatory anxiety, and studies have demonstrated that patients with GAD have more activation in the amygdala during anticipatory intervals than healthy controls (Schienle et al., 2011).

There is also some evidence that the hypothalamic-pituitary-adrenal (HPA) axis is related to the etiology of GAD, particularly genetic variants in the pituitary adenylate cyclase-activating peptide (PACAP) and PACAP-type-I-receptor (PAC1) genes (Cooper, Narasimhan, Rickels, & Lohoff, 2013). The PACAP and PAC1 genes affect the activity in the HPA axis and are believed to modulate anxiety behaviors (Cooper et al., 2013). Specifically, the variant rs2856966 (Asp54Gly) is associated with better treatment response to SSNRIs in patients with GAD (Cooper et al., 2013).

In addition to neuroanatomical differences in patients with GAD, there is evidence that neurotransmitter dysregulation plays a role in the development of GAD as well. These abnormalities range from decreased inhibitory neurotransmission to increased excitatory neurotransmission (Schienle et al., 2011). The neurotransmitter gamma-aminobutyric acid (GABA) has been demonstrated to impact anxiety disorders and GABA-A receptor downregulation has been documented in individuals with GAD (Schienle et al., 2011).

Another key neurotransmitter involved in the regulation of anxiety is serotonin (5-HT), although research is mixed on whether 5-HT increases or decreases anxiety (Graeff, Viana, & Mora, 1997). Research has demonstrated that lower levels of serotonin were found in the cerebrospinal fluid of patients with GAD in comparison to the control group (Schienle et al., 2011). Similarly, researchers found less paroxetine platelet binding in individuals with GAD, which means they had less serotonin transporter binding sites (Schienle et al., 2011).

Antidepressant medication treats GAD by improving 5-HT neurotransmission, however, benzodiazepine anxiolytics treat GAD by decreasing 5-HT release (Graeff et al., 1997).

Another commonly studied system related to internalizing disorders is the dopaminergic system. The gene related to dopamine transportation, DAT1, regulates the amount of dopamine available in the brain and has been identified as being associated with behavioral phenotypes (Rowe et al., 1998). Moreover, Rowe et al. (1998) found that GAD was associated with a greater number of DAT1 10-repeat allele.

There is also some evidence that cortisol levels may be related to GAD (Schienle et al., 2011). Cortisol is a hormone that is released in response to stressful events (Elnazer & Baldwin, 2014). Individuals with Cushing's disease, a disorder in which the body produces too much cortisol, have high rates of GAD and when these individuals get their hypercortisolism treated they demonstrate a decrease in anxiety disorders (Elnazer & Baldwin, 2014). However, other evidence suggests that individuals with GAD actually demonstrate significantly lower levels of cortisol concentrations in their hair follicles and demonstrate hypocortisolism rather than hypercortisolism (Elnazer & Baldwin, 2014). Escitalopram, an SSRI antidepressant medication, has also been shown to be associated with normal salivary cortisol levels (Schienle et al., 2011) in elderly individuals with GAD whenever they previously had elevated cortisol levels (Elnazer & Baldwin, 2014). Furthermore, one study found that the administration of intravenous diazepam, a medication commonly used in the treatment of GAD, demonstrated a decrease in cortisol levels (Elnazer & Baldwin, 2014). Another study administered cognitive therapy to 24 patients with GAD and found that after treatment they demonstrated a significant decline in plasma cortisol levels (Elnazer & Baldwin, 2014). However, these results should be interpreted with caution as other medications used to treat individuals with GAD, such as buspirone,

demonstrated no changes in plasma levels of cortisol and there is mixed evidence regarding cortisol levels prior to treatment in patients with GAD (Elnazer & Baldwin, 2014).

In addition to neuroanatomical structures and neurotransmitter dysregulation, there are genetic risks for GAD as well. There is high concordance for GAD among monozygotic (MZ) twins, who are identical genetically, which suggests this disorder has a genetic factor (Schienle et al., 2011). Twin studies have also supported family study results that familial aggregation is related to GAD (Schienle et al., 2011). However, only 15% to 30% of heritability for GAD can be determined given the uncontrolled variable of common family environments in the role of familial aggregation (Schienle et al., 2011). The personality construct of neuroticism has also been documented to be related to the development of GAD and neuroticism has a small but significant genetic correlation (Schienle et al., 2011). Mackintosh, Gatz, Wetherell, and Pedersen (2006) discussed how high levels of the personality construct neuroticism is correlated with increased levels of worry, and neuroticism is moderately heritable, with 40% to 60% heritability estimates. A twin study evaluating the bivariate relationship involving genes associated with GAD and neuroticism had a genetic correlation of .57, suggesting that GAD and neuroticism do share some genetic influences (Mackintosh et al., 2006).

Psychological Factors. There are a variety of psychological factors that may play into the development of GAD. Whenever a human identifies something they perceive as threatening cognitive, affective, physiological, and behavioral systems are activated to ensure their safety (Ouimet, Gawronski, & Dozois, 2009). The development of GAD occurs when these systems over-activate, and research demonstrates that cognitive factors may play a role in how we process threat-relevant material (Ouimet et al., 2009). For example, a significant amount of research suggests that individuals with anxiety pay more attention to threatening stimuli and find

it more difficult to disengage from a stimulus that they perceive as threatening (Ouimet et al., 2009). Contrastingly, some research indicates individuals with anxiety disorders are more likely to avoid the threatening stimuli, and such avoidance positively reinforces their fear (Ouimet et al., 2009). GAD differs from other anxiety disorders in that their worry is usually constant and unspecific, and involves interacting attentional, conceptual, imaginal, physiological, affective, and behavioral systems that respond to a continually changing environment (Navarro-Haro et al., 2019).

Another important cognitive factor in the perception of threats is how an individual interprets the threat. Ouimet et al. (2009) reported that individuals with anxiety are more likely to interpret neutral stimuli as negative or threatening compared to control participants. Individuals with anxiety disorders are also found to have less proficient abilities in cognitive control, which is important in managing a negative emotional state (Schienle et al., 2011). These results suggest that individuals with GAD demonstrate a cognitive vulnerability to anxiety. Ouimet et al. (2009) found that the higher number of threat-related cognitive associations an individual has, the more likely they are to develop an anxiety disorder.

Additionally, cognitive reappraisal, in which one re-evaluates their thinking about a future event to prevent negative emotional impact, is associated with anxiety symptoms in adults (Marganska, Gallagher, & Miranda, 2013). Furthermore, expressive suppression, which is the inhibition of an active emotional response, is also associated with anxiety symptoms and higher negative affect (Marganska et al., 2013). A meta-analysis reported that three cognitive regulatory strategies were strongly associated to anxiety disorders including rumination, reappraisal difficulties, and emotional avoidance (Marganska et al., 2013). Individuals who have hyperreactivity in their amygdala to relevant cues demonstrate difficulties regulating their

negative affect, which is associated with anxious traits (Schienle et al., 2011). Additionally, the well-researched personality characteristic of neuroticism has been shown to impact how much someone worries, and high scores in neuroticism have been shown to be significantly associated with a GAD diagnosis (Mackintosh et al., 2006). One study found that college students with GAD are less accepting of their emotions and believe themselves to be less capable of regulating such emotions compared to control participants (Marganska et al., 2013).

Literature suggests that individuals with GAD are more likely to make logical cognitive errors including unrealistic perceptions of physical and/or psychological threats and are more likely to hold core cognitive beliefs that the world is a dangerous place (Cassidy, Lichtenstein-Phelps, Sibrava, Thomas, & Borkovec, 2009). Individuals with GAD are also more likely to overestimate the likelihood and intensity of feared events, as well as undervaluing their own ability to cope with such events (Cassidy et al., 2009).

One study demonstrated that people with GAD experience unusually intense negative emotions and do not use adaptive emotional regulation skills, instead they rely on a less adaptive strategy such as worrying to avoid distress (Cassidy et al., 2009). Individuals with GAD often avoid experiencing distress and negative emotions and do so by distracting themselves with abstract conceptual thoughts of worry (Cassidy et al., 2009). Another key risk factor for developing GAD is the inability to tolerate uncertainty, and this characteristic is thought to be reinforced by positive beliefs about worry, negative problem orientation, and cognitive avoidance (Hebert & Dugas, 2019).

Environmental Factors. Early environmental factors also play a role in the etiology of GAD. Insecure attachment to caregivers has been shown to be correlated with anxiety symptoms later in life (Marganska et al., 2013). Specifically, anxious attachment styles, are show to be

associated with GAD diagnoses later in life (Marganska et al., 2013) Attachment plays an important role in the development of the fear system as a child seeks protection from their attachment figure, and the availability and responsiveness of their caregiver plays a role in reducing the child's fearfulness (Cassidy et al., 2009). Insecurity within attachment was also positively correlated with emotion dysregulation, suggesting this may play a role in the development of anxiety disorders (Marganska et al., 2013). Fearful avoidant and preoccupied attachment styles were found to have the strongest correlations with GAD symptoms (Marganska et al., 2013). These attachment styles are documented to result in hyperactivated emotional regulation strategies, which involve amplified monitoring of threats to one's self, which is relevant to individuals with GAD who have a tendency to have attentional bias to threats (Marganska et al., 2013).

Contrastingly, secure attachment styles are negatively correlated with GAD symptoms (Marganska et al., 2013). Furthermore, a longitudinal study demonstrated that adolescents who had high frequency of GAD symptoms perceived that they had a lower quality attachment relationship with both of their parents (van Eijck, Branje, Hale, & Meeus, 2012). Additionally, adolescents who viewed their attachment relationship with their father as low quality were more likely to have higher levels of GAD symptoms later on (van Eijck et al., 2012).

Other environmental factors may play a role in the etiology and maintenance of GAD, including parental loss before the age of 16 and exposure to traumatic events (Cassidy et al., 2009). Furthermore, research shows that GAD occurs within families but lacks a strong genetic component, which suggests that family social relationships may be related to the etiology of GAD (Cassidy et al., 2009). For example, children who experienced role reversal, in which they became the caregiver for their parent, demonstrated high rates of GAD in adulthood, likely

because they lacked a secure base in childhood, could not rely on their parent for care, and in turn had to provide care for the incompetent parent (Cassidy et al., 2009). Research also found that low maternal love and high maternal rejection/neglect were positively associated with GAD rates (Cassidy et al., 2009). It is hypothesized that these results are due to these experiences leading the child to use cognitive and emotional mechanisms that are avoidant of the painful feelings that occur with such negative maternal treatment (Cassidy et al., 2009). Further research has noted that college students who have higher symptoms of worry and diagnoses of GAD were more likely to perceive themselves as alienated from maternal figures and their peers (Viana & Rabian, 2008). This suggests there is an interpersonal component to the etiology of GAD. It was also found that those who worry put greater focus on interoceptive cues and bodily symptoms, which may impact relational attachment (Viana & Rabian, 2008). Feeling alienated from one's support system or caregiver may be related to higher levels of psychopathology (Viana & Rabian, 2008).

An additional environmental factor that may play a role in the etiology of GAD is exposure to trauma. GAD has high comorbidity levels with Posttraumatic Stress Disorder (PTSD) diagnoses, with a range of 11.1% to 31.6% in trauma-exposed patients (Price & van Stolk-Cooke, 2015). Exposure to traumatic events may trigger genetic predispositions to psychiatric conditions, per the diathesis-stress model of psychopathology. The diathesis-stress model refers to theory that humans can carry genetically inherited risks for mental illnesses, and that stressful life events can result in the expression of such genes (Patten, 2013). Thus, someone who inherits a genetic predisposition to anxiety may see that gene expressed following a traumatic life event.

Assessing Generalized Anxiety Disorder

It is important that we understand how to properly assess and diagnose GAD. Assessment procedures often involve a comprehensive psychological evaluation that includes both specific assessment measures, known as narrowband instruments, as well as broadband assessment instruments to evaluate overall psychopathology. The assessment procedure should also always include deliverance of informed consent and a clinical interview.

Narrowband Instruments. Narrowband instruments are assessments that are often brief in length and assess specific psychological constructs, such as generalized anxiety. Narrowband instruments are important in gathering information on specific diagnostic rule outs. Following are several narrowband instruments that are commonly used to assess GAD.

Generalized Anxiety Disorder Questionnaire (GAD-7). The GAD-7 is a 7 item self-report scale that was created by Spitzer, Kroenke, Williams, Williams, and Löwe (2006) to screen clients for the presence and severity of GAD defining symptoms. This measure is time efficient and easily scored, so it is frequently used in short term care settings (Rutter & Brown, 2017). Research has demonstrated that the GAD-7 has strong reliability and psychometric backing (Rutter & Brown, 2017). Additionally, the GAD-7 has been found to be a valid measure of generalized anxiety symptoms with strong sensitivity (.83) as well as strong convergent validity and internal consistency (Rutter & Brown, 2017).

Hamilton Anxiety Rating Scale (HAM-A). The Hamilton Anxiety Scale is a clinician administered measure of the severity of perceived anxiety symptoms that was developed by Hamilton in 1959. The scale assesses 14 symptom features including both psychological and somatic symptoms (Thompson, 2015). The scale has sufficient reliability and validity, with both

good inter-rater reliability and test-retest reliability (Thompson, 2015). The scale takes approximately 12 – 15 minutes to administer (Thompson, 2015).

Penn State Worry Questionnaire (PSWQ). Meyer, Miller, Metzger, and Borkovec (1990) designed the PSWQ to assess a client's habitual worrying and determine whether it is pervasive, excessive, and/or uncontrollable, all key determining factors in diagnosing GAD. Meyer et al. (1990) reported strong internal consistency (α= .91) in the PSWQ and Rutter and Brown (2017) found strong discriminant and convergent validity in this measure, showing that the PSWQ is an acceptable measure to assess symptoms related to GAD.

Beck Anxiety Inventory (BAI). The BAI is a commonly used measure of symptoms of anxiety that consists of 21 self-report items (Beck & Steer, 1993). The BAI has strong internal consistency with a Cronbach's alpha of .92 (Beck, Epstein, Brown, & Steer, 1988). It also has good test-retest reliably of one week of .75 (Beck et al., 1988). Muntingh et al. (2011) found that the BAI is a useful indicator of the severity of anxiety symptoms in patients with anxiety disorders.

Counseling Center Assessment of Psychological Symptoms (CCAPS). The CCAPS is an assessment measure that is specifically designed for use in college counseling centers as a way to screen for psychological symptoms and/or to track progress in addressing psychological symptoms. The longer version of the CCAPS, the CCAPS-62 (Locke et al., 2011), is commonly used during the initial contact with a student to assess for target areas, as well as during the final contact to provide a comprehensive assessment of treatment outcomes. The shorter version, the CCAPS-34 (Locke et al., 2012) is commonly used to track progress session by session in college counseling centers.

The CCAPS-62 is a 62 item self-report measure that is specifically designed to assess psychological symptoms in college students across nine subscales. The subscales assess for symptoms related to generalized anxiety, social anxiety, depression, academic distress, eating concerns, family distress, hostility, substance use, and overall distress (Locke et al., 2011). The CCAPS-62 requires an 8.7 grade reading level and generally takes 7 – 10 minutes to complete (Locke et al., 2011).

The CCAPS-34 is a 34 item self-report measure that is designed to be a brief version of the CCAPS-62. This assessment measure has eight subscales compared to the nine subscales of the CCAPS-62. The CCAPS-34 utilizes the same items as the CCAPS-62 but does not assess for family distress. Additionally, the CCAPS-34 specifically assesses for alcohol use instead of overall substance use like the CCAPS-62 does. The reading level for the CCAPS-34 is slightly higher, with a grade nine level required (Locke et al., 2012). This measure only takes on average 2 – 3 minutes to complete, which makes it a valuable measure to track progress quickly throughout treatment.

Both the CCAPs-62 and the CCAPS-34 will be utilized to assess symptoms of GAD for the proposed VRT program outlined in section III of this paper. Specifically, the generalized anxiety subscale on the CCAPS measures will be used to track student progress throughout the proposed program and to assess for efficacy of treatment. The generalized anxiety subscale on the CCAPS-62 has strong internal consistency with a Cronbach's alpha of .84 (Locke et al., 2011). The CCAPS-34 also had similarly strong internal consistency with a Cronbach's alpha of .83 (Locke et al., 2012).

Broadband Instruments. Broadband instruments help a clinician get a full picture of a wide range of personality and psychopathology. Descriptions of more commonly used broadband instruments include the ones noted below.

Personality Assessment Inventory (PAI). The PAI is a measure of personality and psychopathology which has a specific scale that captures generalized anxiety symptoms (Morey, 1991). This specific scale, ANX, also has three subscales, ANX-C, ANX-A, and ANX-P, which are used to assess cognitive, affective, and physiological symptoms of anxiety (Morey, 1991).

Minnesota Multiphasic Personality Inventory – 2 – Restructured Form (MMPI-2-RF). The MMPI-2-RF is another broadband psychological measure of personality and psychopathology (Ben-Porath, 2012). The MMPI-2-RF includes a specific scale, RC7, which evaluates dysfunctional negative emotions, including anxiety (Ben-Porath, 2012). Other relevant subscales include the internalizing subscale AXY, which assesses for general anxiety symptoms (Ben-Porath, 2012). Other related constructs on the MMPI-2-RF include the Personality Psychopathology Five (PSY-5) Scales, which measures a specific personality construct, NEGE-r, Negative Emotionality/Neuroticism, which is associated with symptoms of anxiety (Ben-Porath, 2012).

Evidence Based Practices

Once a diagnosis of GAD has been assessed, it is critical that clinicians know the types of evidence-based treatments available to provide the best care possible. It is also important to consider the best utilized practices currently available and how this novel intervention program can build upon this research. Given GAD symptoms often involve the activation of several biological systems, outlined below are some of the most common physical, behavioral, and

cognitive targeted strategies that are currently used to treat GAD symptoms. Both physical and psychological interventions for the treatment of GAD are reviewed below.

Physical strategies. GAD often results in high levels of arousal over a long period of time. Due to the physical symptoms that often accompany GAD, interventions that target the physical responses of anxiety are important.

Diaphragmatic breathing. Research has demonstrated that feelings of anxiety and chronic hyperventilation are positively associated, likely due to concurrent abdominal bracing that occurs in the fight-flight response, as well as the inhibition of the exhalation phase of respiration (Peper & MacHose, 1993). Feelings of anxiety also cause people to breathe in a shallower manner, and respiration dysfunction ma increase the physical and emotional complaints related to anxiety (Peper & MacHose, 1993). Thus, it is important that patients become aware of this and learn techniques to reduce this response. Further research has demonstrated that the inhibition of exhalation significantly increases an individual's perception of their sense of anxiety, while inducing slow diaphragmatic breathing significantly decreases their sense of anxiety (Peper & MacHose, 1993).

Diaphragmatic breathing relaxation exercises are evidence-based treatments that decrease both the perceptions and symptoms of anxiety (Chen, Huang, Chien, & Cheng, 2017). This treatment is advantageous due to its natural basis, safety, cost-effectiveness, and ease of both learning and practicing the technique (Chen et al., 2017). Diaphragmatic breathing is conducted by contracting the diaphragm muscle, pushing air downward into the body which lengthens the diaphragm and increases breathing efficiency and exhalation (Chen et al., 2017). This process also relaxes and stabilizes the autonomic nervous system, which is important in addressing physical anxiety symptoms including: pressure and/or constriction of the chest, dyspnea, shallow

breathing, hyperventilation, increased respiratory rates, tachycardia, palpitations, and increased peripheral blood flow (Chen et al., 2017). Whenever the sympathetic nervous system is activated due to anxiety, diaphragmatic breathing can stimulate the parasympathetic nervous system, which reduces anxiety levels, by increasing carbon dioxide levels in the blood (Chen et al., 2017). Diaphragmatic breathing also induces relaxation, in which neuromuscular activity is decreased which decreases proprioceptive input into the hypothalamus (Mizrahi et al., 2012). Diaphragmatic breathing has also been well documented to increase not only relaxation but concentration and body temperature, as well as stabilize heartbeat and blood pressure (Chen et al., 2017). Chen et al. (2017) found that diaphragmatic breathing as a relaxation technique is positively associated with reduced levels of anxiety, as well as skin conductivity, heart rate, and breathing rate.

There is even evidence that diaphragmatic breathing can increase treatment outcomes in virtual reality exposure therapy (VRET) (Shiban et al., 2017). Shiban et al. (2017) conducted a study that demonstrated that VRET was more effective when participants were taught diaphragmatic breathing as a coping skill, as it led to participants having less fear and lower physiological arousal during the exposures.

Pharmacology Interventions. An additional physical intervention that clients may opt to use is a pharmacological approach to treating their GAD. SSRIs (selective serotonin-reuptake inhibitors), SNRIs (serotonin/norepinephrine-reuptake inhibitors), buspirone, pregabalin, and BZDs (benzodiazepines) have been found to be most effective in treating the symptoms of GAD and are reviewed below (Chen, Huang, Hsu, Ouyang, & Lin, 2019).

Comorbid mood and anxiety disorders are common in individuals with GAD, and all of these related disorders are responsive to particular antidepressant treatments (Schienle et al.,

2011). SSRIs and SNRIs are shown to be effective in reducing the symptoms of GAD, while the SSRI paroxetine is the most commonly studied medicine for GAD symptoms, as it decreases symptoms associated with harm avoidance (Schienle et al., 2011). SSRIs are usually the first line of treatment (Goodman, 2004) and also demonstrate a significant reduction in negative affect, which includes negative emotions such as anxiety (Knutson et al., 1998). He et al. (2019) conducted a network meta-analysis that found that venlafaxine (SNRI), escitalopram (SSRI), and duloxetine (SNRI) were more effective than vortioxetine, and that although sertraline (SSRI) is well tolerated it is not as effective as venlafaxine (SNRI), escitalopram (SSRI), or duloxetine (SNRI). They found that all SSRI and SNRI drugs in the study were significantly more effective than the placebos (He et al., 2019). SSRIs and SNRIs are generally well tolerated but clinicians should use caution in noting the bleeding risks in using SSRIs (Chen et al., 2019).

Another well documented treatment of GAD is using medications that increase GABA within the synapse, and these include BZDs and barbiturates (Schienle et al., 2011). These GABA receptor medications help individuals deal with GAD related symptoms such as worrying, hypervigilance, and psychomotor agitation (Schienle et al., 2011). It is recommended that medication use be continued for a minimum of six months to a year to prevent relapse in treating GAD (Tomasi et al., 2019). Clinicians should exercise caution in the use of BZDs as they are associated with long-term dependence and are not recommended as a first-line treatment but may provide a good short-term adjunct to other psychiatric medications in the time it takes for SSRIs and SNRIs to begin taking effect (Chen et al., 2019). Medications that work on GABA receptors are also associated with adverse side effects, lack of long-term efficacy, and addiction problems (Goodman, 2004).

Buspirone, a psychiatric medication used to treat GAD from the azapirones class of drugs, is a non-BZD anxiolytic drug and a partial serotonin 5-HT1A receptor agonist (Chen et al., 2019). Benefits of using this medication include shorter onset of action, less side effects, and less potential for abuse or dependence (Chen et al., 2019). Buspirone also does not have any sedating effects like BZDS, however, it should be noted that it does often require administration three times daily, compared to typical once daily administration of SSRIs or SNRIs (Goodman, 2004). Anticonvulsant drugs may also be used if a person does not tolerate SSRIs or SNRIs well, and pregabalin is the most commonly used medication in this class for treatment of GAD (Chen et al., 2019). This drug is advantageous because it has early onset anxiolytic effects with relatively minimal side effects (Chen et al., 2019). Finally, trazodone, tricyclic antidepressants, and monoamine oxidase inhibitor phenelzine also demonstrate anxiolytic properties but are considered only if the above medications do not work due to adverse side effects (Goodman, 2004).

Psychological Interventions. There is a wide variety of empirically supported psychological interventions that are effective in treating GAD. Some of these are discussed below.

Mindfulness meditation. Mindfulness is a therapy that involves "bringing one's complete attention to the present experience on a moment-to-moment basis" and "paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally" (Baer, 2003). This directing of attention is developed through meditation, with an intentional self-regulation of attention created by attending to internal experiences occurring in the present, such as bodily sensations, thoughts, and emotions, while also focusing on the environment and paying attention to stimuli, such as sights and sounds (Baer, 2003). A key part of practicing mindfulness is non-

judgmentally accepting what is occurring in the present, and not evaluating them as positive or negative, and instead, accepting perceptions, cognitions, and emotions or sensations as they are experienced in the moment (Baer, 2003). It has been well documented that practicing mindfulness can reduce symptoms of anxiety and improve quality of life (Baer, 2003).

There are several theories as to why mindfulness meditation may reduce anxiety symptoms. For example, one argues that the exposure aspect of mindfulness allows individuals with anxiety to maintain nonjudgmental observation of their anxiety symptoms, without trying to avoid them, which could lead to reduction in their emotional response to such symptoms (Baer, 2003). This increase in awareness and nonreactivity has been found to be a mediator in the relationship between anxiety decreases and practicing mindfulness (Hoge et al., 2015). Mindfulness also cultivates cognitive change through the nonjudgmental observation and training of recognizing thoughts as "just thoughts" instead of necessarily being reality (Baer, 2003). Mindfulness may also promote self-management, as observing one's thoughts and reflecting on one's emotions may increase one's ability to recognize impulsive, maladaptive behaviors (Baer, 2003). Mindfulness meditation, like diaphragmatic breathing, promotes abdominal breathing which induces relaxation as well (Chen et al., 2017). Furthermore, mindfulness has been shown to increase parasympathetic influences on heart rate in individuals with high generalized anxiety symptoms (Mankus et al., 2013). Finally, mindfulness meditation promotes acceptance of one's experiences and may encourage individuals to not try and avoid their symptoms through maladaptive coping mechanisms such as drug or alcohol abuse, instead accepting that they occasionally will experience symptoms of anxiety and can observe them nonjudgmentally as they pass (Baer, 2003). Studies suggest that GAD may be characterized by an inflexibility in response style and practicing mindfulness may improve their cognitive

flexibility (Lee & Orsillo, 2014). Patients with anxiety disorders also seem to value the addition of mindfulness techniques into treatment. One study found in a 3-year follow-up to a mindfulness based stress reduction program that participants rated the program as a 7 or higher on a scale of 1-10 assessing the importance of the program in their life and 89% of participants reported the program had "lasting value" for them (Baer, 2003).

Behavioral strategies. Another common approach to treating GAD is through behavioral approaches, which focus on adapting one's maladaptive avoidance behaviors. The primary symptom target here is avoidance, an important factor in the etiology of GAD.

Behavioral exposure. Exposure based treatments are known to be the most effective type of treatment for anxiety disorders (McIntosh & Crino, 2013). This is because the avoidance factor involved in worrying helps the person avoid feeling the emotional distress related to the possibility of future negative events occurring, instead worrying about minor matters to lessen internal distress (McIntosh & Crino, 2013). This cognitive avoidance is addressed by using worry exposure, in which the client is prompted to imaginally expose themselves to their most feared outcome for a prolonged period, as well as giving them response-prevention strategies to help neutralize this image (McIntosh & Crino, 2013). This forced habituation to the feared image allows the client to address the arousal that comes from the feared image and change the meaning of the feared situation (McIntosh & Crino, 2013). Worry exposure has little research on its effectiveness alone on symptoms of GAD, as it is usually combined with typical CBT (McIntosh & Crino, 2013). However, McIntosh and Crino (2013) found that direct imaginal exposure alone lead to an average decrease in worry of 37% and this reduction was maintained at a follow-up. Furthermore, all participants in the direct imaginal exposure condition demonstrated worry levels post-treatment that were in the subclinical GAD range (McIntosh & Crino, 2013).

Hebert and Dugas (2019) note that a key risk factor in the development of GAD is intolerance of uncertainty (IU) and that behavioral experiments can be used to treat this component. These behavioral experiments would target uncertainty within negative beliefs and show participants disconfirmatory information about previously held maladaptive beliefs (Hebert & Dugas, 2019). Furthermore, behavioral experiences can help create neutral or positive beliefs about uncertainty, while also facilitating fear response extinction via new inhibitory learning (Hebert & Dugas, 2019). It has been demonstrated that IU-focused treatment produces a significant decrease in GAD symptomatology and treatment progress was maintained for most participants at a six-month follow-up (Hebert & Dugas, 2019).

Visualization. Some therapies for GAD utilize imagery visualization strategies. Such strategies are taught in session and can be utilized by clients outside of the session. Guided imagery is used to help patients focus on mental imagery and scenes that evoke a feeling of relaxation for them (Mizrahi et al., 2012). This is a mind-body technique which helps the patient actively control their attention (Jing, Wu, Liu, Wu, & Miao, 2011). By focusing their attention on an imagined, relaxing scene, patients are disrupting stressful thoughts and images and replacing them with more adaptive, positive ones (Mizrahi et al., 2012). Jing et al. (2011) found that airplane pilots who used guided imagery prior to centrifuge training had reduced anxiety, reduced heart rate, and decreased sympathetic nervous system activity.

Cognitive control strategies. In addition to physical and behavioral interventions for GAD, cognitive control strategies have been proven effective for reducing GAD symptomatology.

Cognitive Behavioral Therapy (CBT). CBT is the most empirically supported treatment for GAD (Stefan, Cristea, Szentagotai Tatar, & David, 2019). Within CBT there is a wide variety

of theoretical approaches to treatment and Stefan et al. (2019) evaluated the effectiveness of the three most common types of CBT used to treat GAD: Cognitive Therapy/Borkovec's treatment package (CT/BTP), Rational Emotive Behavior Therapy (REBT), and Acceptance and Commitment Therapy/Acceptance-based behavioral therapy (ACT/ABBT). All three of these forms of CBT are based around the idea of modifying dysfunctional thoughts through cognitive change (Stefan et al., 2019). CT/BTP focuses on modifying "cold" dysfunctional thoughts such as "they criticize me", while REBT focuses on modifying "hot" dysfunctional thoughts such as "they should not criticize me and it is awful if they do" (Stefan et al., 2019). ACT, however, does not attempt to modify the contents of dysfunctional thoughts specifically, instead changing the individual's relationship with the thoughts by neutralizing them (Stefan et al., 2019). Stefan et al. (2019) stated that CBT that focuses on dysfunctional automatic thoughts instead of core beliefs because the dysfunctional automatic negative thoughts are more related to anxiety symptoms. Results comparing these three types of CBT showed no significant difference between the three models in terms of outcomes regarding GAD (Stefan et al., 2019). REBT, ACT, and CT/BTP were all proven effective in significant reduction of anxiety symptoms (Stefan et al., 2019). Although CBT is widely considered an effective treatment for GAD, only about 50% of patients reach high levels of functioning after treatment (Stefan et al., 2019), thus it is important that clinicians utilize a holistic approach, involving other coping skills like diaphragmatic breathing and meditation to achieve high levels of functioning.

Virtual Reality Treatment

VR is defined as a "technological interface that allows users to experience computer-generated environments within a controlled setting" (Maples-Keller, Bunnell, Kim, & Rothbaum, 2017). This is created by using head-mounted displays (HMDs) to engage the individual's senses

and promote interaction with the environment (Maples-Keller et al., 2017). Over the last three decades, VR has been shown to be an effective therapy used to treat specific anxieties, PTSD, and other anxious disorders compared to wait list controls (Pallavicini, Algeri, Repetto, Gorini & Riva, 2009; Carl et al., 2019; Valmaggia, Latif, Kempton & Rus-Calafell, 2016; McCann et al., 2014). The prices of VR systems have decreased significantly over the last ten years, with mobile VR sets costing only $600 (Maples-Keller et al., 2017). Consumer VR sets often cost more than $10,000 in the past (Lindner et al., 2019). Thus, feasibility of incorporating VRT into traditional treatment settings has increased significantly in the last decade. Research supports the viability of using low-cost consumer VR technology to conduct effective exposure therapy in both traditional treatment sessions and in self-led, at home sessions (Lindner et al., 2019).

VR induces a sense of presence and can immerse the patient into their feared environment (Maples-Keller et al., 2017). Many treatments for anxiety disorders involve patients being able to stay in their feared situation until both their subjective and physiological fears decline (Diemer, Mühlberger, Pauli & Zwanzger, 2014). Thus, therapeutic change may only occur when psychophysiological fear structures are altered with corrective information (Diemer et al., 2014). Diemer et al.'s (2014) meta-analysis of studies utilizing VR exposure therapy demonstrated that VR exposure can evoke the psychophysiological arousal needed to alter fear responses. Chirico and Gaggioli (2019) found that VR has comparable effects to experiencing a real environment, with similar results regarding sense of physical presence and engagement, positive and negative affect, and discrete emotional states (anger, awe, amusement, disgust, fear, pride, sadness, and joy).

While the first studies began with treating acrophobia through exposure to high heights, a significant variety of other environments have been created to treat a wide variety of feared

situations (Maples-Keller et al., 2017). Meta-analyses even indicate a small effect size supporting VR exposures for anxiety disorders over in vivo exposures, as well as a "powerful" real-life impact and good long-term maintenance of results (Maples-Keller et al., 2017). Meta-analyses also indicate that in vivo exposure therapy is not significantly more effective than VR exposure therapy (Powers & Emmelkamp, 2008).

Typical exposure therapy involves the person imagining their specific feared stimuli, and it is entirely dependent on the patient to do so effectively, while VR eliminates potential barriers patients may have in visualization (Maples-Keller et al., 2017). Furthermore, actual in vivo exposures can be costly (i.e., actually flying on a plane), or difficult to conduct (i.e., combat in a war zone), as well as presenting concerns with confidentiality (Maples-Keller et al., 2017). VR exposures allow the environment to be controlled, utilizing gradual exposure, pacing, as well as repeated exposures (Maples-Keller et al., 2017). Further research indicates that patients are satisfied with VR exposure and may find it more helpful than traditional approaches (Maples-Keller et al., 2017). Patients are more likely to participate in VR exposures than in vivo exposures, as one study identified a 3% refusal rate for VR exposure and a 27% refusal rate for in vivo exposure (Maples-Keller et al., 2017). More research demonstrates that VR may address barriers to treatment, with one study reporting that 19% of people who said they would be unwilling to talk to a counselor in person would be willing to use VR approaches instead for mental health care (Maples-Keller et al., 2017).

VR was first used to treat specific phobias, and there is a wealth of research that supports its' effectiveness in decreasing fears related to flying, heights, animals, needles, or blood (Maples-Keller et al., 2017). Multiple randomized controlled studies about VR exposure on specific phobias show symptom reduction and behavioral change through decreased avoidance

(Maples-Keller et al., 2017). There is also support of VR exposure of social anxiety disorder (SAD) demonstrating decreased anxieties after gradual exposure to VR social environments (Maples-Keller et al., 2017). Similarly, VR exposure has been shown to be effective in treating panic disorder and agoraphobia but putting the patients in situations that commonly elicit panic or agoraphobia (Maples-Keller et al., 2017). VR for panic disorder and agoraphobia has been shown to be advantageous in treatment response and less time required to complete treatment (Maples-Keller et al., 2017).

VR exposure in the treatment of PTSD has been well researched and well supported with medium-to-large effect sizes, with significant declines in PTSD symptoms after treatment with VR (Maples-Keller et al., 2017). One study that had 10 participants complete VR treatment resulted in 7 out of the 10 participants no longer meeting the diagnostic criteria for PTSD anymore following treatment (Maples-Keller et al., 2017). Another study of veterans with PTSD demonstrated that after six sessions of VR exposure therapy not only were PTSD symptoms improved, but cortisol reactivity was reduced and maintained 12 months posttreatment (Maples-Keller et al., 2017). Moreover, VR prolonged exposure therapy has been found effective in treating PTSD in active-duty soldiers who were deployed to Iraq or Afghanistan (Reger et al., 2016).

Treatment of obsessive-compulsive disorder (OCD) utilizing VR has not yet been studied in a randomized controlled study, however, some studies have demonstrated that VR can induce anxiety in patients with OCD (Maples-Keller et al., 2017). Individuals with OCD often have a variety of obsessions that may be difficult to create in a VR environment so unified treatment for large groups is difficult to test, however, more research on treating OCD with VR is warranted given its relation to other anxiety disorders (Maples-Keller et al., 2017).

VR may also be used in the treatment of other mental disorders that do not fall under the anxiety disorders category. For example, VR has shown promising results in treating schizophrenia by having patients practice social skills and learn to cope with social distress associated with delusional beliefs (Maples-Keller et al., 2017). It appears VR may have value in addressing the isolation factor of schizophrenia by providing social skills training and interactivity, as well as teaching assertiveness and understanding nonverbal social cues (Maples-Keller et al., 2017). Furthermore, Pot-Kolder and colleagues (2018) found that utilizing a VR-CBT approach in adjunct to treatment-as-usual significantly reduced paranoid ideation and anxiety in patients with psychotic disorders, further supporting the utilization of VR for this population. Moreover, Fornells-Ambrojo et al. (2008) demonstrated that brief VR treatments are safe for individuals with psychosis and are a good way to expose them to social situations that may induce paranoia.

There is also significant research supporting VR's utilization in the experience of acute and chronic pain, as it facilitates a distraction from pain and VR has been demonstrated to be more effective than other distraction techniques such as music and TV with headphones (Maples-Keller et al., 2017). Multiple studies have demonstrated that VR used to decrease pain significantly reduced the time spent thinking about pain and pain severity, as well as fMRI data that shows reduced activity in brain regions that process sensory and emotional pain, thus offering both subjective and objective evidence that VR can help in pain reduction (Maples-Keller et al., 2017).

There is also significant research on VRT in treating addiction by conditioning the patient's reactivity to drug or alcohol related cues in their environments, which is a key factor in preventing relapse (Maples-Keller et al., 2017). Using VR based craving exposures patients can

face their drug or alcohol related cues in a safe therapeutic environment, and this method is effective in inducing the same physiological arousal, subjective craving, and impulse to use as real-world triggers (Maples-Keller et al., 2017). There is even evidence for VR treatment in other types of addictions, such as gambling, as VR casino environments were shown to induce the same psychophysiological arousal and cravings in those addicted to gambling (Maples-Keller et al., 2017).

VR's effectiveness has also been studied in varying forms of eating pathology. For example, VR can be used to explore body-image distortions as well as use exposure to food triggers to identify and challenge triggers in the recovery process (Maples-Keller et al., 2017). Other studies have demonstrated that VRT is effective in improving body awareness in individuals with obesity and binge-eating disorders (Maples-Keller et al., 2017). Another controlled study of 28 obese patients randomly assigned participants to VRT or CBT and found that the VRT group demonstrated significantly higher improvements in body satisfaction, anxiety level, and problematic eating (Maples-Keller et al., 2017).

VRT has also been investigated regarding its usefulness in treating concerns commonly associated with Autism Spectrum Disorder, such as difficulties with communication, emotion regulation, and theory of mind (Maples-Keller et al., 2017). There is preliminary evidence that VR can be helpful in improving such areas of concern, however, results are not yet significant given small sample sizes (Maples-Keller et al., 2017). Moreover, there is some research that suggests VR technology has the potential to increase empathic abilities in humans, an important social skill (Schoeller et al., 2019).

Cybersickness is the most common side effect associated with using immersive VRT (Calogiuri et al. 2018). Pot-Kolder, Veling, Counotte and van der Gaag (2018) found five

common symptoms of cybersickness including: general discomfort, fatigue, headache, difficulty concentrating, and fullness of head. Other symptoms can include vomiting, nausea, lightheadedness, vertigo, sweating, hot flashes, increased salivation, drowsiness and changes in facial pallor (Dennison, Wisti & D'Zmura, 2016; Bouchard, St-Jacques, Renaud, & Wiederhold, 2009; Sharples, Cobb, Moody, & Wilson, 2008). Furthermore, oculomotor symptoms including eyestrain and blurred vision may occur (Pot-Kolder et al., 2018).

These symptoms have been shown to last from minutes to up to five hours after VR exposure, however, improvements in VR technology may decrease the occurrence of such symptoms (Dennison et al., 2016). Such improvements include minimizing lag between head movement and visual display updates, as well as reducing the weight of head mounted displays (Dennison et al., 2016). Other research suggests that reducing sensory mismatch can reduce symptoms of cybersickness as well as increase feelings of "being there" (Weech, Kenny, & Barnett-Cowan, 2019). Furthermore, by increasing intuitiveness of interaction and navigation of the technology also lead to higher presence and lower cybersickness (Weech at al., 2019). Additionally, individuals with gaming experience demonstrate less cybersickness and higher presence (Weech et al., 2019).

A common theory about cybersickness is the sensory conflict theory, in which cyber sickness is believed to be caused by conflicting signals being received by both the visual and vestibular systems (Calogiuri et al. 2018). Another common theory of cybersickness is the postural instability theory which theorizes that long periods of time without postural control causes cybersickness (Calogiuri et al. 2018). Others posit that motion sickness is a key factor in cybersickness, with varying theories on the reasons for this including the body's adaptive response to a noxious stimulus, while others argue it prolonged postural instability that causes

motion sickness (Dennison et al., 2016). Dennison et al. (2016) found that physiological reactions such as changes in stomach activity, blinking behavior, and breathing are predictors of cybersickness and argue that these signals demonstrate the mismatch between real and virtual cues activate the autonomic nervous system.

Pot-Kolder et al. (2018) found that common cybersickness symptoms, specifically nausea and disorientation, are better explained by anxiety symptoms than by cybersickness alone. Thus, when VR helps decline symptoms of anxiety, it is hypothesized that the cybersickness symptoms of nausea and disorientation will decrease after repetitive use of the VRT (Pot-Kolder et al., 2018). Despite the concerns with cybersickness and VR side effects, research has demonstrated that there are no reasons to be concerned with health and safety of the client within 24 hours of the VR session (Bouchard et al., 2009). However, side effects should still be closely monitored because most participants experience slight side effects (Bouchard et al., 2009). It is important to note that Bouchard et al. (2009) found that some side effects found in participants were strong even before the immersion in the VRT.

Virtual Reality and GAD Treatment

Research has demonstrated the effectiveness of using VRT in the treatment of other mental illnesses, and there is promising research for using VRT in the treatment of GAD as well. Given GAD's wide variety of worries that are individualized to the patient exposure therapy for GAD is difficult to conduct, thus VR based treatment for GAD could focus on facilitating a visual guide for breathing exercises and for practicing relaxation or mindfulness approaches, as this project suggests (Maples-Keller et al., 20187). VR can be used to facilitate relaxation in anxious participants by providing relaxing images that also induce a sense of presence (Pallavicini et al., 2009). VR can be used to help patients practice and master relaxation, while

also providing more vivid and "real" experiences than most subjects can induce by imagination and memory alone (Pallavicini et al., 2009). Pallavicini et al. (2009) conducted a study that supports the possibility of using VR to treat GAD with a significant decrease in symptoms, as well as 91% of patients reporting they were satisfied with the VR treatment.

Patients with GAD demonstrate significantly lower amounts of mindfulness and mindfulness is a common treatment approach as described above (Navarro-Haro et al., 2019). Because worrying can take up one's attentional resources, patients with GAD may have reduced ability to sustain attention during mindfulness-based treatments (Navarro-Haro et al., 2019). Thus, the distraction of worry may impact treatment outcomes VR can function as a visual guide for practicing mindfulness by giving patients the feeling of "being there" in the present moment (Navarro-Haro et al., 2019). Navarro-Haro et al. (2019) tested this theory and found that after treatment, VR patients showed significant decreases anxiety, as well as increased emotion regulation with improvements in confusion, impulsivity, and interoceptive awareness.

Furthermore, it was found that patients who were assigned to the VR group were more likely to adhere to the intervention than patients in the standard mindfulness intervention alone (Navarro-Haro et al., 2019). This supports my theory that VR can engage patients and increase treatment adherence and retention. The Navarro-Haro et al. (2019) study also only utilized VR 10 minutes before or for 10 minutes after traditional mindfulness sessions, which supports this project's structure of adding VR component to treatment adjunct to treatment-as-usual.

Nature Therapy and VRT

It has been well documented that coming into contact with nature can enhance positive affect (Barnes et al., 2019), psychological well-being, and health (Schutte, Bhullar, Stilinović & Richardson, 2017). For example, when a group of nonclinical participants were randomly

assigned to go into nature every day for two weeks, they experienced significantly higher positive affect compared to the control group that was assigned to experience human-built surroundings everyday instead (Schutte et al., 2017). Moreover, this study also included a "business-as-usual" control group, and the nature assigned group still experienced significantly more positive affect (Schutte et al., 2017). It is thought that evolution shaped humans to obtain benefits from exposure to nature, both physical and psychologically (Schutte et al., 2017). Not only has nature contact increased both hedonic (pleasure and comfort) and self-transcendent (awe, gratitude, wonder, and sense of being part of something greater than yourself) emotions, but research has also demonstrated that the length of contact with nature does not have impact on the amount of improvement, suggesting short intervals of nature exposure are beneficial to psychological well-being (Neill, Gerard, & Arbuthnott, 2019). Neill et al. (2019) demonstrated that improvements in emotions in university students after exposure to nature environments can be obtained within five minutes.

Exposure to nature has also been documented to show benefit in clinical populations as well (Schutte et al., 2017). Schutte et al. (2017) designed a study to evaluate the effectiveness of using virtual natural environments on well-being and found that VR experience of natural environments compared to VR experience of an urban environment led to higher levels of positive affect. The effect size found in this study (r =.46) was larger than the effect sizes previously found for environments simulated by film or photographs (r =.21) and was somewhat larger than the effect size impact of actual environment (r =.37) (Schutte et al., 2017). These results demonstrate promise in the utilization of VR based environments for positive impact on psychological well-being (Schutte et al., 2017). Similarly, Chirico and Gaggioli (2019) found that exposure to a VR nature environment decreased anger, sadness, and negative affect.

VR exposure to nature can also provide nature exposure for individuals living in isolated confined environments (Anderson et al., 2017). Being in nature provides restorativeness through being away from routine mental concerns, interest-driven attention, and is supported by an environment of substantial scope (Anderson et al., 2017). Since new VR technology provides high degrees of scene immersion and presence, VR natural environments also have the ability to evoke restorativeness (Anderson et al., 2017). VR natural scenes are not only superior to control urban environments, which may prevent relaxation, but were also found to be superior to a neutral indoor scene (Anderson et al., 2017). Electrodermal activity, which increase as stress is induced, significantly decreased in the VR nature condition, and negative affect also decreased significantly after the natural VR experience and not in the control experience (Anderson et al., 2017).

VR natural scenes have not only been found to decrease stress and anxiety, as well as improve mood when compared with urban environments, but coastal natural environments have been significantly beneficial (Tanja-Dijkstra et al., 2018). Natural VR coastal environments also demonstrated analgesic properties for pain management, providing more support for the transferable nature exposure effects using VR (Tanja-Dijkstra et al., 2018). Such effects were shown to not be due to distraction alone, as the effects were not found in a control group that was exposed to urban environments, thus, again supporting the benefits of exposure to natural environments (Tanja-Dijkstra et al., 2018). Furthermore, there is research that suggests that adding nature sounds to a virtual natural environment can induce the same physiological stress reduction, through parasympathetic nervous activation, just as a real nature environment would (Annerstedt et al., 2013).

Research has demonstrated that immersive natural environments may be hindered by cybersickness caused by movement lag, poor postural control, and flatness (Calogiuri et al. 2018). Thus, future VR technology should focus on creating a holistic sensory experience with better image quality and prompt for postural control to prevent cyber sickness (Calogiuri et al., 2018).

Section III: Original Contribution to Practice

Methods

Participants. Participants will include students enrolled full-time at the university, who are eligible to receive counseling center services, and who receive an elevated score on the generalized anxiety scale on the CCAPS-62 (Locke et al., 2011). If the client meets these three criteria, and the clinician determines that the client meets criteria for GAD, they may suggest participation in this program as a part of their treatment plan. Students indicating any concerns with psychotic symptoms, mania or hypomania, or substance abuse should not be included in the program.

Technology equipment. There is a company called Limbix, which creates digital therapies that can be utilized by mental health professionals. The Limbix VR Kit was "inspired by over 300 peer reviewed studies that have shown VR can play a meaningful role in healthcare" and was created with the help of mental health professionals ("Limbix," n.d.). The Limbix VR Kit is medical grade, wireless, and does not require internet. The VR kit comes with a VR headset that is medical grade and can be sanitized with wipes, a tablet that connects to the VR headset via Bluetooth, a docking station to charge, transport, and store the kit, as well as complete access to their full VR immersive environment library. Per their website, these environments allow patients to "visit remote locations and relax in tranquil nature environments

while in authentic, virtual environments" ("Limbix," n.d.). The VR headsets provide real-world 360-degree footage that is built from panoramic images and videos, rather than animated graphics, which allows patients to more easily experience true "presence with visceral sensations" ("Limbix," n.d.). Although exposure therapy will not be utilized in the proposed program, the Limbix VR kit also offers a unique way for therapists to gradually increase exposure for patients with specific phobias and anxieties.

Virtual environments available currently include: driving exposure, depression, trauma, anxiety, addiction and teenage depression psychoeducational films, public speaking, claustrophobia, fear of needles, agoraphobia, bars & drinks, world traveler, teleporter where you can visit any address around the world on Google Street View, as well as various positive games. Their website states that coming soon they will also include job interview environments, social anxiety, fear of heights, school anxiety, behavioral activation, and guided imagery ("Limbix," n.d.). This proposed program would utilize the tree mindfulness environment, in which you "observe an environment and engage in tasks that encourage mindful growth and exploration to transition the scene from winter to spring" ("Limbix," n.d.). Focus meditation, in which you "concentrate on single objects in a dark environment for focus meditation" ("Limbix," n.d.). Nature environments, in which you can "relax in tranquil, outdoor environments while optionally listening to guided meditation tracks" ("Limbix," n.d.). Breathing exercises in which you "practice diaphragmatic breathing and learn how to reduce feelings of anxiety" ("Limbix," n.d.).

The Limbix VR Kit that is readily available for anyone to purchase costs $1,999 and includes the VR headset, tablet, docking station, content library, online training, and email support ("Limbix," n.d.). There is a custom research project headset that is offered at a custom price which includes the VR headset, tablet, docking station, content library, and research

support including: custom data logging, study design support, and grant collaborations ("Limbix," n.d.). While the VR equipment should be readily available for students to use with a scheduled appointment Monday – Friday, students may also have the option of purchasing their own, relatively cheap mobile-VR set so that they may continue to use this intervention after their 12-session limit has been reached. Mobile based VR may also be helpful in allowing patients to utilize the technology in real time whenever they need to become relaxed in their time away from the office presence (Pallavicini et al., 2009).

Clinician Requirements. Clinicians must be master's or Doctoral level practitioners who are well versed in treating GAD and its accompanying concerns. Clinicians must be licensed in their state of practice or receive adequate supervision required to practice without a license. They should have experience in teaching clients how to effectively utilize diaphragmatic breathing and mindfulness meditation to reduce symptoms of anxiety. They should also be well versed in the research behind these treatments and be able to provide a rationale for treatment and psychoeducate the client on why the treatment is a worthy endeavor. Clinicians must also be able to provide rationale for utilizing VR in treatment as well as demonstrate the credibility of incorporating VR into treatment (Maples-Keller et al., 2017). The clinicians should also be familiar with the Limbix VR Kit and be able to set up and operate it. It is recommended that the clinicians familiarize themselves with the environments offered and utilize them to become familiar with how they operate and what clients can expect. In-depth training and practice with the equipment is necessary before administration. Clinicians should also be well educated on the potential risks and side effects of using VR equipment, such as cybersickness.

Psychological Outcome Measures. The CCAPS-62 (Locke et al., 2011) and the CCAPS-34 (Locke et al., 2012) will be used to track progress on generalized anxiety scores. The

GAD-7 (Spitzer, et al., 2006) will also be used to track progress. The CCAPS-34 (Locke et al., 2012) will be administered at the beginning of every session to track progress week-by-week. The CCAPS-62 (Locke et al., 2011) will be administered at the beginning of session 1 and at the beginning of session 11. The GAD-7 (Spitzer, et al., 2006) will be administered at the end of session 1 and at the end of session 11 to evaluate progress. Students will be emailed to complete a follow-up CCAPS-34 (Locke et al., 2012) and GAD-7 (Spitzer, et al., 2006) at 1-3- and 6-months post-treatment to see if progress is maintained.

Proposed Outline. The program will consist of 11 sessions of VRT within a counseling center setting. The counseling center will have a room or use an existing computer room to rent out the space for appointments using the equipment. As most Counseling Center's run on a time-limited brief therapy model, this adjunct to therapy will be beneficial in providing the most comprehensive care in a time limited setting.

Initial contact. The initial contact, not included in the session total, will be used to interview the client to determine presenting concerns and suitability for VRT treatment. In this session the client will fill out counseling center paperwork, take the CCAPS-62 (Locke et al., 2011), and speak with a clinician about their concerns. By the end of the first session the clinician should determine if the client is appropriate for VRT treatment for GAD and educate them on the program if they meet criteria.

Session 1. The second contact will include treatment as usual, plus an additional 30-minute psychoeducational introduction to utilizing the VR equipment. The clinician will educate the client on how to best utilize the technology, as well as discussing the benefits of utilizing it. Clinicians should emphasize that repeated use of the equipment leads to better outcomes. Once a client has been trained on how to use the equipment, the clinician will mark in their electronic

file that the student may schedule times to utilize the VR equipment on their own. Clients will be encouraged so schedule 30-minute sessions with the VR equipment coinciding with their regular treatment times. Clients may also utilize the equipment outside of their normal treatment times. Clients can check out the VR equipment from the administration at the front desk in the counseling center, provided they leave their student ID at the front desk while they use the equipment. The clinician should check in with the client at their normal session to monitor how often they are utilizing the VR equipment as well as answer any questions or concerns about it. It is important that the clinician assess the client's perceived value of the VR adjunct to treatment.

Program Evaluation

The participants will be emailed and asked to complete a follow up CCAPS-34 (Locke et al., 2012) and GAD-7 (Spitzer, et al., 2006) at one month, three months, and 6 months following treatment to assess prolonged effects of treatment. Participants will also be asked to complete a posttreatment survey designed specifically to assess satisfaction with treatment and perceived benefits. To assess the effectiveness of adding the VRT alongside typical GAD treatment, the counseling center could randomly assign half of the students who meet criteria for GAD to the VRT experimental group, while the other half provide a control measure by only receiving treatment per usual. Statistical analyses should be conducted to determine if the effect size between the groups are significant.

Proposed Budget

The budget will consist of $2,000 allocation for the VR equipment. If the counseling center has the funding and willingness to expand, the purchase of four sets at $2,000 each would need to allocate $8,000 for cost. The program will be advertised through the school's social media department free of cost. The program will also be advertised by the clinician through word

of mouth whenever they encounter a student who meets the proposed criteria to participate in the program.

Conclusion

As contemporary technologies have become a central part in modern life, it is important that treatments adjust accordingly and integrate new technologies into existing treatment modalities. Increasing access to VRT has allowed this technology to become an effective treatment delivery method for various mental disorders, including GAD. The benefits of utilizing a cost-effective, evidence-based treatment in counseling centers are demonstrated in this manuscript.

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