A RANDOMIZED CONTROLLED STUDY OF THE EFFECTIVENESS OF CASUAL VIDEO GAMES IN REDUCING SYMPTOMS OF ANXIETY

by

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April, 2011

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Anxiety is a natural reaction to stress. However, when anxiety becomes excessive it can develop into a debilitating disorder. Interventions are needed to ameliorate and prevent the development of anxiety related health disorders. Casual video games (CVGs) are fun, easy to play, spontaneous, and extremely popular. In this randomized controlled study the efficacy of CVGs in reducing symptoms of anxiety in a depressed population was tested by comparing individuals in the experimental group, who were prescribed a CVG to utilize over a one month period, with a no-treatment control group. The methodology included participants in the experimental group playing a CVG three times a week for 30 minutes each session, over a one-month period. The State Trait Anxiety Inventory (STAI) was used to measure participants' state and trait anxiety pre-post intervention. Results from both state and trait measures demonstrated that the intervention was effective in reducing state and trait anxiety symptom severity scores for the experimental group when compared to the control group. These findings demonstrate the use of prescriptive interventions that utilize CVGs as a way to treat anxiety, as well as, implications that include the potential expansion of applications of CVGs as an adjunct to medicine and other medical therapies being utilized alone

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A Thesis

Presented To

The Faculty of the Department of Recreation and Leisure Studies

East Carolina University

In Partial Fulfillment of the Requirements for the Master's Degree in

Recreational Therapy Administration

by

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April, 2011

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CHAPTER I: INTRODUCTION

Background

Anxiety is a paradoxical phenomenon. On the one hand it is a normal reaction typically brought about by a stressor or some form of danger (Butcher, Mineky, & Hooley, 2007). Anxiety serves as a coping mechanism in this respect helping some people with stressful experiences. On the other hand, anxiety disorders develop when anxiety becomes excessive or uncontrollable. Anxiety can then become detrimental to overall daily functioning and health. This can lead to impairments in cognitive, physiological, and behavioral states. Some common symptoms experienced with anxiety include negative mood, unnecessary worry, loss of control, chronic stress and tension, and avoidance of specific situations or environments (Butcher et al., 2007; National Institutes of Mental Health, 2010a).

Anxiety prevalence statistics estimate that anxiety disorders affect approximately 40 million Americans (National Institutes of Mental Health, 2009). The National Comorbidity Survey (NCS) found that lifetime and 12-month prevalence for any anxiety disorders was 24.9% and 17.2% (Belzer & Schneier, 2004). In the United States general population, approximately 40 million (18.1%) adults have an anxiety disorder (National Institute of Mental Health, 2010b). Anxiety disorders are the most commonly diagnosed psychological disorders among women and are the second most prevalent for men. In a recent study, it was observed that at least one form of an anxiety disorder was experienced over a 12-month period by approximately 23 percent of women and 12 percent of men (Himle, Raymond, Taylor, Campbell, & Jackson 2009).

Current healthcare treatments for anxiety are limited and costly, creating a need for effective and affordable interventions (Kasper, Boer, & Sitsen, 2003). Generally, individuals diagnosed with anxiety receive medication, psychotherapy, or a combination of the two (Barlow, 2004). Medications are sometimes viewed as the cure all for anxiety. However, it is

suggested that medications should be used collaboratively with psychotherapy (National Institutes of Mental Health, 2009). Relapse rates for these forms of treatment are high (National Institutes of Mental Health, 2009). Furthermore, medications can lead to a variety of side effects that can be detrimental to an individual's quality of life (Kasper et al., 2003). Dosage must be continually increased to achieve the same therapeutic effect, forcing patients to take increased amounts of medications. Such dilemmas can create unhealthy and problematic issues, such as chemical dependencies, which can complicate and/or delay the rehabilitation process. Psychotherapy and medications tend to be expensive and can create financial challenges for patients (National Institutes of Mental Health, 2009). Thus there is a need for cost effective efficacious treatments for anxiety disorders.

More recently, other non-pharmacological treatments have begun to be studied as potential treatments. For instance, in a recent randomized-controlled research study, with non-diagnosed anxious participants, it was demonstrated that individuals who played Casual Video Games (CVGs) when compared to control subjects with similar conditions elicited increased positive mood and decreased stress (Russoniello, O'Brien, & Parks, 2009). The Casual Games Association (2007) defines CVGs as fun, fast to access, simple to learn and require no previous video game skills or time commitment to play. Casual Video Games can be played in small time increments because they are easy to pause, stop, and restart at any time. Results from the study established changes in electroencephalography (EEG), a measure of electrical activity recorded from the brain, consistent with improved mood and positive changes in heart rate variability (HRV), a physiological measure that records autonomic nervous system (ANS) activity, which correlates with a relaxation of the ANS. In some cases, positive changes were documented in EEG, HRV, and psychological effect (Russoniello et al., 2009; Casual Games Association, 2007).

Purpose of the Study

The purpose of this study was to examine the effectiveness of CVGs in reducing symptoms of anxiety in a depressed population. This study utilized an experimental design using CVG play as a prescribed activity in comparison to a no-treatment control group. The intent of this research was to test if individuals who play CVGs as a prescribed intervention exhibited a decrease in reported symptoms of anxiety on the State-Trait Anxiety Inventory (STAI). To date this type of research has not previously been examined. If determined that prescribed CVG play is an effective treatment for symptoms of anxiety, then persons with anxiety will have a tested alternative form of treatment.

Statement of the Problem

Current healthcare treatment options and research is limited for persons with anxiety (Barlow, 2004). Healthcare systems currently need methods and interventions that offer relief from anxiety symptoms while improving healthcare outcomes (Kasper et al., 2003). If anxiety is left untreated and allowed to build it can negatively impact an individual's ability to function in society and cope with everyday life. Recent research with non-diagnosed anxious participants indicated that CVGs can elicit enhanced mood and decreased stress (Russoniello, O'Brien, & Parks, 2009). By utilizing CVGs as a prescribed activity it is hypothesized that individuals with anxiety who play CVGs will have a decrease in symptom severity and issues caused by anxiety.

Objectives

1. To determine if CVGs are efficacious in reducing state anxiety symptoms in a depressed population.
2. To determine if CVGs are efficacious in reducing trait anxiety symptoms in a depressed population.

Hypotheses

Ho_1: There will be no significant difference in state anxiety symptom severity scores as measured by the STAI between the experimental and control groups.

Ha_1: There will be a positive significant difference in state anxiety symptom severity scores as measured by the STAI between the experimental and control groups.

Ho_2: There will be no significant difference in trait anxiety symptom severity scores as measured by the STAI between the experimental and control groups.

Ha_2: There will be a positive significant difference in trait anxiety symptom severity scores as measured by the STAI between the experimental and control groups.

Limitations

When conducting research it is necessary to control for extraneous variables that may have an influence on results. First, one limitation is this study was underwritten by PopCap games, whose games were utilized in this study. Additionally, a technological barrier may be experienced between participants who have none or little experience working with computers. Other limitations are associated with the measurement of physiological data, which is an estimate and necessary precautions must be taken to ensure that the most accurate signal is recorded. Additional limitations include morbidity, random recruitment and selection, use of volunteers as subjects, inducement, truth in reporting on psychological assessments, and reporting of time spent playing CVG at home. Also, literature does not suggest a specific amount of time needed for such an intervention to ensure an effect; thus, it is not known if the treatment protocol employed will positively affect individuals with anxiety.

Delimitations

The study findings were delimited to 59 participants from Eastern North Carolina who had a score of greater than or equal to 5 on the Patient Health Questionnaire-9 (PHQ-9).

Assumptions

The researcher assumed that participants had answered all questions and required documents honestly. The researcher also assumed that participants completed all self-administered questionnaires and log sheets as accurately as possible.

Definition of Terms

Autonomic nervous system (ANS) - The section of the nervous system responsible for regulation of internal organs. The ANS can be divided into sympathetic and parasympathetic systems (Friedman & Thayer, 1998).

Behavioral state - The behavior exhibited by an individual is dependent upon the information obtained or learned (Butcher et al., 2007).

Casual Video Games (CVGs) – Games that are fun, fast to access, simple to learn, and require no previous video game skills or regular time commitment to play. CVGs are played in small time increments due to the fact they are easy to pause, stop, and restart at any time (Casual Games Association, 2007).

Cognition - "Mental processes, including perception, memory, and reasoning, by which one acquires knowledge, solves problems, and makes plans" (Butcher et al., 2007, p. G-5).

Coping mechanism - A technique used to help overcome a problem or disability without correcting or removing the core condition (Butcher et al., 2007).

Electroencephalography (EEG) - By placing electrodes on the scalp of a person at designated spots, electrical activity from the brain can be picked up and different waves and amplitudes can be measured (Peper, Tylova, Gibney, Harvey, & Combatalade, 2008).

Heart Rate Variability (HRV) - A physiological measure that is directly related to the balance of the autonomic nervous system, which is in control of the body. HRV reflects the sympathetic (anxiety) or parasympathetic (relaxation) initiation within the body (Friedman & Thayer, 1998).

Patient Health Questionnaire (PHQ) – A self-administered screening and diagnostic tool that uses diagnostic criteria from the Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (2000) (DSM-IV-TR) to identify specific disorders and measure symptom severity (Spitzer et al., 1994).

Profile of Mood States (POMS) – A self-administered psychological inventory that measures six subscales: tension, depression, anger, vigor, fatigue, and confusion. This inventory can be utilized to examine both "last week including today" and "right now" instructions (Multi-Health Systems Inc., 2003).

Psychotherapy - "Treatment of mental disorders by psychological methods" (Butcher et al., 2007, p. G-19).

Salivary-Alpha Amylase (sAA) - A non-invasive standard measure that allows for repeated assessments of variables such as hormones, antibodies, and stress (Mandel, 1980; Mandel, 1990; Smith et al., 1991; Tabak, 2001; Rantonen, 2003).

State-Trait Anxiety Inventory (STAI) – A self-administered inventory that distinguishes between the temporary condition "state anxiety" (S-Anxiety) and the more general "trait anxiety" (T-Anxiety). This inventory allows researchers to separate feelings of anxiety and depression (Spielberger, Gorusuch, & Lushene, 1970).

CHAPTER II: LITERATURE REVIEW

Anxiety

Anxiety is a broad sensation of uneasiness that is marked by an inner state of apprehension and a belief that one is in some type of danger (Butcher, Mineka, & Hooley, 2007). Anxiety and fear are two different emotions but are commonly regarded as the same. Fear is defined by an obvious source of danger. However, with anxiety, danger is not typically specified clearly, as it can occur in situations where danger is not observable (Butcher et al., 2007; Spielberger, 1985). Anxiety is often described as a mixture of unsettling sensations and thoughts comprised of different components that are directly affected (Butcher et al., 2007).

While small to medium bouts of anxiety can be helpful in learning and skill acquisition, frequent bouts of anxiety that sustain over long periods of time can lead to anxiety disorders. Anxiety directly affects the individual's cognitive/subjective, physiological, and behavioral states (Kasper, Boer, & Sitsen, 1994). Within the cognitive/subjective level, anxiety has the ability to bring about negative mood, unnecessary worries, fixation on self, and loss of control of actual fear. Physiologically, the body is not in a homoeostatic state (Kasper et al., 1994). The body is in a state of chronic stress and tension, leaving the person prepared for any danger that may occur. Lastly, on the behavioral level, situations or environments where danger could occur are frequently avoided (Butcher et al., 2007).

In a person's lifetime, threatening experiences will occur and anxiety is learned. For many years, research experiments have been conducted on human and nonhuman animals to examine how anxiety and fear are provoked and controlled (Kasper et al., 1994). This research demonstrates that anxiety is learned, and is also conditionable (Butcher et al., 2007). When a normally neutral object becomes constantly paired with stimuli, and negative reactions steadily

occur and are predictable, these neutral objects can become paired with the negative stimuli to illicit anxiety (Spielberger, 1985; Spielberger et al., 1970).

Physical symptoms typically associated with anxiety include heart palpitations, exhaustion, queasiness, thoracic angina, loss of breath, stomachaches, and headaches (Thayer, Friedman, & Borkovec, 1996). When the body prepares to deal with a threat, blood pressure and heart rate increase rapidly. Blood flows to major muscle groups and the immune and digestive systems become subdued. Sometimes panic attacks are experienced with anxiety. Panic attacks can come without notice, and as with anxiety, the accompanying fear is generally unreasonable but feels very real. Experiencing a panic attack can seem as if one is dying, going crazy, or having a heart attack (Butcher et al., 2007).

Prevalence

Anxiety is a prevalent issue among people in America. Anxiety has no barriers or constraints when targeting affected persons. There are no age limits, gender barriers, or environmental constraints. In a recent survey, it was found that close to 40 million Americans (about 18%) will encounter some form of anxiety disorder at least once in their lifetime (National Institutes of Mental Health, 2009). In fact, anxiety disorders are the most commonly diagnosed category for psychological disorders found in women, and rank second in psychological disorders for men (Kessler et al., 1994). Even more startling are the findings from Kessler et al. (1994), who found that within a 12-month period, approximately 23 percent of women and 12 percent of men experienced at least one anxiety disorder.

With more than 40 million adults suffering from an anxiety disorder, healthcare systems are shifting to increase the quality of care and cost effectiveness of treatment (Kessler et al., 2005). The recent healthcare shift includes five key components, all of which are focused towards increased health outcomes, decreased costs, and increased effectiveness of treatment

(Royston, 1998). Anxiety has produced enormous personal, economic, and healthcare problems for those involved. Kessler and Greenberg (2002) found that spending on anxiety disorders in the United States is more than $100 billion in indirect and direct costs annually.

History of Treatments

Throughout history there have been several effective therapies to help relieve anxiety such as medication, psychotherapy, biofeedback, virtual reality, and eye movement desensitization and reprocessing (EMDR). As the medical world continues to explore different areas of research, new treatments for anxiety are unveiled. Generally, individuals diagnosed with anxiety are prescribed medication, psychotherapy, or a combination of the two therapies. Before being prescribed treatment patients are assessed on specific symptoms and problems associated with anxiety. Anxiety is often comorbid with other psychological disorders or conditions, and it is important to understand to what extent anxiety is the cause or caused by related comorbid conditions (National Institutes of Mental Health, 2009).

Persons experiencing anxiety sometimes must engage in several different treatments before they are able to find relief. When reevaluating a patient it is important the doctor know what previous treatments were tried, the duration, dosage amount, and side effects, etc.. When a treatment does not work it can make the patient feel as if he or she has failed and exacerbate his or her anxiety. The truth more likely is linked to poorly performed or incorrect treatment, or treatment that is not effective given specific personal characteristics of the individual (National Institutes of Mental Health, 2009). Some examples of anxiety treatments used today include medications, psychotherapy, electromyography (EMG), virtual reality, and EMDR (National Institutes of Mental Health, 2009; Coelho, Waters, Hine, & Wallis, 2009; Hiebert & Fitzsimmons, 1981; Shapiro, 1999).

A common misconception about medication for patients with anxiety is that medication alone is the cure (National Institutes of Mental Health, 2009). However, medication is prescribed to help with the process of psychotherapy. The main types of medications used are anti-depressants and anti-anxiety drugs. Antidepressants, which were created for patients with depression, are also effective with relieving anxiety symptoms. These medications tend to take 4 to 6 weeks to start relieving symptoms but begin changing brain chemistry after the first dose (National Institutes of Mental Health, 2009; Butcher et al., 2007).

Selective serotonin reuptake inhibitors (SSRIs) are one of the newer antidepressants prescribed for anxiety. These SSRIs work by manipulating levels of serotonin, a neurotransmitter in the brain that allows cells within the brain to communicate with one another. Upon starting the medication, SSRIs can occasionally produce side effects such as nausea, jitters, or sexual dysfunction. Like other medications, dosage must be adjusted throughout usage or may require changing to another SSRI. Examples of these medications include Prozac, Zoloft, Lexapro, and Paxil (National Institutes of Mental Health, 2009; Butcher et al., 2007).

Older antidepressants include Tricyclic's and monoamine oxidase inhibitors (MAOIs). Tricyclics are just as effective as SSRIs but tend to have additional side effects such as vertigo, lethargy, dry mouth, and weight gain. These MAOIs are the oldest form of anti-depressant medication and appear to be the most dangerous (Thase, Trivedi, & Rush, 1995). When taking MAOIs specific foods and drinks must be taken out of one's diet. Certain medications are not allowed to be taken, for example some birth control pills, pain relievers, cold medication, and herbal supplements. If mixed together unhealthy increases in blood pressure can take place or if taken along with SSRIs, a condition called "serotonin syndrome" can happen. Side effects include confusion, delusions, sweating, muscle rigidity, convulsions, and other life threatening conditions (National Institutes of Mental Health, 2009).

Anti-anxiety drugs are high-potency benzodiazepines that are typically used for short periods of time. Other than making the individual drowsy, the drugs tend to have few side effects when used properly. Some negative problems include one must constantly increase dosage to maintain a continuous effect. Anti-anxiety drugs can become very addicting for persons' who have previously had substance abuse problems (Busto, Romach, & Sellers, 1996). If medication is stopped suddenly without weaning anxiety symptoms can return almost immediately. Problems like this have kept some physicians from prescribing these pills unless other options have been exhausted (National Institutes of Mental Health, 2009; Butcher et al., 2007).

Psychotherapy is a common form of treatment used for anxiety and is conducted by a mental health specialist who can identify and treat symptoms of anxiety. The most common form of psychotherapy is cognitive-behavioral therapy (CBT). Cognitive-behavioral therapy has been found to be very useful allowing thought processes to be evaluated and changed to no longer support negative thoughts or fears. Cognitive-behavioral therapy is also used to deal with behavior towards situations that may be anxiety provoking and is usually provided for a 12 week duration period in individual or group sessions. During therapy, weekly assignments are designated for completion between meetings. Evidence points to CBT having longer lasting results than medications and it can be utilized repeatedly if needed. On the other hand, some negative aspects associated with CBT include multiple treatment visits that can last weeks or months, insurance can deny treatment, the cost to the patient, and the intense emotional effort required from the client (National Institutes of Mental Health, 2009; Butcher et al., 2007; Neukrug, 2007).

Biofeedback utilizing electromyography (EMG) for the treatment of anxiety was compared to established clinical procedures (Hiebert & Fitzsimmons, 1981). Hiebert and

Fitzsimmons (1981) research design included a two-stage, four-group, repeated-measures design with a nonorthognonal control group. The four treatment groups were (1) EMG biofeedback training, (2) cognitive monitoring, (3) EMG biofeedback training and cognitive monitoring, (4) high expectancy discussion groups, and (5) waiting list control. Each treatment group (groups 1-4) participated in six 50-minute sessions, while waiting list control subjects (group 5) were told in order to begin treatment researchers would need to obtain an established anxiety level. Participants (n= 173) were recruited from announcements in the local media and large undergraduate classes. The Institute for Personality and Ability Testing Self-Analysis Form (IPAT) was used to measure the individual's current perception of their anxiety level. Additionally, a 5-minute frontal EMG baseline was collected at the beginning of each session. Both measures were administered throughout all treatment groups at the start of session 1, again at the start of session 3, and again during session 6. Three procedures were examined in this study: cognitive self-monitoring, systematic desensitization, and biofeedback using EMG. A significant ($p \leq .05$) decrease in IPAT scores and significant ($p \leq .05$) EMG changes were demonstrated within the EMG biofeedback-training group.

Coelho et al. (2009) reviewed the use and benefits of treating patients with anxiety utilizing virtual reality. The purpose of this study was to examine virtual reality treatments, ranging from traditional exposure therapies to more recent virtually guided ones, utilized with patients suffering from anxiety. Currently, virtual reality exposure therapy (VRET) is one of the leading virtual reality protocols being used to treat patient with anxiety (Coelho et al., 2009). Virtual reality exposure therapy produces the same fears and physical symptoms that would occur if placed in a similar situation. Patients wear headgear that connects to a computer monitor, immersing the patient into a virtual world displaying the anxiety-provoking environment. This type of treatment allows participants to interact in an environment that is

safer than the real world, allowing fears to be faced in a controlled environment. Other benefits to this approach are related to eliminating logistical, financial, and personal concerns related to treatment. Virtual reality exposure therapy offers easy access, as there is no need to leave the office when compared to other exposure treatments. One benefit VRET offers is it protects patients' fears from a confidentiality breach as it can be performed in a private setting. Virtual reality exposure therapy patients also express a preference for this form of therapy over exposure therapy. Through VRET, patients can be exposed to anxiety triggers in a safe way, where this was not possible in the past (Coelho et al. 2009). Krijn, Emmelkamp, Olafsson, and Biemond (2004) performed a review of literature on research surrounding the use of VRET with anxiety disorders. Research indicated there are studies demonstrating VRET to be more effective than no-treatment for specific anxiety disorders and in conjunction with other therapies. It is noted that there is a lack of the controlled and randomized studies needed to demonstrate VRETs effectiveness as a stand-alone treatment (Krijn, Emmelkamp, & Biemond, 2004).

Shapiro (1999) reviewed four controlled studies of EMDR, which stated that 84 to 100% of their subjects who were diagnosed pre-treatment as suffering from an anxiety disorder such as posttraumatic stress disorder, no longer retained their diagnosis post-treatment. Shapiro (1999) examined the fidelity and validity of these four studies, as well as, described which procedures and protocols may have the greatest effect on treatment outcomes. The four controlled studies examining the effectiveness of EMDR were conducted by independent research teams, which involved a total of 107 subjects. Each study required participants to participate in a treatment program consisting of 7 to 10 treatment sessions and daily homework. To maximize effect, EMDR combined different psychotherapies into one structured treatment, which included psychodynamic, cognitive behavioral, interpersonal, experiential, and body-centered therapies (Shapiro, 1999). Eye movement desensitization and reprocessing in these studies were a

combined eight-phase treatment protocol, which are standardized protocols and procedures that should be utilized in clinical and research settings. Overall, the study indicated that when EMDR is applied correctly it can significantly decrease symptom severity of and, in some cases, patients no longer retained their diagnosis (Shapiro, 1999).

Anxiety Measurement

This research was part of a larger study that included multiple measures. The following instruments were used and are considered valid and reliable measures of anxiety and other mood states: State-Trait Anxiety Inventory (STAI), Profile of Mood States (POMS), PRIME-MD Patient Health Questionnaire (PHQ), electroencephalography (EEG), hearth rate variability (HRV), and salivary alpha amylase (sAA). However, while all of these instruments are included in the literature review only the STAI was used to test the hypotheses.

According to Spielberger (1983), state (S-Anxiety) anxiety refers to a transitory emotional state or condition that can be characterized by subjective, consciously apparent feelings of tension and apprehension, and arousal of the autonomic nervous system. On the contrary, trait (T-Anxiety) anxiety refers to an individual's proneness for anxiety and a common tendency to respond with anxiety when confronted with a perceived threat.

The STAI is a brief, self-report inventory that consists of 20 S-Anxiety questions and 20 T-Anxiety questions, for a total of 40 anxiety questions. Both scales can be administered to subjects independently of each other or combined. S-Anxiety questions focus on how the person feels right now, at that moment. Participants are able to rate their current S-Anxiety on the following 4-point *intensity* scale: (1) Not at all; (2) Somewhat; (3) Moderately so; and (4) Very much so (Spielberger, 1985). T-Anxiety questions ask the person to score how they normally feel by rating themselves on the following 4-point *frequency* scale: (1) Almost never; (2) Sometimes; (3) Often; and (4) Almost always (Spielberger, 1985). The STAI takes

approximately 5 to 10 minutes to complete. Concurrent validity of the T-Anxiety scale was demonstrated through correlations with the Taylor Manifest Anxiety Scale (TMAS) and the Anxiety Scale Questionnaire (ASQ). Correlations with neuropsychiatric patients and college students ranged from .70 to .85 (Spielberger, 1985). Construct validity for the S-Anxiety scale was demonstrated through research studies where the inventory was administered during high- and low-stress conditions (Spielberger, Gorusuch, & Lushene, 1970). For example, students who were preparing for a test or viewing a stressful movie scored significantly higher than those returning from a 10-minute relaxation session.

Since 1971, POMS has demonstrated efficacy as an inventory that measures six individual moods including anxiety. The POMS inventory can be administered and scored using "Last Week" and "Right Now" instructions. For patients, POMS are quickly and precisely completed and simple to comprehend. The POMS database is based from psychiatric outpatients, college students, adults, and geriatric norms. Respondents use self-report inventories to rate each question. Each item is rated on a 5-point scale varying from "not at all" to "extremely". Construct and predictive validity has been demonstrated through numerous research studies. A high level of internal consistency (.90 or above) and a reasonable level of test-retest reliability (.68-.74) have been exhibited through other studies and all factors (Multi-Health Systems Inc., 2003; Watson et al., 1995).

The PHQ has been updated from the original PRIME-MD, to a more user-friendly assessment. What was the original two-part questionnaire is now a solo, three-page survey that the patient completes. After completing the test, the clinician applies diagnostic algorithms located at the bottom of the page. From this the diagnoses and symptoms can be recorded and monitored (Spitzer, Kroenke, & Williams, 1999). The PHQ offers quick and accurate analysis of the most common mental disorders currently within primary care. The PHQ is equipped

with the tools needed for the busy clinician and the primary care researcher. Also, items utilized in the PHQ are derived from the American Psychiatric Associations Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV-TR) (Spitzer et al., 1994).

When comparing operating characteristics of the PHQ and the original PRIME-MD, results indicate a satisfactory relationship with the previous results obtained. Notable increases in the sensitivity of the PHQ were demonstrated in major depressive disorder (57% to 73%), panic disorder (57% to 81%), and eating disorders (73% to 89%) (Spitzer et al., 1999; Spitzer et al., 1994). Other sensitivity percentages are satisfactory; any PRIME-MD psychiatric diagnosis (75%), any mood disorder (61%), any anxiety disorder (63%), and probable alcohol abuse/dependence (62%) (Spitzer et al., 1999). Specificity percentages in six of the eight categories were greater than or equal to 96% with the exception of two categories, any PRIME-MD psychiatric diagnosis (90%) and any mood disorder (94%) (Spitzer et al., 1999). The PRIME-MD has been demonstrated to be a valid instrument (Spitzer et al., 1999).

Changes in brain activity were recorded using a 10-channel EEG device (NEXUS-10). Electroencephalography symmetry has been used over time to test the effects of stimuli on the brain and it is now typically recognized that hypo-activity in the left hemisphere of the brain is interconnected with stress and negative affect (Field, Grizzle, Scafidi, & Schanberg, 1996). Several therapies, including massage, have been demonstrated to help people increase brain activity areas associated with anxiety and stress to areas associated with relaxation and alertness (Fox, 1991; Field et al., 1996).

Heart rate variability and recent research surrounding its uses has indicated it to be a valid measure in viewing the relationship between anxiety and autonomic nervous system (ANS) activity (Friedman & Thayer 1998). Heart rate variability data can be collected using a blood

volume pulse (BVP) sensor, photoplethysmography (PPG) pulse wave sensor, or a wrist-to-wrist electrocardiograph (ECG) device. Heart rate variability is a standardized physiological measurement that directly reflects one's ANS regulation. More specifically, HRV breaks the ANS down to smaller levels including the Sympathetic Nervous System (SNS) (stress, anxiety) and Parasympathetic Nervous System (PNS) (relaxation, calmness). Cannon's (1929) model noted that the hypothalamus was consistently activated when experiencing fear or anxiety, which leads to frequent activations of the SNS response. Heart rate variability changes indicated by increases in high frequency (PNS) and low frequency (SNS) norms and low/high frequency ratios are used as specific indicators of stress and mood (Wilkinson, 1998; Davidson, 1988).

The use of sAA as a diagnostic tool and for measurement has become increasingly popular across multiple healthcare fields including physiology, dentistry, and internal medicine (Mandel, 1993; Rantonen, 2003). This non-invasive standard allows for repeated measures of variables such as hormones, antibodies, and stress (Mandel, 1980; Mandel, 1990; Smith et al., 1991; Tabak, 2001; Rantonen, 2003). By measuring saliva's flow rate, viscosity, proteins, and amylase specific changes in the ANS can be detected. Salivary alpha amylase has demonstrated in previous studies that as SNS activity increases so does secretion and as PNS activity increases so does flow rate (Yamaguchi et al, 2003). During both physical and psychological stress, increases in sAA have been recorded (Yamaguchi et al, 2003).

Casual Video Games

The Casual Games Association (2007) defines CVGs as fun, easily accessible, fast to learn, requiring no prior gaming experience, knowledge, or required time commitment to play. Most CVGs are based from previous game concepts from arcades or Atari. Also, CVGs tend to be easy to pause, stop, and restart, while preventing loss of fun (Casual Games Association, 2007).

According to Casual Games Association (2007) there are 200 million people playing Casual Video Games (CVGs) online each month. In fact, Microsoft Solitaire for Windows XP is opened more than any other casual video game (Casual Games Association, 2007). With increased use and interest, research has begun to investigate benefits of such games.

Recently, the Casual Games Association (2007) released a statement that CVGs are attracting the interest of more people. The term "gamer" typically brings about the stereotypical image of a teenager who enjoys video games. However, research is proving this wrong, indicating that an increasing number of young and old people are playing CVGs. The nature of CVGs is simple and easy, which tends to increase interest from people who normally would not be interested. Casual video gamers range in culture, age, and lifestyle. Casual video games allow for people to access games while at work, school, home, or even on the road. The CVG consumer base has expanded rapidly due to the ease and availability of play. Many people report playing CVGs for quite a few reasons. Some reasons include cognitive exercise, fun, and relaxing (Casual Games Association, 2007).

Casual Video Games are played on various gaming platforms. These platforms include PCs, online networks, handheld gaming devices, and mobile phones (Russoniello et al., 2009). Casual Video Games have produced massive increases in popularity throughout online communities, which is viewed as a major strength. With smart phones reaching over 1.15 billion sales in 2007 it has made CVGs more accessible and available for play (Gartner Research, 2008).

Research around video games and their effects on players has been concentrated on negative effects such as violent behaviors and aggression. These studies tend to portray games as tools for turning people into hyper aroused-aggressive bullies (Calvert & Richards, 2006).

Anderson and Bushman (2001) performed a meta-analytic review of the video-game research literature to examine if violent video games exacerbate aggressive behaviors in both children and young adults. The purpose of the study was to examine the effects violent video games had on aggressive behavior, prosocial behavior, aggressive cognition, aggressive affect, and physiological arousal. The literature search retrieved 35 research reports and 54 independent samples of participants for a total of 4,262 participants. Studies were only reviewed if they examined effects of playing violent video games. However, studies where subjects watched others play violent video games were excluded. Results indicated that high video game violence was significantly related with increased aggressive behavior, decline in prosocial behavior, rise in aggressive thought, increase in aggressive affect, increase in physiological arousal, and that even short-term exposure to violent video games can lead to brief increases in aggression.

Anderson and Dill (2000) performed a study that examined the effects of video game violence. The purpose of the study was to start building an empirical foundation to better understand the effects of video game violence. Participants involved in the study included 272 undergraduates from a large Midwestern university. Participants completed a self-report questionnaire, which collected data on aggressive behavior and delinquency. Assessments utilized within the self-report questionnaire include: Caprara Irritability Scale (CIS), Buss-Perry Aggression Questionnaire (AQ), and Delinquency Scale. Results from the study indicated that video game violence is significantly related ($p \leq .05$) to aggressive behavior and delinquency.

There are only a few studies completed that have looked at health related outcomes or positive effects of video gaming. With increased interest researchers are beginning to research the human-computer interaction that takes place when playing a game. They want to understand how it works, what it does, and what possibilities could be exposed (Barr, Noble, &

Biddle, 2007). Other research has examined positive effects such as cognition, therapeutic adaptability, relationships, and educational benefits (Gelfond & Salonius-Pasternak, 2005).

Durkin and Barber (2002) performed a study that examined if computer game play has a negative impact on young people. The purpose of the study was to examine the relationship between the amount of computer game play and measures of adjustment or risk taking. The data used in this study came from Wave 5 of the Michigan Study of Adolescent Life Transitions (MSALT). Data utilized from the Wave 5 was collected from 1,304 participants that were in the 10^{th} grade and 16 years of age. Questionnaires were utilized to examine computer game use, adjustment, self-concept, risk behaviors, and social context. Results from the study indicated that the low computer use group reported their depressed mood to be significantly ($p \leq .05$) lower when compared to the high and no use computer groups.

Russoniello et al. (2009) was one of the first research studies to target health outcomes from CVGs. The purpose of the study was to examine whether CVGs are an effective intervention in reducing mood, anxiety, and stress in a "normal" population. Participants included in the study were 143 subjects from Eastern North Carolina with a mean age of 26. Participants completed a self-report questionnaire, Profile of Mood States (POMS), and physiological measurements were used to examine the effectiveness of CVGs in reducing mood and stress. Physiological parameters utilized included electroencephalography (EEG) and heart rate variability (HRV). Results indicated that the CVGs significantly ($p \leq .05$) increased mood when compared to the baseline measurement. Changes in physiological parameters were congruent with the questionnaire measures demonstrating an increase in mood and a decrease in stress and anxiety.

In the current US population approximately 18.1 percent of the adult population is diagnosed with an anxiety disorder (National Institute of Mental Health, 2010b). There is a

need for preventative interventions that are both health and cost effective. CVGs cost less than prescription medications and do not possess side effects typically associated with anxiety medications.

This study examined the potential of CVGs as an alternative or adjunct to medications for treatment of anxiety. Through the present study, it is hoped to increase ideas that CVGs could eventually be utilized as a prescriptive medical therapy-demonstrating efficacy through psychological and physiological measures.

CHAPTER III: METHODS

Introduction

The purpose of this study was to examine the effectiveness of CVGs in reducing symptoms of anxiety. This study utilized a randomized controlled experimental design with individuals who utilized CVGs as a prescribed intervention in comparison to a no-treatment control group. The intent of this research was to examine whether individuals who play CVGs as a prescribed intervention will have a decrease in reported symptoms of anxiety on the State-Trait Anxiety Inventory (STAI). To date, research examining the use of CVGs as a prescribed intervention and the effect it has on severity of anxiety symptoms over time has not been examined. If determined that prescribed CVG play is an effective treatment of symptoms of anxiety, then persons with anxiety will have a potential alternative form of treatment.

Study Design

East Carolina University's Psychophysiology Lab and Biofeedback Clinic completed a recent study that demonstrated individuals, "normal participants", who played CVGs improved their mood and symptoms of undiagnosed depression (Russoniello et al., 2009). These findings along with subjective evidence has led researchers to hypothesize that CVGs could have the potential to help persons with anxiety to better cope with symptoms of anxiety (Russoniello et al., 2009). The method used involves a randomization of participants into control and experimental groups, where a comparison of physiological, biochemical, and psychological variables will be done. Participants randomized into the experimental group were given a choice of three popular CVGs to play. Research has demonstrated that freedom to choose is an important precursor to experiencing the full benefits of recreation participation. The participant then played the games of their choice for 30 minutes while their physiology was recorded. In addition to the two lab sessions scheduled one month apart, the experimental group was

instructed to play the CVG of their choice at home for at least 30 minutes three times per week for one month. Additionally, participants were asked to keep a log of the amount of time spent playing the game during the month. Participants randomized into the control group engaged in a web-based review of the National Institutes of Mental Health consumer web site on depression for 30 minutes. This method was used to simulate the experimental conditions as closely as possible. During the one-month period between sessions control group participants were told to refrain from any CVG play.

Population

Participants included 59 individuals from Eastern North Carolina. Of the 59 participants who completed the study, 30 were randomly assigned to the experimental group and 29 were randomly assigned to the control group. Participants were required to be at least 18 years of age, able to read and speak English, and have a score greater than or equal to 5 on the Brief Patient Health Questionnaire (PHQ-9). This criterion was used to ensure that individuals included in the study were adults experiencing at least minimal symptoms of depression based from the American Psychiatric Associations Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV-TR) criteria standards. Non-qualifying volunteers were given a CVG of their choice.

Sample and Sampling Procedures

Recruitment for the study began after approval from the University and Medical Center Institutional Review Board (UMCIRB) of East Carolina University (ECU). The study's hypotheses, methodology, and logistical plan were developed between July 2009 and August 2010. Likewise, the clinical state of the study was conducted between July 2010 and November 2010. Recruitment was completed by word of mouth and distributing a recruitment flier to possible referral sources, i.e. local mental health agencies, family medicine practitioners, and

local newspapers. The flier was also posted at various campus locations, i.e. ECU, Pitt Community College Campus Counseling Centers, ECU Student Recreation Center, etc.. A statistical Random Number Generator was used to randomize participants into experimental and control groups, which was completed prior to the start of the study.

Site/Setting

This study took take place at East Carolina University's, Carol G. Belk Building located in Greenville, North Carolina. When working with a clinical population, such as persons with depression, confidentiality is of great importance to the participant and researcher. To ensure that participants' identities were kept confidential, the Sensory Motor Room located across the hall from the East Carolina University's Psychophysiology Lab and Biofeedback Clinic was utilized. The Sensory Motor Room was arranged so that the participant and researcher were located on the far side of the room facing the outside wall. Both were seated next to each other during each session. The researcher sat on the right side of the table with a computer that was connected to physiological equipment, which recorded EEG and HRV data. This allowed the researcher to make sure that the physiological data being collected was clean. To the left of the researcher sat the participant. The participant also had a computer located directly in front of them, on which they would play their CVG of choice or would read the National Institutes of Mental Health's website on depression. The Sensory Motor Room remained locked during each session. The researcher remained in the Sensory Motor Room with the participant for the entire length of each session, except to take saliva samples that were collected to the freezer. These precautions were taken to help minimize the potential for participants to be identified and linked with the study.

Data Collection Procedures

Table 1 presents an overview of the data collection process. During the initial meeting, the researcher screened participants for entrance into the study and explained the purpose of the study including requirements of the program and data collection procedures. The researcher remained in the room to monitor all physiological signals for integrity, as well as, to answer any questions regarding inventories being answered. After completion of the informed consent, participants were asked to fill out pre-intervention questionnaires including the Brief Patient Health Questionnaire (PHQ), State Trait Anxiety Inventory (STAI), and Profile of Mood States (POMS).

Table 1
Data Collection

Involvement	Measurements	Time Involved
Informed Consent	Inclusion/Exclusion (PHQ-9)	5 minutes
Session 1 (Experimental and Control)	PHQ, STAI, POMS,HRV, EEG, sAA	1 hour 30 minutes
Home Play (Experimental only) 3x per week for 30 minutes, 12 sessions	Participant log playing time	6 hours
1 Month Follow up Experimental and Control	PHQ, STAI, POMS, HRV, EEG, sAA	1 hour 30 minutes
Total Time	Hours	Control =3 hours Experimental =9 hours

Table Key: PHQ-9 (Patient Health Questionnaire-9); PHQ (Patient Health Questionnaire); STAI (State-Trait Anxiety Inventory); POMS (Profile of Mood States); EEG (Electroencephalography); Heart Rate Variability (HRV); Salivary Alpha Amylase (sAA)

The STAI was used to measure changes in state and trait anxiety. The POMS and PHQ were also used to assess anxiety and other aspects of mood. Participants also completed a demographic profile (Appendix D) regarding information about age, gender, ethnic background, and previous game play. Participants were connected to the Nexus 10, physiological monitoring equipment, in order to measure changes in brain activity using EEG as well as ANS change using HRV. To do so a software computer screen was developed that automatically collected 6 minutes of baseline and 30 minutes of intervention providing normative data and R/L brain alpha ratio scores. After completion of all required forms and all physiological equipment was connected, participants were asked to fill up a tube with saliva for measurement of sAA. Participants were given a tube with a straw, in which they spit through the straw into the tube until it was filled up to the appropriate mark. Upon completion of baseline assessments, the individual then opened an envelope to reveal whether they were randomized into the experimental or control group. After completion of the intervention the same pre-intervention measures, PHQ, STAI, and POMS, were completed once again by both the experimental and control group. To further protect the individual's identity, all forms were coded and kept in separate folders.

During the next four weeks, control subjects were asked to refrain from any CVG play. However, the experimental group was asked to record each CVG session they played. On a log sheet (Appendix H), participants recorded the date and duration of each CVG session. After four weeks were completed, experimental and control group participants returned to meet with the researcher. Participants were then asked to fill out the same pre-intervention questionnaires and give saliva samples, as during the initial session. Participants were then connected to EEG and HRV physiological monitoring equipment, where a software computer screen was developed that automatically collected 6 minutes of baseline and 30 minutes of intervention providing

normative data and R/L brain alpha ratio scores. Post-intervention, participants again filled out the PHQ, STAI, POMS, and gave a saliva sample. Upon successfully completing the study, participants received three free CVGs and a $100 gift card for their participation, which was funded by PopCap games.

Treatment Protocol

Participants in the experimental group were prescribed a CVG of their choice to play with instructions regarding frequency and duration. During the first session participants played a CVG of their choice for 30 minutes, while having physiological data collected. Over the next four weeks participants were required to play their chosen CVG for a minimum of 30 minutes per session. The participant also needed to play the CVG a minimum of three times each week over a one-month period. Participants could play more than the minimum amount of game play required if they wished but were asked to document any extra time. At the end of the four weeks participants needed to have completed a minimum of 12 sessions playing their CVG.

Hypotheses

Ho_1: There will be no significant difference in state anxiety symptom severity scores as measured by the STAI between the experimental and control groups.

Ha_1: There will be a positive significant difference in state anxiety symptom severity scores as measured by the STAI between the experimental and control groups.

Ho_2: There will be no significant difference in trait anxiety symptom severity scores as measured by the STAI between the experimental and control groups.

Ha_2: There will be a positive significant difference in trait anxiety symptom severity scores as measured by the STAI between the experimental and control groups

Instrumentation/Variable Operationalization

This research was part of a larger study that included multiple instruments, including the Patient Health Questionnaire (PHQ), State-Trait Anxiety Inventory (STAI), and Profile of Mood States (POMS) that were administered pre and post implementation for both groups. Baseline electroencephalography (EEG) and heart rate variability (HRV) physiological data was collected. Also, a salivary alpha amylase (sAA) sample was gathered pre and post intervention. To collect demographic information a demographic profile was administered during the initial session along with the other health questionnaires. It is recognized that this research was part of a larger study and only the STAI was used to test hypotheses. However, all instruments utilized in the larger study were included to demonstrate the methodology of the larger study.

Patient Health Questionnaire (PHQ)

The PHQ is based on an earlier edition of the Primary Care Evaluation of Mental Disorders (PRIME-MD). The PRIME-MD was the first assessment to use the Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition (DSM-III-R) diagnostic criteria to actually identify specific disorders (Spitzer et al., 1994). Likewise, items utilized in the PHQ are derived from the American Psychiatric Associations Diagnostic and Statistical Manual of Mental Disorders, 4th Edition, Text Revision (DSM-IV-TR) (Spitzer et al., 1994). In this study the depression screener (PHQ-9) located on the front page was used as a screening tool for admission into the study and if the individual qualified the remaining sections of the questionnaire were completed. After completing the test, the researcher applied diagnostic algorithms located at the bottom of the page. From this the diagnoses and symptoms can be recorded and monitored (Spitzer, Kroenke, & Williams, 1999). The PHQ was administered pre-assessment both sessions in this study and participants were instructed to answer questions based on the previous two and four weeks, dependent upon the section being completed.

During the post assessment both sessions, participants were instructed to answer questions as to how they felt at that moment.

State-Trait Anxiety Inventory (STAI)

To determine if there was any change in participants anxiety level the STAI was used to measure changes in both state (S-Anxiety) and trait (T-Anxiety) anxiety. The STAI is a brief, self-report inventory that consists of 20 S-Anxiety questions and 20 T-Anxiety questions, for a total of 40 anxiety questions. S-Anxiety questions focused on how you feel right now, at that moment. Participants were able to rate their current S-Anxiety on the following 4-point *intensity* scale: (1) Not at all; (2) Somewhat; (3) Moderately so; (4) Very much so. T-Anxiety questions asked participants to score how they normally feel by rating themselves on the following 4-point *frequency* scale: (1) Almost never; (2) Sometimes; (3) Often; (4) Almost always. The S-Anxiety scale was administered pre and post session 1 and session 2 and the T-Anxiety scale was administered pre session 1 and pre session 2.

Profile Of Mood States (POMS)

The POMS has demonstrated efficacy as an inventory that measures the following six subscales: tension (anxiety), depression, anger, vigor, fatigue, and confusion. The POMS database is derived from psychiatric outpatients, college students, adults, and geriatric norms. Respondents used self-report inventories to rate each question. Each item was rated on a 5-point scale varying from "not at all" to "extremely" (Multi-Health Systems Inc., 2003). . The POMS inventory was administered and scored using "Last Week" directions for pre session 1 and pre session 2 and "Right Now" instructions for post session 1 and post session 2.

Electroencephalography (EEG)

Changes in brain activity was recorded using a 10-channel electroencephalography device (NEXUS-10). Electroencephalography symmetry has been used over time to test the

effects of stimuli on the brain and it is now typically recognized that hypo-activity in the left hemisphere of the brain is interconnected with stress and negative affect (Field, Grizzle, Scafidi, & Schanberg, 1996). Several therapies, including massage, have been demonstrated to help people increase brain activity from areas associated with anxiety and stress to areas associated with relaxation and alertness (Fox, 1991; Field et al., 1996). For example, positive mood shifts were distinguished in changes from right frontal EEG activation, which is generally associated with sad affect, to left frontal EEG activation, which is typically associated with a happy affect. This shift in EEG was observed in both depressed mothers and their infants with anxiety, immediately following a 20-minute massage (Field et al., 1996). To record participants EEG data a software computer screen was created that collected 6 minutes of baseline data and 30 minutes of intervention, providing normative data and R/L brain alpha ratio scores. The protocol utilized in this study for recording participants EEG was as follows:

- Researcher located and marked F3, F4, and CZ placements using a 10/20 standard measurement cap.
- Researcher prepped skin by cleaning connection sites using alcohol pads and Nuprep.
- Researcher placed EEG sensors with #1s on the left and #2s on the right. Active leads (red) were placed at F3 and F4. Reference leads (black) were placed at CZ. The ground lead was placed on C7.
- Researcher checked impedance to determine if it was at an acceptable level (between -25,000 and 25,000). If not, sensors were adjusted or replaced until impedance was in an acceptable range.
- Researcher visually inspected the EEG signal to determine if it was free of signal artifact.

Heart Rate Variability (HRV)

Recent research surrounding HRV use has indicated it to be a valid measure in viewing the relationship between anxiety and autonomic nervous system (ANS) activity (Friedman & Thayer 1998). Heart rate variability data was collected using the Nexus-10 blood volume pulse (BVP) sensor, which was attached to participants' non-dominant index finger and recorded for the duration of the intervention. Heart rate variability is a standardized physiological measurement that directly reflects one's ANS regulation. Heart rate variability breaks the ANS down to smaller levels including the Sympathetic Nervous System (SNS) (stress, anxiety) and Parasympathetic Nervous System (PNS) (relaxation, calmness). Cannon's (1929) model noted that the hypothalamus was consistently activated when experiencing fear or anxiety, which leads to frequent activations of the SNS response. Additionally, HRV changes indicated by increases in high frequency (PNS) and low frequency (SNS) norms and low/high frequency ratio will be used as specific indicators of stress and mood (Wilkinson et al., 1998; Davidson, 1988). Data obtained was used to demonstrate if changes in the ANS are consistent with SNS withdrawal activity.

Salivary Alpha Amylase (sAA)

Use of sAA as a diagnostic tool and measurement has become increasingly popular across multiple healthcare fields including physiology, dentistry, and internal medicine (Mandel, 1993; Rantonen, 2003). This non-invasive standard allows for repeated measures of variables such as hormones, antibodies, and stress (Mandel, 1980; Mandel, 1990; Smith et al., 1991; Tabak, 2001; Rantonen, 2003). By measuring saliva's flow rate, viscosity, proteins, and amylase specific changes that have taken place both during the initial session, post-intervention, and after the training protocol can be demonstrated. Participants gave a sAA sample pre and post intervention for session 1 and session 2. Salivary alpha amylase has been demonstrated in

previous studies that as SNS activity increases so does secretion and as PNS activity increases so does flow rate (Yamaguchi et al, 2003). During both physical and psychological stressors, increases in sAA have been recorded (Yamaguchi et al, 2003).

Demographic Profile

Participants also completed a demographic profile, which included pertinent demographic information. Information included was gender, race, educational status, occupational status, and amount of time spent playing video games in the last week. Information gathered was helpful in describing the population as well as if they have any gaming experience.

Log Sheet

Participants in the experimental group completed a log sheet during the one-month period between sessions. Information included the title of their CVG, amount of sessions played, and amount of time played per session. Information obtained from the log sheet was used to ensure that participants met minimum requirements for the intervention.

Analysis Plan

Data analysis was performed using PASW Statistics software (version 18). The level of significance was set at .05. For statistical analysis a two-way mixed ANOVA was administered to determine what times had a significant change, which included both time and group as factors. This ANOVA allowed testing of hypotheses regarding changes in time within each group, as well as, to examine group differences at each of the time points.

CHAPTER IV: RESULTS

The purpose of this study was to determine the effects of casual video games (CVGs) when used as a prescribed intervention in reducing symptoms of anxiety in a depressed population. Anxiety prevalence statistics estimate that in the United States general population approximately 40 million (18.1%) adults have an anxiety disorder (National Institute of Mental Health, 2010b). The instrument used to test the research questions was the State Trait Anxiety Inventory (STAI). To determine which times had a significant change, a two-way mixed ANOVA was utilized that included both time and group as factors. The level of significance was set at 0.05. A Mann-Whitney U test was used to determine if any covariates were significant. None of the covariates examined revealed significance except for medications (p = 0.013). A Multivariate Analysis of Variance (MANOVA) that adjusted for medications was used to determine if there were group differences that would impact the outcome of the data. Results from the MANOVA revealed that medications did not impact the significance of the group differences observed between the experimental and control groups.

Sample Description

Participants included in the study were individuals classified with clinical depression that was categorized by the PHQ-9, between the ages of 18-74. There were a total of 59 participants in the study. A total of 85 people were screened for inclusion into the study with 26 not meeting the entrance criteria, representing a rejection rate of 44%. There were 30 females and 29 males included in the study. Participants in the experimental group ranged in age from 18-56 with a mean age of 29, while participants in the control group ranged in age from 18-74 with a mean age of 31. Ethnic origins of respondents from the experimental group was reported to be 70% European American, 26.7% African American, and 3.3% Asian/Pacific Islander.

Participants in the control group ethnic origins was reported to be 65.5% European American, 20.7% African American, 6.9% Latino American, and 6.9% Other.

Marital status of respondents from the experimental group was reported to be 26.7% married, 13.3% separated, 6.7% divorced, and 53.3% never married. Participants in the control group marital status was reported to be 35.7% married, 3.6% separated, 3.6% divorced, and 57.1% never married. Educational level for participants from the experimental group was reported to be 23.3% high school graduate, 40.0% some college, 20.0% college graduate, and 16.7% post graduate. Participants in the control group education level was reported to be 6.9% high school graduate, 55.2% some college, 24.1% college graduate, and 13.8% post graduate. Occupation status for respondents in the experimental group was reported to be 10.0% part-time, 53.3% full-time, 3.3% disabled, 30.0% student, and 3.3% retired. Respondents in the control group occupation status was reported to be 13.8% part-time, 34.5% full-time, 13.8% unemployed, 3.4% disabled, 3.4% homemaker, 27.6% student, and 3.4% retired.

Participants in the experimental group reported that 56.7% had played a video game in the previous week and 40.0% had not. Participants in the control group reported that 75.9% had played a video game in the previous week and 24.1% had not. Respondents in the experimental group reported that 13.3% were utilizing antidepressant medications while 86.7% were not using any type of medication. Respondents in the control group reported that 34.5% were utilizing antidepressant medications while 65.5% were not. Participants in the experimental group log sheet revealed that the experimental group played their CVG of choice three times a week for 30 minutes minimum, 68 minutes maximum, and an average 40.7 minutes per week over the one-month period.

Participants in the experimental group had a mean score of 11.0 on the PHQ-9 depression screener. Participants in the control group had a mean score of 10.7 on the PHQ-9 depression

screener. Baseline state anxiety scores on the STAI for respondents in the experimental group was 38, while trait anxiety scores were 42. Baseline state anxiety scores on the STAI for respondents in the control group was 42, while trait anxiety scores were 47.

Quantitative Results

Data Collection Times

The STAI data collection method followed administrative guidelines outlined in Chapter 3. State anxiety refers to a transitory emotional state or condition that can be characterized by subjective, consciously apparent feelings of tension and apprehension, and an amplified autonomic nervous system (Spielberger, 1985). Conversely, trait anxiety refers to an individual's proneness for anxiety and a common tendency to respond with anxiety when confronted with a perceived threat (Spielberger, 1985). The state anxiety scale, which was created for short-term use was administered pre and post session 1 and session 2 and the trait anxiety scale was administered pre session 1 and pre session 2.

Data collected at Time 1, initial baseline, was gathered before randomizing participants into either a control or experimental group. Data collected during Time 2, post session 1, was completed at the end of the first session. Data collected at Time 3, pre session 2, took place one-month post the initial baseline and prior to the beginning of session 2. Time 4, post session 2, was collected at the end of session 2. The experimental and control groups had the same data collected at matching times and sessions.

Results

Hypothesis 1:

Ho_1: There will be no significant difference in state anxiety symptom severity scores as measured by the STAI between the experimental and control groups.

Table 2

Between Group Test for State Anxiety

Group	*N*	*Mean*	*Std. Error*	*Mean Difference*	*F*	*p*
Experimental	30	32.04	1.82	−7.94	9.7	0.003
Control	29	39.98	1.78	7.94	9.7	0.003

Table 3

Between Group Test for State Anxiety at Time 1, Time 2, Time 3, and Time 4

Time	*Group*	*Group*	*Mean Difference*	*Std. Error*	*p*
1	Control	Experimental	3.28	3.0	0.275
2	Control	Experimental	8.48	2.7	0.003
3	Control	Experimental	8.34	3.1	0.009
4	Control	Experimental	11.64	2.7	0.000

Overall there was a significant difference between the experimental and control groups for state anxiety scores, $p = 0.003$, and can be seen in Table 2. However, this statistic includes all measurement times and, therefore, did not reveal where changes took place. In order to determine which times had a significant change a two-way mixed ANOVA was utilized that included both time and group as factors. This repeated measures ANOVA provided the statistical analysis needed to test additional hypotheses regarding changes over time within each group, as well as, to examine group differences at each of the time points.

Analysis revealed positive significant changes in state anxiety scores between the experimental and control group at specific measurement times, which is demonstrated by lower state anxiety scores, and can be seen in Table 3. At Time 1, initial baseline, there was not a significant difference between the experimental and control groups state anxiety scores. At Time 2, post session 1, there was a significant difference between the experimental and control groups state anxiety scores demonstrating the short-term effect of the game. At Time 3, pre session 2, there was a significant difference between the experimental and control groups state anxiety scores demonstrating a decrease in anxiety symptoms after one-month of game play. Additionally, at Time 4, post session 2, there was a significant difference between the experimental and control groups state anxiety scores.

Table 4

Pairwise Comparisons for State Anxiety

Experimental	*Time*	*Time*	*N*	*Mean Difference*	*Std. Error*	*p*
	1	2	30	6.44	1.35	0.000
	1	3	30	7.67	1.73	0.000
	3	4	30	2.22	1.49	0.142
Control						
	1	2	29	1.25	1.33	0.351
	1	3	29	2.61	1.70	0.131
	3	4	29	−1.07	1.46	0.467

Further analysis revealed a significant change over time took place in the experimental group, F (3, 51) = 13.1, $p < 0.001$. The mean difference was significant between Time 1 and Time 2, demonstrating a significant short-term change and between Time 1 and Time 3, demonstrating a significant difference between experimental and control groups following one-month of game play. However, there was not a significant mean difference between Time 3 and Time 4.

Analysis revealed that there was no statistically significant change over time in the control group, F (3, 51) = 0.8, $p = 0.48$. Furthermore, none of the mean differences examined demonstrated a significant difference.

Hypothesis 2:

Ho_2: There will be no significant difference in trait anxiety symptom severity scores as measured by the STAI between the experimental and control groups.

Table 5

Between Group Test for Trait Anxiety

Group	*N*	*Mean*	*Std. Error*	*Mean Difference*	*F*	*p*
Experimental	30	41.63	2.17	−5.50	3.2	0.078
Control	29	47.13	2.17	5.50	3.2	0.078

Overall there was no statistically significant difference between the experimental and control groups for trait anxiety scores, $p = 0.078$, failing to reject the null hypothesis (see Table 5). However, the p-value was near significance level so additional analyses were completed. Given the trend towards significance, a secondary analysis using Cohen's Delta, a measure of

effect size that standardizes the difference between groups, was administered to determine the size of change between pre and post means (Cronk, 2008). The analysis indicated that there was medium effect size of 0.45.

At Time 1, initial baseline, there was not a statistically significant difference between the experimental and control groups trait anxiety scores (see Table 6). At Time 3, pre session 2, there was a significant difference between the experimental and control groups trait anxiety scores, demonstrating change over a one-month period. A significant decrease in trait anxiety scores is equated with lower levels of general anxiety experienced by participants in the experimental group (Spielberger, 1983).

Table 6

Between Group Test for Trait Anxiety at Time 1 and Time 3

Time	*Group*	*Group*	*Mean Difference*	*Std. Error*	*p*
1	Control	Experimental	3.14	3.2	0.333
3	Control	Experimental	7.86	3.2	0.019

Further analysis revealed a significant change over time took place in the experimental group (see Table 7). A significant change in trait anxiety scores in the experimental group is indicative of a decrease in trait anxiety. Analysis revealed that there was no significant change over time in the trait anxiety scores of the control group (see Table 7).

Table 7

Pairwise Comparisons for Trait Anxiety

Experimental	*Time*	*Time*	*N*	*Mean Difference*	*Std. Error*	*p*
	1	3	30	6.89	1.44	0.000
Control						
	1	3	29	2.18	1.44	0.135

Summary of Results

The results of this randomized controlled clinical study determined the significance of certain CVGs in terms of effectiveness of reducing anxiety symptoms. Data obtained in this study supports the hypotheses that prescribed CVG play is consistent with reductions in anxiety

symptom severity. For the experimental group significant changes were demonstrated pre and post game play session, as well as, before and after the month, which supports both the short and long term efficacy of prescribed CVG play to decrease both state and trait anxiety scores.

CHAPTER V: DISCUSSION

Anxiety disorders affect approximately 40 million Americans and can directly impact the level of an individual's quality of life (National Institutes of Mental Health, 2010b). The purpose of this study was to determine the effects of casual video games (CVGs) when used as a prescribed intervention in reducing symptoms of anxiety in a depressed population. From a practical perspective, if it is true, as the data indicate, playing a specific game under a prescribed condition can reduce anxiety. Therefore, the use of CVGs by healthcare practitioners, such as recreational therapists, may be an effective intervention.

This research utilized a randomized controlled study design to compare state and trait anxiety scores among an experimental and control group at separate times. All participants were screened using the Brief Patient Health Questionnaire-9 (PHQ-9) and met the criteria score for inclusion, which was a score equal to or greater than 5. There were 85 people screened with 26 not meeting the entrance criteria, representing a rejection rate of 44%. A total of 59 participants were included in the study. The control group, consisting of 29 participants, engaged in a web-based review of the National Institutes of Mental Health's web page on depression. The experimental group, consisting of 30 participants, engaged in the use of CVGs as an intervention.

In addition to the two lab sessions that were scheduled one month apart, the experimental group was required to play their chosen game at home for a minimum of 30 minutes, 3 times a week for one month. Results demonstrated that the experimental group's state and trait anxiety scores significantly decreased, indicating a reduction in state and trait anxiety symptom severity when compared to the control group scores.

Discussion of Findings

In this study, state anxiety of the experimental group was significantly reduced after individual sessions, as well as when compared to the control group at one month. In addition, trait anxiety was significantly reduced when the experimental group was compared to the control group at the end of the month long study.

The results indicate that the CVGs demonstrated both short term (after 30 minutes of game play) and one-month statistically significant improvements in STAI scores when compared to the control group. Participant log sheets reflected compliance as prescribed CVGs were played three times a week for 30 minutes minimum, 68 minutes maximum, and an average 40.7 minutes. This positive level of compliance with the prescribed regimen is not typical of other treatment interventions for anxiety disorders, and is a key benefit of this type of intervention (Osterberg & Blaschke, 2005).

Implications

The results from this study demonstrate the intrinsic value of CVGs in significantly reducing anxiety scores. The data support the hypothesis that prescribed CVGs can affect anxiety symptom severity and as a result have practical health applications.

Recreational therapists and other rehabilitation disciplines have been using video games to help patients with physical rehabilitation. For example, Madonna Rehabilitation Hospital uses the Wii and similar games as part of its Commission on Accreditation of Rehabilitation Facilities (CARF) accredited brain injury program. Likewise, the American Therapeutic Recreation Association (2009) website states that "the unique feature of recreational therapy that makes it different from other therapies is the use of recreational modalities in the designed intervention strategies". Prescribed CVGs is a pure recreational modality that in this study has demonstrated effectiveness as an intervention to address a clinical condition. Conversely, the

recreational therapy literature offers no efficacious data surrounding the use of CVGs as an intervention.

Based on the data, it is recommended that recreational therapists could prescribe this type of CVG to clients who are experiencing an anxiety disorder. Data indicate playing a CVG at the prescribed protocol of three times a week, 30 minutes per session, for four weeks is an efficacious treatment for reducing anxiety scores in clients. It is suggested that professionals such as recreational therapists who are lacking efficacious interventions for video games use this methodology, offering professionals a way to provide an effective intervention to reduce anxiety.

Prescribed CVGs can address anxiety symptoms and help clients with their mental health sustainability. The uses of CVGs offer an efficacious, cost effective, structured, and measurable intervention. For anxiety, the data suggest that many rehabilitation therapists could utilize CVGs with patients to decrease their anxiety symptoms. For example, a physical therapist could use CVGs with a patient to help alleviate state anxiety that is experienced during treatment.

In application, recreational therapists could utilize this intervention for a patient who is experiencing pre surgery state anxiety or for a patient who needs help with stress management. Additionally, recreational therapists could use CVGs as a prescriptive intervention in rehabilitation settings. For example, CVGs could be utilized with a patient who has experienced a stroke and is having a difficult time coping. Other examples include, utilizing CVGs with clients who are experiencing anxiety as a result of transitioning into a new environment, such as a nursing facility. As a result, CVGs should be made accessible at mental health clinics, community centers, online medical sites, and given out by therapists as a means of intervention for individuals experiencing anxiety.

Recommendations for Future Research

To further test the efficacious use of CVGs as an intervention, future research should investigate the effectiveness of CVGs with other drugs and as an adjunct to medicine and other therapies. Traditional anxiety medications and therapies have had compliance issues and unfortunate side effects, such as nausea, jitters, addiction, and/or sexual dysfunction (National Institutes of Mental Health, 2009). When trying to combat anxiety, these side effects and compliance problems may in turn increase an individual's anxiety. Therefore, future research should examine more proactive interventions, such as prescribed CVGs, as an efficacious, accessible, less invasive, and cost effective strategy for addressing anxiety. A research study comparing CVGs with medicine is logically one next step in examining the efficacy of its utilization.

Another study recommendation is to examine different frequencies, intensities, and durations of prescribed CVG play. The results of the present study demonstrated that a prescribed CVG utilized for 30 minutes, three times a week, for one month was effective; however, researchers should examine various frequencies, intensities, and durations, such as the number of times played during the week, how many minutes per session, and length of time. Additionally, researchers should examine different types of CVGs utilizing these prescribed protocols. These results could help demonstrate what is the most efficacious prescription of CVGs in reducing individual's anxiety levels.

Given differences observed in characteristics of the experimental and control groups, future research should examine these disparities. Results from such a study would allow for an increased understanding of who benefits most from the use of CVGs as a treatment. Furthermore, to determine CVGs effectiveness as a treatment future research should control for covariates such as level of anxiety, education level, medication use, and computer use.

Given the results, persons who suffer from anxiety should be given access to this type of intervention, especially given CVGs cost and accessibility. Moreover, individuals experiencing anxiety should be given the opportunity to utilize such an intervention, specifically due to increased compliance rates and no known side effects (Osterberg & Blaschke, 2005). When compared to traditional treatments, this non-invasive treatment may be more cost-effective and perhaps overall more effective in reducing anxiety.

Based on the issues that many individuals with anxiety experience it is recommended that CVGs as a valid treatment for individuals with anxiety be further investigated.

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APPENDIX A: UNIVERISTY & MEDICAL CENTER INSTITUTIONAL REVIEW BOARD APPROVAL FORM

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board Office
1L-09 Brody Medical Sciences Building• 600 Moye Boulevard • Greenville, NC 27834
Office **252-744-2914** • Fax **252-744-2284** • **www.ecu.edu/irb**

TO: Carmon Russoniello, PhD, Dept. of Recreation & Leisure Studies, ECU

FROM: UMCIRB

DATE: September 20, 2010

RE: Expedited Continuing Review of a Research Study

TITLE: "A Randomized Controlled Study of the Effectiveness of Casual Video Game Play in Reducing Symptoms Depression"

UMCIRB #09-0568

The above referenced research study was initially reviewed and approved by the convened UMCIRB on 10.7.09. This research study has undergone a subsequent continuing review using expedited review on 9.15.10. This research study is eligible for expedited review because continuing review of research, not conducted under an investigational new drug application or investigational device exemption where categories two (2) through eight (8) do not apply but the IRB has determined and documented at a convened meeting that the research involves no greater than minimal risk and no additional risks have been identified.
The Chairperson (or designee) deemed this **PopCap Video Games** sponsored study **no more than minimal risk** requiring a continuing review in **12 months**. Changes to this approved research may not be initiated without UMCIRB review except when necessary to eliminate an apparent immediate hazard to the participant. All unanticipated problems involving risks to participants and others must be promptly reported to the UMCIRB. The investigator must submit a continuing review/closure application to the UMCIRB prior to the date of study expiration. The investigator must adhere to all reporting requirements for this study.

The above referenced research study has been given approval for the period of **9.15.10** to **9.14.11**. The approval includes the following items:

- Continuing Review Form (date 9.13.10)
- Internal Processing Form (date 10.5.09)
- Informed Consent (received 9.14.10)
- Protocol Summary

The Chairperson (or designee) does not have a conflict of interest on this study.

The UMCIRB applies 45 CFR 46, Subparts A-D, to all research reviewed by the UMCIRB regardless of the funding source. 21 CFR 50 and 21 CFR 56 are applied to all research studies under the Food and Drug Administration regulation. The UMCIRB follows applicable International Conference on Harmonisation Good Clinical Practice guidelines.

APPENDIX B: INFORMED CONSENT

INFORMED CONSENT

Principal Investigator: Carmen V. Russoniello, Ph.D., LRT, LPC, BCIAC
Institution: East Carolina University
Address: Carol Belk Building Suite 2501
Telephone Number: (252) 328-0024

TITLE OF PROJECT: A Randomized Controlled Study of the Effectiveness of Casual Video Games in Reducing Symptoms of Depression

INTRODUCTION
I have been asked to participate in a research study being conducted by Carmen V. Russoniello, Ph.D., LRT, LPC and his research assistants; Mr. Matt Fish, BS, BCIAC and Mr. Bennie Stover, BS. The purpose of this project is to determine whether playing casual video games (CVG) can decrease symptoms of depression in adults. Video games are played for a variety of reasons including challenge, competition, skill development, to reduce stress and improve mood. According to a recent study conducted at East Carolina University Psychophysiology Lab playing casual video games can improve mood including symptoms of depression.

The study will involve 60 participants and will take place at East Carolina University in a private room located in the Belk Building on the East Carolina University Campus.

PLAN AND PROCEDURES
Prior to participation, I will read and sign this Informed Consent for research, as well as provide some background information such as age, sex, etc.

My Participation Will Involve:
This study will test the effectiveness of casual video games such as Bejeweled 2, Peggle and Bookworm on measures of depression and anxiety symptoms. Casual video games are fun, quick to access, easy to learn, and require no previous special video game skills, expertise, or regular time commitment to play. If I agree to participate I will be asked to complete an assessment to see if I meet study entrance criteria (presently experiencing symptoms of depression). If I do not have symptoms of depression I will be excluded from the study. If I am not included in the study I will be given one casual video game (valued at $20.00) for my time.

If I do meet the entrance criteria and am assigned to Group I:
I will be asked to attend two sessions lasting approximately one hour and forty minutes (100 minutes). During these visits I will complete the following assessments, questionnaires; Demographic Information, age, sex, level of education, Patient Health Questionnaire (PHQ), the Profile of Mood States (POMS), State-Trait Anxiety Inventory (STAI), and give a small saliva sample (spit in a small tube). I will have sensors that record brain wave information placed by researcher on my head. I will also wear a small finger clip sensor during the session. Once the sensors are placed there will be 6 minutes of baseline data collected. I will then participate in a 30 minute session where I will browse/surf the National Institutes of Mental Health consumer web site on depression http://www.nimh.nih.gov/health/topics/depression/index.shtml. After the session I will complete the Patient Health Questionnaire (PHQ), Profile of Mood States

Subject's Initials _____

(POMS), State-Trait Anxiety Inventory (STAI), and give a small saliva sample (spit in a small tube). I am being asked to refrain from playing casual video games for 1 month until the completion of the study. I will be scheduled for a second appointment in approximately one month and asked to again fill out the PHQ, the POMS, the STAI, and give a small saliva sample (spit in a small tube). I will again be monitored while I visit the National Institutes of Mental Health consumer web site on depression. I will be given three video games and a $100.00 check after completion of the study.

If I meet the entrance criteria and am assigned to Group II:
I will be asked to attend two sessions where I will complete the following assessments, questionnaires; Demographic Information, age, sex, level of education. The Patient Health Questionnaire (PHQ), the Profile of Mood States (POMS), State-Trait Anxiety Inventory (STAI), and give a small saliva sample (spit in a small tube). I will have sensors that record brain wave information placed by researcher on my head. I will also wear a small finger clip sensor during the session. Once the sensors are placed there will be 6 minutes of baseline data collected. I will then play a video game of my choice from a selection of three very popular easy to play video games for 30 minutes. After the session I will complete the Patient Health Questionnaire (PHQ), Profile of Mood States (POMS), State-Trait Anxiety Inventory (STAI), and give a small saliva sample (spit in a small tube). I will also be asked to continue playing this video game at home three days per week for 30 minutes lasting one month. I will be asked to record how much time I spent playing. I will be scheduled to return in one month and be asked to again fill out the PHQ, the POMS, the STAI questionnaires, and be monitored while I play the video game. I will be given one video game after completion of the first session. After completion of the final session I will receive two additional video games and a $100.00 check.

Both sessions will be conducted in a private area in the Belk Building located on the East Carolina University campus. All research participants completing the study will be given three casual games (valued at $60.00) and a $100.00 check for their participation.

If I am assigned to Group I the entire study will require 2 visits. One visit will be at the beginning of the study and one at the end (3 hours and 20 minutes total). If I am assigned to Group II the entire study will require 2 visits one at the beginning of the study and one at the end (3 hours and 20 minutes total). I will also be asked to play a casual video game of my choice at home three times per week for thirty minutes each time.

RISKS AND DISCOMFORTS
There are certain risks and discomforts that may be associated with this research. They include:

- There is always a risk that my depression will get worse. If this occurs I will promptly inform Dr. Russoniello or his research assistants.
- There are no known risks associated with playing casual video games or browsing the National Institutes of Mental Health web site on depression.
- I am aware that there may be unforeseen risks involved with this and all research studies.

UMCIRB
APPROVED
FROM 5-14-10
TO 10-6-10

Subject's Initials _____

POTENTIAL BENEFITS

- All participants may learn about their level of depression and be given information regarding where to seek treatment
- If I am placed in Group II, I will be able to choose and play an enjoyable video game.
- I may learn more about depression and its symptoms
- Researchers will gain knowledge about the effectiveness of playing video game that may potentially help others with depression in the future.

TERMINATION OF PARTICIPATION

My participation in this research study may be terminated without my consent if the investigators believe that these procedures pose unnecessary risk to me. I may also be terminated from the participation if I do not adhere to the study protocol.

COST AND COMPENSATION

There is no cost associated with my participation in the study. If I do not meet study entrance requirements I will be given one free casual video game ($20.00 value). If I do meet the entrance criteria and complete the study I will be given 3 casual video games ($60.00 value) and a $100.00 check. The policy of East Carolina University does not provide for the compensation or medical treatment for participants resulting from this research activity. However, I understand every effort will be made to make the facilities of the School of Medicine available for treatment or I will receive references for counseling in the event of harm.

CONFIDENTIALITY

I understand every effort will be made to protect my identity. The study will be held in a private area with no indicators that this is a clinical study. Only the investigators associated with this study will have access to the data obtained. Numeric coding will protect the identity of the participants. No identifying information will be released. However, the research team has an ethical duty to help you obtain assistance if they are believed you to be dangerous to yourself or others and that might involve a release of you name.

VOLUNTARY PARTICIPATION

I understand that my participation in this study is voluntary. Refusal to participate will involve no penalty or loss of benefits to which I am otherwise entitled. Furthermore, I may stop participating at any time I choose without penalty, loss of benefits, or without jeopardizing any of my grades, if I am a student.

PERSONS TO CONTACT WITH QUESTIONS

The investigators will be available to answer my concerns regarding this research, now or in the future. I may contact the investigator, Carmen Russoniello, Ph.D. (days: 328-0024, nights: 367-6465). Also, if questions arise about my rights as a participant in this research, I may contact the Chairperson of the University and Medical Center Institutional Review Board at 252-744-2914 (days).

UMCIRB
APPROVED
FROM 5.14.10
TO 10.6.10

Subject's Initials _____

CONSENT TO PARTICIPATE

I certify that I have read all of the above information, asked questions, and received answers concerning areas I did not understand, and have received satisfactory answers to these questions. I willingly consent for participation in this research study. (A copy of this consent form will be given to the person signing as the subject).

TITLE OF STUDY: A Randomized Controlled Study of the Effectiveness of Casual Video Games in Reducing Symptoms of Depression

_____

Participant's Name (Print)

_____

Participant's Signature

_____

Investigator's Name (Print)

_____

Signature of Principal Investigator

UMCIRB
APPROVED
FROM 5.14.10
TO 10.6.10

Subject's Initials _____

APPENDIX C: RECRUITMENT FLIER

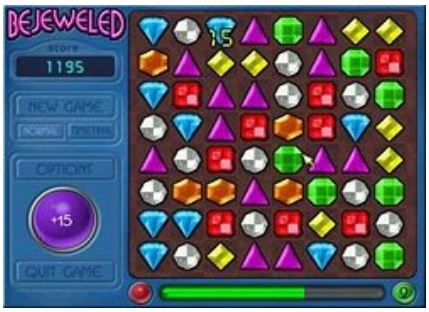
VIDEO GAME RESEARCH

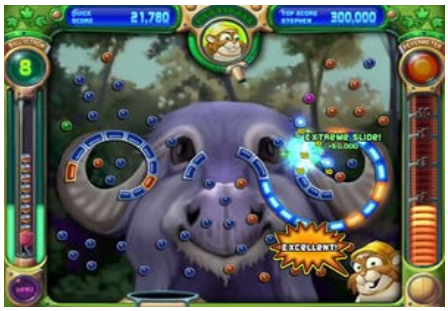
NEEDED: Participants for a research study to determine if playing video games can improve symptoms of depression.

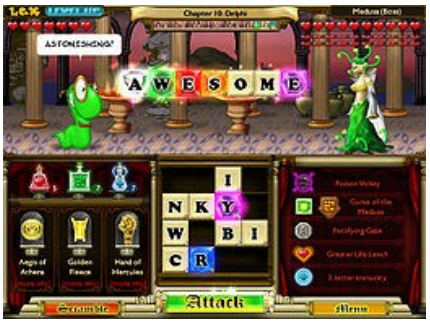
- If you are selected and complete the study you will receive 3 video games (valued at $60.00).
- If you are not selected you will still receive one free video game (valued at $20.00)

Participants who meet the criteria will be placed into one of two groups:

- Group I: Attend two sessions approximately 90 minutes each
  EACH SESSION REQUIRES PARTICIPANT TO:
  1. Complete written pre-assessments, saliva sample and record physical changes using sensors
  2. Record physical changes for 30 minutes while participant **browses** NIMH website on depression
  3. Complete written post-assessments and saliva sample
  4. Return after 1 month and repeat steps 1-3 and receive 3 video games & a $100.00 check
- Group II: Attend two sessions approximately 90 minutes each
  EACH SESSION REQUIRES PARTICIPANT TO:
  1. Complete written pre-assessments, saliva sample and record physical changes using sensors
  2. Record physical changes for 30 minutes while participant **plays video game**
  3. Complete written post-assessments and saliva sample
  4. Receive 1 video game to play at home 3x a week for 30 minutes during the next month
  5. Return after 1 month and repeat steps 1-3 and receive other 2 video games & a $100.00 check







If you are interested in participating please contact Mr. Matthew Fish, BCIAC or Dr. Carmen Russoniello at 252-328-0876 or 252-328-0024 or by email: fishm04@students.ecu.edu or russonielloc@ecu.edu.

APPENDIX D: DEMOGRAPHIC SHEET

Demographic / Clinical Data Collection Sheet
Study ID #:_____
Interview Date:_____ Age:_____
Gender:____ (1=Male, 2=Female)

4. Racial Background:
1= White/European American
2= Latino/Latina
3= Black/African American
4= Asian/Pacific Islander
5= American Indian/Alaska Native
6= Other

5. Educational Status:
1= 8th grade or less
2= some high school
3= high school graduate
4= some college
5=college graduate
6=post graduate

6. Occupational Status:
1= Employed part time
2= employed full time
3= Unemployed
4= Disabled
5= Homemaker
6= Student
7= Retired
If employed, how many hours per week:_____

7. Marital Status:
1= Married
2= Widowed
3= Separated
4= Divorced
5= Never married

How many hours did you spend playing video games in the last week?
1= 12 or more hours
2=8 to 11 hours
3=4 to 7 hours
4=1 to 4 hours
5=never

PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME:_____ **DATE:**_____

Over the last *2 weeks,* how often have you been bothered by any of the following problems?
(use "✓" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so figety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3
		add columns	+	+

(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card). TOTAL:

10. If you checked off *any problems,* how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all _____
- Somewhat difficult _____
- Very difficult _____
- Extremely difficult _____

A2663B 10-04-2005

APPENDIX F: STATE TRAIT ANXIETY INVENTORY

mind garden

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-1

Please provide the following information:

Name_____ Date_____ S_____

Age_____ Gender (*Circle*) M F T_____

DIRECTIONS:

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

	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel confused	1	2	3	4
19. I feel steady	1	2	3	4
20. I feel pleasant	1	2	3	4

 STAIP-AD Test Form Y

Published by Mind Garden, Inc., Redwood City, CA.

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Name_____ Date_____

DIRECTIONS

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

	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
21. I feel pleasant	1	2	3	4
22. I feel nervous and restless	1	2	3	4
23. I feel satisfied with myself	1	2	3	4
24. I wish I could be as happy as others seem to be	1	2	3	4
25. I feel like a failure	1	2	3	4
26. I feel rested	1	2	3	4
27. I am "calm, cool, and collected"	1	2	3	4
28. I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29. I worry too much over something that really doesn't matter	1	2	3	4
30. I am happy	1	2	3	4
31. I have disturbing thoughts	1	2	3	4
32. I lack self-confidence	1	2	3	4
33. I feel secure	1	2	3	4
34. I make decisions easily	1	2	3	4
35. I feel inadequate	1	2	3	4
36. I am content	1	2	3	4
37. Some unimportant thought runs through my mind and bothers me	1	2	3	4
38. I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39. I am a steady person	1	2	3	4
40. I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

APPENDIX G: STATE TRAIT ANXIETY INVENTORY COPYRIGHT PERMISSION

May 24, 2010

Mr. Matthew Taft Fish
Psychophysiology & Biofeedback Clinic
East Carolina University

Dear Mr. Fish:

In response to your recent request, I am very pleased to give you permission to reproduce and use the State-Trait Anxiety Inventory (STAI) in your Masters Thesis research**,** entitled:

A randomized controlled study of the effectiveness of casual video games in reducing symptoms of anxiety.

It is my understanding that your research will be carried out at:

In a private secure room in the Belk Building.

This permission is contingent on your agreement to share your findings with us when your research is completed. I look forward to receiving further information about your procedures and the results of your study as this information becomes available.

Best wishes on your research project.

Sincerely,

Charles D. Spielberger, Ph.D., ABPP
Distinguished Research Professor of Psychology
Director, Center for Research in Behavioral
Medicine and Health Psychology
Phone (813) 974-2342; E-mail: spielber@cas.usf.edu

APPENDIX H: GAME LOG SHEET

Game Log Sheet

Name:_____

Game:_____

Directions: Play game **3 times a week for 30 minutes, for a total of 12 sessions. C**omplete the sections date, amount of time played, and initial after each session.

Week 1	Date	Amount of Time Played	Initial
1			
2			
3			
Week 2			
4			
5			
6			
Week 3			
7			
8			
9			
Week 4			
10			
11			
12			