THE EFFECTIVENESS OF PRESCRIBED CASUAL VIDEO GAME PLAY IN REDUCING TOTAL MOOD DISTURBANCE: A RETROACTIVE ANALYSIS

by

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ABSTRACT

As the world becomes more complex, mood disorders are becoming increasingly common. Mood disorders develop when one or more of the factors of mood, such as depression, become too excessive, developing into an incapacitating disorder. Current treatment for mood disorders have been negatively associated with high cost, a lack of viable resources, and negative stigma. To this end, recreational therapists need newer interventions to help clients treat and prevent the development of mood disorders. Casual video games (CVGs) have been identified as a popular and easily available method to impact mood. This randomized controlled study will evaluate the efficacy of using CVGs in reducing the Total Mood Disturbance (TMD) in a population of adults diagnosed with depression. The Profile of Mood States (POMS) was used to measure participants' TMD scores after CVG gameplay during a one-month period of playing CVGs for 30 minutes, three times per week. The results from the POMS show that CVG gameplay was correlated with a reduction of TMD levels. Likewise, this study demonstrates that recreational therapists can use a prescription of CVGs to treat mood disturbances.

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CHAPTER I: INTRODUCTION

Mood changes have been observed frequently in everyday life, with some changes being positive (e.g., joy, excitement, happiness), and some being negative. Examples of negatively moderating factors have included feelings of depression, anxiety, anger, and fatigue are common of global mood (Ekkekakis, 2012). The Global Burden of Disease Collaboration Network (2017) reported that more than 254 million individuals worldwide have depression, and 284 million individuals have anxiety. The Anxiety and Depression Association of America (ADAA, n.d.) reported that an estimated 16 million American adults experienced some form of depression, and 40 million suffered from anxiety in the past year. Prevalence rates for anxiety and depression have significantly increased each year for U.S. citizens 12 years of age and older (Weinberger et al., 2018). Similar statistics arise when examining other moderating factors of mood in the U.S. For example, a Gallup Poll on emotions revealed that U.S. adults who reported issues controlling their anger have increased from 16% to 22% in 10 years (Ray, 2020). Meanwhile, 31% of U.S. adults reported chronic fatigue symptoms (Meng et al., 2010). Assuming these statistics are accurate, mood disorders are prevalent, increasing, and detrimental when not addressed.

Unfortunately, as the moderators' severity and frequency increase each year, the likelihood of a mood disturbance grows (Ekkekakis, 2012). The detrimental side effects of mood disturbances have included decreases in physical and cognitive health (Harvey, 2011). Moreover, mood disturbance have also been associated with increased healthcare costs, work disability claims, and an increased likelihood of developing a comorbid health condition (Greenberg et al., 2015). Mnookin (2016) noted that the U.S. spent over $2.5 trillion in 2010 for mental health disorders related to depression and anxiety, and projected this number to multiply by 240% (or $6 trillion) by 2030.

According to the Substance Abuse and Mental Health Services Administration (SAMHSA, 2018), only 43% of adults with mental illness symptoms (e.g., depression and anxiety) received treatment. Equally important, the average time between an individual's onset of symptoms and receiving treatment is 11 years. Watanabe et al. (2018) found some reasons why such a large discrepancy between symptom onset and seeking treatment exists, citing how treatment strategies for mood disorders continue to become more expensive and complicated to acquire due to a lack of available resources. Likewise, stigma is associated with mental health treatment, which may negatively influence relationships at work, with friends, or with family members (Dockery et al., 2015). For these reasons, affordable, yet effective and less stigmatizing, treatment strategies need to be readily available.

An option available for healthcare providers to utilize is recreational activities as therapy. Recreational Therapy (RT) practitioners are healthcare professionals who prescribe evidence-based recreation activities as interventions to provide individual treatment services to clients. The American Therapeutic Recreation Association (ATRA, 2018) identifies certified RT practitioners as healthcare workers that assist individuals in managing their illness and disability throughout many aspects of the Biopsychosocial Model, which includes physical, cognitive, and affective domains so individuals may achieve optimal levels of independence and quality of life.

There are many studies exploring the effectiveness of RT based activities being utilized to improve mood. Fitzsimmons (2001) demonstrated that recreational activities could ameliorate the effects of several mood disorders, noting that RT based wheelchair biking in a two-week trial was associated with a significant decrease in depression symptoms in older adults. Davidson et al. (2017) reported significant reductions in self-reported anxiety symptoms among school-aged, hospitalized, patients after six RT sessions using toys for role play. Silverman and Rosenow

(2013) found a significant association between music-based RT interventions with decreases in self-reported anxiety, depression, and anger symptoms. A leisure activity that has begun to be used as a therapeutic treatment is video games.

Since the first commercially successful video game launch in the 1970s, therapy treatments have utilized video games worldwide (Horne-Moyer et al., 2014). Video games have been associated with benefits to mental health. The most notable video game benefits for mental health include increased autonomy, competence, relatedness (Ryan et al., 2006), and cognitive functioning (Green & Bavelier, 2012), while decreasing feelings of distress (Kiraly et al., 2015). However, most of the available video game research have been relegated to genres like exergames and serious games. Manufacturers typically design exergames and serious games for educational, training, or exercise purposes, which often come at a significant cost to users (Djaouti et al., 2011). Alternatively, Casual Video Games (CVGs) are a genre of games that are free or affordable, have varying degrees of difficulty and gameplay length, and players need minimal experience to play (Chiapello, 2013). Moreover, CVGs are among the most popular game genres utilized today for leisure play (Chiapello, 2013). Some popular examples of a CVGs are Candy Crush, Plants versus Zombies, and Words with Friends. Given the general availability of these games, and their low cost, using them as therapeutic activity could alleviate some of the aforementioned challenges of being expensive and unavailable that are seen with other popular treatment techniques. Researchers have only recently begun exploring the effectiveness of CVGs on mental health and mood.

A seminal study by Russoniello et al. (2009) examined the impact CVGs have on non-clinical individuals' mood and reported stress. Compared to a control group, results indicated that the experimental group playing CVGs showed an improvement in assessed mood as evidenced by electroencephalography (EEG) changes (i.e., brain wave changes). Likewise, heart rate variability (HRV) measurements showed an increase in variables associated with relaxation and decreased physical stress. The study revealed that CVGs have inherent characteristics that could improve individuals' mood and stress, common factors of mental health disorders.

In a follow up study, Russoniello et al. (2013) examined the effectiveness of prescribed CVG play on participants with clinical depression, a mood disorder. This study investigated the effects of prescribed CVG play on participants' depression symptoms using the Patient Health Questionnaire-9 (PHQ-9) as a clinical assessment. The results demonstrated that a prescribed CVG play regimen significantly reduced participants' reported symptoms of depression, as evidenced by the PHQ-9, a clinical assessment structured to measure depression. Additionally, the researchers collected data using the Profile of Mood States (POMS) assessment. This assessment is designed to measure Total Mood Disturbance (TMD); however, no analysis of these data exists. The TMD score represents the POMS' six dimensions. The first five dimension's scores (*Tension*, *Fatigue*, *Depression*, *Confusion*, and *Anger*) are added together. The sixth dimension (*Vigor*) is then subtracted to find the individual's TMD score (Annesi, 2005). Russoniello and colleagues did not explore POMS data in their study; however, an investigation into TMD scores and the POMS assessment subscales may reveal the extent that prescribed CVG play influences mood and other aspects of mental health measured by the POMS subscales. Ultimately, the continued exploration into this possible treatment strategy's effectiveness could provide RT practitioners with evidence-based research to effectively treat patients with mood disorders.

Purpose of the Study

The purpose of this study is to examine the efficacy of prescribed CVG play as an intervention to decrease TMD symptoms in adults diagnosed with depression. This study uses secondary data collected from a previous research project for its analysis. CVGs were utilized as a prescribed activity and compared to a control group that received no treatment. In this previous study, the researchers did not analyze TMD data. This research study examines if individuals prescribed CVGs as an intervention improve their TMD symptom scores, as measured by the POMS.

Further analysis of these data will explore how prescribed CVGs may influence other subscales measured by the POMS. Continued research examining the effectiveness of prescribed CVGs on influencing TMD is needed. However, if this treatment method demonstrates helpfulness, RT practitioners may utilize CVGs as a treatment method to decrease TMD in similar populations.

Hypothesis

There will be a significant decrease in TMD scores measured by the POMS between the experimental and control groups, resulting from the CVG intervention.

Limitations

The limitations of this study primarily relate to the study design and population discrepancies. Concerning the study design, no current research existed detailing a specific amount of time the treatment intervention needed to be applied to be able to measure effects from the intervention. Moreover, the study only uses CVGs from Popcap games. Likewise, researchers recruited volunteer participants within the area. Researchers received data from the participants assuming they were honest and accurate when filling out their psychological assessments and video game usage log. Some participants may have had greater access and experience with computers than others, which is a variable not controlled for and may/may not have a mediating effect. Participants had to score at least 5 on the PHQ-9, only 59 participants met standard criteria for participation in the study from Eastern North Carolina – this could indicate a pseudo-self-selection bias.

Assumptions

As most assessments were self-reported, researchers assumed that participants fully comprehended assessment questions. In addition, researchers assumed that each participant responded to and answered questions honestly.

CHAPTER II: LITERATURE REVIEW

This chapter presents literature on the relationship between mood and Casual Video Games (CVGs) with a specific focus on mood and treatment dimensions, along with current literature on the effects of video games on cognition, behavior, and mood. This chapter covers six parts. The first part of this chapter includes an examination of mood and provides a contrast between emotion and mood. Second, the researchers review dimensions of mood and their individual mediating factors on other existing dimensions. Next, the chapter includes how assessment procedures of mood dimensions are assessed and how the current study utilized them. Fourth, the researchers review current strategies for mood regulation and the treatment of mood disorders. Fifth, the chapter includes current research involving CVGs and indicating their specific influence on cognition, behavior, and mood. Finally, the researchers review current theoretical models that directly link activities like CVGs to mood dysregulation improvements.

Distinguishing Mood from Emotion

As a concept, most understand mood as normal emotional feelings experienced in everyday life. For example, anger, depression, and happiness are all categories of feelings anyone can experience. However, it is imperative to distinguish between the two commonly interchanged phrases of mood and emotion from a research perspective. The American Psychological Association (APA, n.d.) defines mood as a short-lived emotional state of mind or predominant emotion. Likewise, the APA defines emotion as a complex reaction involving experiential, behavioral, and psychological elements. The difference between the two concepts is that mood lacks a stimuli and may have no clear starting point. Payne and Cooper (2003) conceptualize both terms by depicting emotions as the intense, high activation states that occur infrequently, while moods involve longer lasting and low activation feeling states that comprise our everyday experiences. To break down the definitions further, the authors provide three concepts that help differentiate mood and emotions. First, the authors postulate that mood encompasses all feelings and not just accompanying specific emotions like anger or fear. Second, moods have a much longer duration than emotions. An example of this second concept would be the few moments of fear one would experience if a bear entered the room instead of the constant mood of nervousness and trepidation before giving a rather important business presentation. Furthermore, the authors noted in their last concept that people experience moods more consistently than emotions. Beedie et al. (2005) noted that if anxiety is different from an anxious mood, the difference may be associated with diverse causes and could be treatable with varying intervention strategies. For the purposes of this study, *mood* will be defined and conceptualized as consistent, prolonged feelings. This study examines the effectiveness of prescribed video games on mood, and it is essential to differentiate mood from emotion conceptually.

Six Dimensions of Mood

Ekkekakis (2012) studied participants' moods, emotions, and affect in sports psychology. He elaborated on two models of thought regarding the measurement of mood. The first model, viewing mood through two broad dimensions, is a two-dimensional model measuring positive or negative influences on participants' affect. The second model, designed to measure distinct mood states, involved evaluating multiple dimensions of mood. Of the two models, Ekkakakis suggested using the second model when assessing specific changes in mood and dimensions of it. One of the most common measurement methods following the multi-dimensional model is the six dimensions of mood primarily measured by the Profile of Mood States (POMS) assessment.

Researchers have thoroughly examined each mood dimension. However, much of the available research has been focused on sports psychology relating mood to performance.

Research on each of the dimensions of mood is still building, further adding to the importance of studies documenting the effect and treatment of the dimensional aspects of mood. In this multi-dimensional model (Ekkekakis, 2012), the multifaceted concepts associated with mood are vigor, depression, tension, anger, fatigue, and confusion – each dimension is discussed in turn below.

Vigor

Vigor is a positively influencing mood factor measured in this model. Shirom (2007) describes vigor as a person's appraisal of their ability, strength, emotional vitality, motivation, and cognitive energy. Researchers studying the impact of high levels of vigor have shown positive correlations with the facilitation of goal-directed behavior (Carver & Sheier, 1990) and performance (Lane et al., 2005). Moreover, vigor components negatively correlate with other mood dimensions (Watson & Clark, 1997). Knowing how vigor levels affect activities that promote or enhance vigor may also decrease mood dimensions detrimental to overall global mood.

Depression

National Institute of Mental Health (NIMH, n.d.-a) defines depression as feelings of persistent sadness, hopelessness, guilt, loss of interest, or decreases in energy for most of the day or nearly every day for at least two weeks. One of the more significant moderators of mood is depression. For instance, Lane and Terry (2000) viewed depression as the most significant negative influence on mood because of its association with increases in the constructs of anger, confusion, and fatigue, while also showing a connection with decreases in vigor. Other mood dimensions do not display this ability, making it one of the only mood dimensions that can significantly alter global mood in a negative way (Rokke, 1993).

Statistics on the prevalence of depression display how common it is for individuals to experience a depressed mood. The National Survey on Drug Use and Health (NSDUH, 2017) estimates that over 7% (17 million) Americans experienced at least one depressive episode in the past year. The most common treatments for depression include antidepressant medications like selective serotonin reuptake inhibitors (SSRIs), psychotherapy, or a combination of the two (NIMH, n.d.-a). If not treated, depression can evolve into a depressive disorder. As depression is often comorbid with other mood aspects, it remains one of the most common and detrimental mood states.

Tension-Anxiety

Common knowledge indicates that everyone goes through tension or anxiety daily; however, it may develop into a disorder if anxiety becomes chronic or severe. As an anxiety disorder, the Anxiety and Depression Association of America (ADAA, n.d.) reports that 18.1 % of adults in the U.S. report issues with chronic anxiety every year. Current treatments for anxiety include pharmacotherapy, along with psychotherapy such as cognitive-behavioral therapy.

Anger

Researchers often characterize anger as a feeling of annoyance, aggravation, or rage that is not associated with a specific antecedent (Lane & Taylor, 2000). In creating and analyzing the State-Trait Anger Expression Inventory, Spielberger (1988) postulated that an individual may direct anger in an inward or outward manner. Spielberger also noted that anger could stimulate the presence and intensity of other mood dimensions such as tension. This connection suggests that the intensity and frequency of unresolved inward anger could be a catalyst for entering negative global mood states. According to the Association for Behavioral and Cognitive

Therapies (n.d.), current treatment strategies for anger and anger disorders primarily include psychotherapy forms, including cognitive-behavioral therapy and solution-focused therapies.

Fatigue

The POMS defines fatigue as feelings of physical or mental tiredness (McNair et al., 1971). Fatigue is commonly associated with negative mood dimensions such as depression, anger, and anxiety (Lehman et al., 2002; Stahl, 2002). Lane and Terry (2000) found common antecedents of fatigue were lack of sleep or deficiency in rest paired with increases in physical or mental activity.

Confusion

The last dimension of mood, confusion, is characterized as phases of bewilderment or uncertainty (Watson & Tellegen, 1985). Up to this point in time, research has not thoroughly analyzed confusion as a mood dimension instead of a symptom of illness. Confusion is most notably associated with depression, while connections between confusion and dimensions of anger, anxiety, and fatigue also exist (Kendall & Hammen, 1995; Lane et al., 2001). As situational or medical events can trigger confusion, the significance of their effect on mood and alternative mood dimensions may vary.

In summary, most mood dimensions influence the frequency and intensity of other aspects of mood. Some dimensions, like depression, have been identified as a more significant moderator of mood states than others. Researchers can use the collective view of these mood dimensions to identify Total Mood Disturbance (TMD). Likewise, analyzing multiple mood dimensions gives the assessor an accurate idea of a person's global mood and the ability to identify individual dimensions of mood significantly affecting an individual's overall mood on a per-person basis. Ultimately, the assessment of mood and its multiple dimensions remains a significant part of mental health treatment and the measurement of its effectiveness.

Assessment of Mood

This research study was part of a larger study utilizing multiple assessment measurements. The assessments in this study measured and tracked various levels and aspects of mood and physiology. The following instruments have valid and reliable psychometrics and were utilized in the study: The POMS, State-Trait Anxiety Inventory (STAI), Patient Health Questionnaire (PHQ-9), electroencephalography (EEG), heart rate variability (HRV), and salivary alpha-amylase (sAA). While the literature review includes all instruments, only the POMS is used to test the study hypotheses.

Profile of Mood States (POMS)

This assessment is a 65-item assessment with a 5-point rating scale for each variable. This self-report inventory measures six affective mood state subscales, which include: Tension-Anxiety (9-items), Depression (15-items), Anger-Hostility (12-items), Vigor (8-items), Fatigue (7-items), and Confusion (7-items) (McNair et al., 1971). The 5-point Likert scale reflected descriptive answer phrases and uses the following anchors: (0) *Not at all*, (1) *A little*, (2) *Moderately*, (3) *Quite a bit*, and (4) *Extremely*. The POMS item scores range from -32 to 232 and represent the individual's TMD severity. Researchers are encouraged to view the TMD scores as a global estimate in changes of affective state.

Shaw (1993) noted that the developers of the POMS initially created the assessment to measure psychiatric outpatient mood states. Since then, the 100-question assessment has been reduced to 65 to improve the assessment's validity. A factor analysis by McNair et al. (1971) utilizing 1000 subjects provides evidence of the factorial validity of the six mood factors represented in the assessment. Psychoanalytic properties gathered from the research indicated in McNair et al. (1971) that the POMS assessment internal consistency scores for the subscales ranged from α= .87 to α= .92. In this study, test-retest reliability scores ranged from .68 to.74 over a median of 20 days and .43 to .53 for six-week periods. In reviewing pre and post psychiatric treatment results, construct validity for the POMS was supported through factor analytic techniques, which determined POMS scores improved in response to treatment. Likewise, Bourgeois et al. (2010) examined 760 participants' scores on the POMS for internal consistency. When broken down, the participant's assessment scores showed an internal consistency coefficient (coefficient alpha, α) of Tension (α = .80), Depression (α = .83), Anger (α = .86), Confusion (α = .67), Fatigue (α = .90), and Vigor (α = .89). These results show that the POMS assessment subscales' internal consistency is high, indicating that the POMS subscales measure their intended dimensions of mood.

Similarly, McNair et al. (1981) evaluated the concurrent validity of the POMS by correlating it with the Hopkins Symptom Distress Scale (r = .30) and the Taylor Manifest (r = .86), indicating the POMS assessment has a low to relatively high correlation coefficient between similar assessments. In these studies, anxiety and depressive subscales had the highest correlations. Likewise, Matthias et al. (2007) examined convergent validity in a study based on POMS assessment scores of 4,596 people. Concepts of vigor in this study were positively associated with Life Satisfaction feelings on the Indicators of Reha-Status assessment (r = .08) and negatively with Vital Exhaustion (r = -.28), thus, indicating that vigor is associated with high stamina and livelihood. Likewise, fatigue subscales were more positively associated with feelings of a Vegetative State (r = .50) and negatively with Life Satisfaction (r = -.31). This study's findings indicate that the POMS holds high convergent and discriminant validity, which is essential considering that the POMS assessment measures multiple mood dimensions.

Bourgeois et al. (2010) provided evidence of construct validity for the POMS by administering an exploratory factor analysis on the 58 POMS items. The results detailed that the Eigenvalues for the first five factors were positive: Depression (*ev* = 18.52), Anger (*ev* = 4.09). Vigor (*ev* = 2.53); Fatigue (*ev* = 1.66); and Tension (*ev* = 1.26). The only factor that was not significant in this factor analysis was Confusion, which the authors further note is due to some items of the POMS being strongly associated with other factors instead of Confusion.

State-Trait Anxiety Inventory (STAI)

The STAI is a 40-question assessment composed of 20 state anxiety (S-Anxiety) and 20 trait anxiety (T-Anxiety) questions (Spielberger, 1983). According to Spielberger (1985), S-Anxiety refers to transitionary emotional states at the moment characterized by feelings or symptoms of existing anxiety such as tension or arousal of the autonomic nervous system (ANS). Likewise, T-Anxiety is related to an individual's predisposition to become anxious or respond to threatening stimuli with anxiousness. Spielberger's assessment dictates that the participants can self-report the intensity of their S-Anxiety or T-Anxiety through a Likert scale with the following response anchors: (1) *Not at all*, (2) *Somewhat*, (3) *Moderately so*, and (4) *Very much so*.

The STAI reliability measures are varied for the S-Anxiety scale as it measures transitory anxiety. Spielberger (1983) examined the Test-Retest reliability for the STAI when administering the assessment to a high school student population with administration intervals ranging from 1 hour to 104 days apart from the original baseline assessment. The participant's scores on the assessment revealed test-retest reliability coefficients ranged from .31 to .86, respectively. Likewise, internal consistency alpha coefficients were relatively high for high school students (α = .85) and military personnel (α = .95). The STAI has shown comparable results between the Taylor manifest anxiety scale (Taylor, 1953) and the Scheier's anxiety scale questionnaire (Cattell & Scheier, 1963), with correlation coefficients ranging from .73 to .85. Research indicates that one weakness of the STAI is its low construct validity scores compared to depression scores. For instance, VanDyke et al. (2004) found a high correlation (r = .83) between the STAI scores and measures of depression.

Patient Health Questionnaire (PHQ-9)

The Primary Care Evaluation of Mental Disorders (PRIME-MD) is a two-component assessment created to identify common mental health disorders and symptoms Spitzer et al. (1999). Since its creation, the researchers modified the PRIME-MD into a three-page questionnaire, now known as the PHQ-9. According to Spitzer et al. (1999), the change enabled self-administration and more natural scoring. This study by Spitzer utilized 545 subjects assessed with the PRIME-MD and the PHQ-9. Results show that the sensitivity of the PHQ-9 improved from 37% to 73% while maintaining a high specificity of 94%. The reported correlation coefficient between the two assessments was (r = .84), indicating the PHQ-9 and PRIME-MD do measure similar variables.

Williams et al. (2000) found that patients diagnosed using the PHQ-9 had higher levels of functional impairment, healthcare use, and psychosocial stressors than those not diagnosed using the PHQ-9 with a significance of ($p < .05$) for all measures. The authors noted that the assessment is a valuable instrument to assess mental disorders, symptoms, and stressors.

Electroencephalography (EEG)

Researchers utilized this method to monitor and measure brain wave activity, and in this study, researchers used a 10-channel psychophysiological device called the NEXUS-10.

Palmiero and Piccardi (2017) explained how EEG is extensively used to detect the real-time change in emotional processes paired with mood influencing stimuli. A valence-arousal model indicates that positive emotions are more associated with the right hemisphere of the brain. In contrast, negative ones, such as anxiety or depression, are more associated with the brain's left hemisphere (Heller, 1990). Sheikholeslami et al. (2007) measured such processes while participants played computer-based video games and reported that EEG waves are a helpful way to track brain waves and processes during such fast-paced events.

Heart Rate Variability (HRV)

This measurement represents differences in beat-to-beat intervals measured between R-waves of a regular cardiac QRS complex (Conder & Conder, 2014). To measure HRV, an electrocardiogram (ECG), or a blood volume pulse sensor (BVP), is connected to an individual's earlobe or fingertip (Yucha & Gilbert, 2004). There are two ways to measure HRV, including time-domain and power-domain measures. Time-domain strategies utilize the Standard Deviation of Normal-to-Normal beats (SDNN; Conder & Conder, 2014). Likewise, SDNN measurement is the variation of time between the R-R beat intervals measured in the cardiac QRS complex.

The power spectrum is the epoch of a heartbeat measured in 3 sub-bands divided by hertz: Very Low Frequency (VLF), Low Frequency (LF), and High Frequency (HF) (Burr, 2007). Burr's research explains that VFL is usually 0.04 Hz or lower, LF is 0.04Hz to 0.15 Hz, and HF is 0.15Hz to 0.4 Hz. Expanding literature illustrates that these bands reflect physiological and cognitive correlations. For example, Combatalade (2010) suggested that VLF reflects sympathetic activity, like stress, while LF reflects parasympathetic activity, such as relaxation and increases in cognitive processing. This research relates to findings from Davidson (1998) and Wilkinson et al. (1998) postulated that changes in HRV HF and LF bands were specific indicators of mood.

Salivary Alpha-Amylase (*sAA)*

The measurement of sAA has recently become a typical measurement of the autonomic nervous system (ANS). More specifically, studies have found a high correlation between an increase in specific markers in saliva and the activation of the sympathetic-adrenal medullary system (SAM) when measured (Nater & Rohleder, 2009; Rohleder et al., 2004). This method of measurement is non-invasive and is exceptionally reliable. Contreras-Aguilar et al. (2017) discussed the process as an accurate and reproducible method of measuring hormone and antibody levels in saliva.

Regulation and Treatment of a Mood Disturbance

After a thorough assessment, treatment is often sought out and prescribed by a qualified professional to alienate the specific mood dimension responsible for the mood disturbance. As previously indicated while discussing the six dimensions of mood, dimensions are treated through various methods to manage and reduce the mood dimension's intensity. As many of these mood dimensions are commonly co-morbid, treatment strategies can be very similar (i.e., depression and anxiety). Current treatment strategies for mood disturbance include pharmacotherapy, psychotherapy, and alternative treatments such as biofeedback therapy.

Pharmacotherapy

The prescription of medicinal treatment is one of the most popular types of treatment for any form of mood disturbance. The most popular and efficient of these medications are anti-depressants and anti-anxiety medications. For instance, the NIMH (n.d.-a) indicates that a conventional medicine prescribed for depression and anxiety are selective serotonin reuptake inhibitors (SSRIs) and serotonin and norepinephrine reuptake inhibitors (SNRIs). Both medications are anti-depressants known to increase serotonin in the brain by blocking uptake inhibitors. Locher et al. (2017) conducted a meta-analysis consisting of 36 trials, including 6,778 participants, concluded that SSRIs and SNRIs showed a significantly stronger correlation in decreases in anxiety symptoms, Hedges's $g = .56$; 95% CI [0.40-0.72], $p < .001$, and depressive symptoms Hedges*'s* $g = .20$; 95% CI [0.13-0.27]; $p < .001$ compared to placebos. Similar studies such as Farnam et al. (2017) show patients may use anti-depressants to reduce symptoms of anger ($SD = 10.93$, $t = 3.32$, $p < .01$). These studies provide a brief overview of how effective anti-depressants can be on different mood dimensions.

Physicians treat symptoms of mood disorders with anti-anxiety medications as well. Generally, physicians prescribe SSRIs for anxiety, followed by Benzodiazepines if needed. Benzodiazepines are strong opiate-based medications frequently used to calm the body and mind. In a meta-analysis by Gomez et al. (2018), over 56 studies, including 12,655 participants, were examined for anti-anxiety mediation treatment efficacy. In this study, benzodiazepines were shown to have a greater effect size, Hedges's $g = .50$, $p < .001$ than SSRIs, Hedges's $g = .33$, $p < .001$ and SNRIs, Hedges's $g = .36$, $p < .001$. While these medications are powerful, authors noted that addiction and strong side effects affiliated with benzodiazepines compared to other types of medication might be detrimental to their purpose.

Benzodiazepines are not the only medications met with such resistance. Researchers have had well-documented drawbacks to pharmacological treatment strategies for many years. In a research compliance questionnaire focused on the use of anti-depressants, 56% of the population sampled stated they worried that taking the medication for too long of a period would result in addiction (Kessing et al., 2005). Side effects of medications are often a common concern among users. Common side effects of anti-depressants and anti-anxiety medications include nausea, headaches, dizziness, psychomotor incoordination, fatigue, trouble sleeping, seizures, and confusion (NIMH, n.d.-b). Alternatively, a reason unrelated to these medications' physical side effects includes people actively avoiding medications to negate the social stigma of being on medications for mood. For instance, research has indicated that some individuals prescribed these medications do not want to take them for fear of being labeled or judged by others (Boyd et al., 2015). Moreover, many pharmacotherapy options may be expensive or unavailable. To this end, medicinal strategies for mood disturbance may be a viably effective treatment strategy; however, they may not outweigh the severe drawbacks and barriers remaining to use them.

Psychotherapy

Often paired with pharmacological treatment options, psychotherapy, or counseling, is a highly effective and frequently used treatment method for emotional or behavioral issues. The combination of the two treatment strategies has shown to be highly efficacious, as well. Cuijpers et al. (2014) identified in a meta-analysis of 52 studies that psychotherapy and pharmacology were significantly effective in treating mood disturbances by themselves; however, when paired together, the treatments were twice as effective as before. One of the most popular forms of psychotherapy for mood disturbance is cognitive-behavioral therapy (CBT). Treatment using CBT can often last 12 to16 sessions and require effort and practice from the client outside of treatment before significant results can be noticed (Picardi & Gaetano, 2014). For these reasons, treating mood disturbance using psychotherapy can be tedious, time-consuming, and expensive.

A newer and alternative form of treatment for mood disturbance is Biofeedback therapy. Biofeedback is a self-regulation technique that utilizes live signals relayed from the human body to provide feedback to clients to help train their bodies to improve physical, mental, and emotional health. Biofeedback includes many treatment methodologies such as electromyography (EMG), galvanic skin response (GSR), HRV, and EEG. While many of these modalities are used by a healthcare professional in conjunction with one another for treatment, one such modality that has shown significant treatment results with mood disturbances is HRV biofeedback.

In a study by Karavidas et al. (2007), researchers provided HRV biofeedback training to 10 participants meeting cut-off scores for depression in the Hamilton Depression Scale and the Beck Depression Inventory. The researchers recorded changes in the assessment scales and HRV variables at baseline intervals and the 4th, 7th, and 10th sessions. Results of the sessions indicated that significant overall decreases in the Hamilton Depression Scale, ($t(30) = -6.16$, $p < .001$), and Becks Depression Inventory, ($t(30) = -4.05$, $p < .001$), correlate with improvements in the SDNN ($p < .001$). These findings, along with a growing number of research studies, illustrate the effectiveness of biofeedback in treating mood disturbance symptoms and disorders. Much like psychotherapy, however, the utilization of biofeedback in these research studies requires time, money, and effort from the client to be significantly effective in treating mood disturbance.

In the review of treatment strategies for mood disturbances, pharmacotherapy, psychotherapy, and alternative treatment methods like biofeedback have shown to be efficacious treatment strategies. However, the research also associates these strategies with adverse side-effects, excessive cost, and the requirement of moderate effort from clients outside of treatment for the strategies to be effective. To this end, research studies examining cheaper and less detrimental treatment strategies for mood disturbances are still necessary. One possible technique meeting these criteria is the use of casual video game play. However, to better understand the applicability of casual video game play to health-related treatment strategies, one must first conceptualize what constitutes a CVG and then review the literature regarding their previous uses in the healthcare field.

Casual Video Games (CVGs)

Video games are currently one of the most popular recreational activities around the world. The Entertainment Software Association (ESA, 2019) recently estimated that over 166 million adults in the United States play video games, with worldwide video game sales soaring above $43.4 billion. It is no surprise considering the reported revenue and estimated users are at such astronomical levels that video games are bought and utilized by populations spanning across many ages, genders, and cultures. Stan Pierre-Louis, the Chief Executive Officer of ESA, was quoted in the 2019 write-up saying that three-quarters of video game users report using video games for mental stimulation and stress relief (ESA, 2019). This statement elucidates the possibility of using video games to treat mood disturbances since gamers are already using them for such methods.

The ESA (2019) surveyed 4,000 U.S. gamers about gaming habits to identify the gaming market and its impact on the world. The research data showed that 65% of Americans play video games, with over half using smartphones or personal computers to play the games. The survey indicated that the most popular of the game types, CVGs, were played the most (71%) by this study population, followed by action (53%) and shooter games (47%) (ESA, 2019). In examining their study population, the ESA (2019) found that 54% of the gaming populations were males, who are associated with higher use of action and shooter games. Likewise, the study found that female gamers were more likely to play casual and action games. While the ESA (2019) report involves many types of games, this study focuses on CVGs. Researchers conceptualize CVGs as games with varying lengths that are relatively inexpensive, easy to use, and utilized by anyone despite skill or ability (Chiapello, 2013). Estimates from 2013 reveal that over 200 million people played CVGs and represent up to 17% of gaming revenue, as they are easily accessible by smartphones or computers (Casual Games Association, 2013). The availability and popularity of these types of games make them an easy-to-use tool for research.

As the technologies surrounding these games continue to advance and develop, their effects on the body and mind have become a focal research point. The most recent literature on the subject explicitly highlights these games' long-term impact on cognitive ability, behavior, and mood. When explicitly focusing on the cognitive applications of video games, results indicate significant results in studies examining adults.

For example, Peretz et al. (2011) examined cognitive functioning in 155 adults over the age of 68 to determine that domains of focused and sustained attention, memory recognition, and mental flexibility significantly improved ($p < .05$) after video game usage. A meta-analysis on the impacts of video game training on cognitive processes by Wang et al. (2016) indicated that video games significantly influenced aspects of informational processing and spatial skills, adding that time spent playing, the number of times played, and age influenced this outcome. Although cognitive advancement brought on by video game play is a mainstay in current research, some researchers argue that adults may benefit more from studies focusing on video games' behavioral and emotional effects.

Current literature postulates that the age range of 18 to 55 years old plays essential roles in lifespan development, primarily because of neuroplasticity stabilization and high levels of psychological stress perceived by adults throughout this period (Kudielkaa et al., 2004; Zhao et al., 2015). To this end, it is reasonable to assume that researchers should examine any method of positively moderating mood and behavior during this period of life.

For example, Ryan et al. (2006) ran a three-phase study to examine the effects of video games on motivation and overall positive affect. The first phase of the study specifically examined the effect of playing a video game (Super Mario 64) on the scores of the Mood Rating Scale and the Multi-Dimensional Self-Esteem Inventory. Results from the 86 university students that participated in the study indicated that players who continued to play the video game experienced a more positive pre-to post-play difference in effect, $F(1,83) = 12.83$, $p < .001$, and self-esteem, $F(1,83) = 7.32$, $p < .001$, than the participants that did not play the game.

Russoniello et al. (2009) found equivalent results regarding CVGs and their effect on improving mood and reducing stress. This randomized controlled study utilized 143 volunteer participants from East Carolina. Researchers preemptively assessed the participants using self-reported questionnaires (e.g., the POMS) and physiological measurement strategies during gameplay. The participants were given the option of three different CVGs and instructed to play uninterrupted for 20 minutes. POMS and EEG scores showed that all three games significantly differed from the control group ($p < .05$), indicating an improvement in effect. Subscales of the POMS indicated significant changes in most mood dimensions. For example, participant's POMS scores showed a significant decrease in Tension ($p = .003$), Anger ($p = .084$). Likewise, a secondary analysis of Cohen's d showed a large change in depression scores when compared to the control group after playing the games, Peggle (d=1.4), Bookwork Adventures (d=1.2), and Bejeweled II (d= 1.1). Total overall changes in the Participants' POMS assessment scores were significant compared to control groups ($p = .01$). Likewise, HRV measurements taken illustrated that measurements of Total Power ($p = .003$) increased while a secondary analysis of Cohen's d showed a large decrease in heart rate (*d* = 1.3). The results from this study indicated that CVGs could be used to improve mood and decrease stress.

In a follow-up study, the basis for this thesis study, Russoniello et al. (2013) explored the effects of prescribing CVGS on the depression symptoms of 59 participants with clinical depression. Compared to the first study in 2009, this study utilized participants that met the criteria for clinical depression, a mood disorder. Participants were included in the study if they scored a minimum of 5 or more on the PHQ-9, a clinical assessment for depression. In addition, the researchers collected the participant's pre-intervention STAI, POMS, EEG, and HRV assessments. Researchers asked participants in the experimental group to play a hand-selected CVG for 30 minutes while they collected physiological data from the participant. The participants then repeat the pre-intervention assessments. Researchers scheduled a follow-up session to repeat this procedure after one month.

Meanwhile, the researchers asked the experimental group to continue playing the CVG for 30 minutes per day three times per week for the one month between the data collection session. This month-long assignment mirrored a prescription of CVGs for depression, allowing researchers to analyze data for correlations within and between groups. Researchers completed this analysis to determine the short-term and long-term effects of CVGs on participant's PHQ-9 scores.

Analysis of the data revealed that PHQ-9 scores significantly changed between the initial baseline assessment (Time 1) and the second baseline assessment (Time 3) that took place at the end of the one month within the experimental group ($p < .001$) and were significantly different compared to the control group ($p = .011$). Researchers found similar results when comparing the experimental groups PHQ-9 results at baseline (Time 1) and post-intervention (Time 4) scores (*p*

= .012). This follow-up study revealed that CVGs could significantly reduce depression symptoms in a clinically depressed population. Moreover, the results indicated that CVGS could facilitate the change in depression severity when used for short and prolonged periods, suggesting that the prescription of CVGs as a recreational therapy intervention may be beneficial.

Theoretical Perspective

The theoretical foundation supporting recreational activities as a treatment for mood disorders comes from the Recreational Therapy Medicine Model ([RTM]; Russoniello, 2013). In this RTM model, therapists structure recreational activities to predict, prevent, or treat disease and illness. When explaining this model, Russoniello describes similarly utilizing recreational interventions to a doctor prescribing medicine for an illness. The RTM model is similar to modern-day clinical models in that a prescribed recreational treatment intervention is utilized, assessed for effectiveness, and modified to ameliorate the participant's symptoms best. The participants continue the recreational intervention in this model until their condition is improved or the treatment no longer shows effectiveness.

Theoretical perspectives lending credence to the idea of using video games as a recreational treatment strategy derive from the benefits such activities can give its users. Ryan et al. (2006) identified that video game play motivation was positively associated with increased feelings of autonomy and competence. The authors conceptualized autonomy as controlling when and what to play and improved controls over character traits or abilities. Likewise, the authors linked competence to having the skill and abilities to complete challenges and tasks in the games. Similar research to this 2006 study found that participants can use video games to improve the frequency of positive feelings and increases in overall well-being because of the ability of the players to associate themselves with their self-created characters in the game (Snodgrass et al., 2011). In summary, researchers associate video game play with increased positive emotion production and regulation opportunities throughout the games.

Theories reflecting the findings of these research studies are also the underpinnings of this thesis study. For example, the Uses and Gratifications Theory by Ruggiero (2000) postulates that stimuli that increase positive emotions and self-regulatory opportunities draw in individuals, much like one would experience playing video games. This theory reflects Ryan et al. (2006), where gamers found increases in feelings of autonomy and competence. Similarly, one of the most highlighted attributes found throughout video game research is the concept of feelings of flow (Nakamura & Csikszemtimihaly, 2009). Nakamura and Csikszemtimihaly (2009) conceptualize the theory of flow as a subjective experience of intrinsically rewarding intense focus and lack of reflective self-consciousness garnered by situations of barely manageable challenges requiring skill and adjustment. Studies on the concept by Csikszemtimihaly and colleagues (1939) have connected increases in experiences of flow to improved self-esteem and decreased anxiety. To this end, flow may be one of many positive emotions commonly experienced and sought after via video game play alluded to in the Uses and Gratifications Theory.

Finally, a theory that will bring more perspective to the long-term benefits of utilizing CVGs is the Broaden and Build Theory by Fredrickson (2004). This theory postulates that consistently experiencing positive emotions can broaden the number of behaviors the individual considers motivating and possible while also helping the individual build and strengthen such behaviors to further improve coping strategies and goal obtainment. Granic et al. (2014) argue that video games may help gamers learn to experience and cope with anger, anxiety, or sadness in a small context while also helping one learn emotional regulation strategies like problem-solving, appraisal, and modulation. To this end, the Broaden and Build Theory help provide reasoning as to the effect of video games on emotion and behavior in the long term.

CHAPTER III: METHODOLOGY

Study Design

This research study will examine data collected from a study by Russoniello et al. (2009). Researchers used a random number generator to assign participants to experimental and control groups before the study. Researchers placed the assignment for experimental or control groups into sealed envelopes to ensure the participants were blind to their assignment until they opened their envelopes. After completing the subjective assessment, researchers connected participants to physiological measures, electroencephalography (EEG), and heart rate variability (HRV). The researchers collected the participant's baseline physiological data for 6 minutes. The researchers instructed the participants in the control group to utilize a website-based National Institute of Mental Health (NIMH, 2021) consumer website's pamphlet centered on depression for 30 minutes while measurements of researchers recorded their physiology to mimic sitting at the computer with an active task. Meanwhile, the researchers instructed the participants in the experimental group to play Casual Video Games (CVGs) for thirty minutes. Upon completing the intervention, the pre-intervention measures, Patient Health Quetionaire-9 (PHQ-9), the State-Trait Anxiety Inventory (STAI), and the Profile of Mood States (POMS), were completed again by the control and experimental groups.

During the next month, the researchers instructed the experimental group to continue playing CVGs for 30 minutes, three times per week, with at least 24 hours in between gaming sessions, and keep a log of the amount of time spent playing during the month. The participants in the experimental group were asked to choose one of the following CVGS to play for their task: Peggle, Bejeweled 2, and Bookworm Adventures. In the same one-month time frame, the control group participants were instructed not to play any CVGs. After one month, the researchers scheduled a follow-up session to record the participant's physiology while completing the same steps in the initial part of the study. Researchers then compared data collected during the study to examine changes pre- and post-intervention sessions (e.g., participants baseline physiology compared to their post-intervention physiology). The researchers also noted any changes in participants' physiological data before and after the month-long intervention.

Recruitment and Population Sample

Participants in this study were recruited via word of mouth and by recruitment fliers placed around East Carolina University and local resources such as medical practices and mental health organizations. Researchers recruited participants after the approval from East Carolina University's University and Medical Center Institutional Review Board (UMCIRB). Participants for the study included individuals from eastern North Carolina. The researchers screened participants using set criteria including; the participant must be at least 18 years of age, read and speak English, and have a score of at least 5 on the PHQ-9. This inclusion criterion ensured that all participants were adults experiencing minimal or higher symptoms of depression based on the criteria standards recommended by the American Psychiatric Association Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV-TR).

Data Collection

Researchers collected all data at East Carolina University in the Carol Belk building. The study utilized one room to minimize the potential to breach participant confidentiality and provide a consistent environment for data collection. The participant was seated to the left of the researcher with a computer directly in front of them for their research tasks.

In the initial meeting, the researcher screened the participant for inclusion in the study. Researchers explained the purpose of the study and their rights to quit at any time during the study. Upon the completion of informed consent, the researchers asked the participant to complete the baseline assessments, which comprised of a demographic profile to record information regarding the participant's age, gender, ethnicity, and previous gaming experience, along with the PHQ-9. An assessment score of at least 5 granted participants inclusion into the study. Researchers gave participants who were not included in the study their choice of a video game. If included, the participants completed the remaining assessments. Of the 89 participants recruited, 59 individuals met the inclusion criteria for the study. Researchers used a random number generator to randomly assign 30 participants to the experimental group and 29 participants to the control group.

Session one took place over a 1-hour and 30-minute period. First, all participants completed pre-intervention assessments that included the STAI and the POMS. Researchers then connected participants to a Nexus 10 to measure changes in brain wave activity using an electroencephalograph (EEG) and a photoplethysmograph (PPG) ear clip to measure the autonomic nervous system (ANS) changes using HRV methods. The software selected for this measurement recorded 6 minutes of baseline data. The researchers then asked the participants to fill a saliva tube to measure salivary alpha-amylase (sAA). After completing data and sample collection, the researchers randomly assigned participants into the control or experimental groups. The researchers instructed the experimental group to play their choice of a CVG for a total of 30 minutes. Meanwhile, the researchers instructed the control group to read a web-based computer task created by the National Institute of Mental Health (NIMH, 2021) and instructed not to play any CVGS for 30 minutes. During the intervention, EEG, PPG, and HRV data were collected. Upon completion of the intervention, researchers asked the participant to fill out the pre-intervention assessments again.

For the following one-month interval, researchers prescribed experimental group participants to play their selected CVG three times per week for a total of 30 minutes over the next 30 days. This schedule results in the participant playing CVGs for 12 sessions culminating into 6-hours of total gameplay. The researchers asked participants to log the date and duration of their playing time onto a log sheet. During this time, the researchers instructed the control group to refrain from playing any CVGs.

The research team scheduled all participants to come back in for a follow-up session precisely one month after their session one baseline collection. This follow-up phase followed the same protocol as session one, lasting 1 hour and 30 minutes. After the study, researchers provided all participants with the three CVGs used in the study and a $100 gift card for their time and participation.

Analysis Plan

A repeated measure design will examine the impact of prescribed video game play on the participants' POMS scores. This study uses a standard level of significance that will be ($\alpha = .05$). As the study is exploratory, researchers will use a Tukeys-Test for a post hoc analysis of the participants' POMS scores. Moreover, Eta-Squared (Adams & Conway, 2014) will be used to determine the effect of the prescribed CVG play and differences between groups on participants' POMS assessment scores.

CHAPTER IV: RESULTS

Sample Description

The researchers recruited a total of 85 people for the study. Of the 85 recruited, 59 participants met the study's inclusion criteria, a 44% rejection rate. Table 1 details the demographic information of the participants. The gender of the participants was split nearly evenly among the control and experimental groups. Likewise, the participants represent a similar makeup of race between the control and experimental groups. The control group participants ranged in age from 18 to 74 years old, with a mean age of 31 years old, whereas the experimental group participants ranged from 18 to 56 years old, with a mean age of 29 years old.

Table 1

Demographic Profile of Participants

Factor	Full Sample		Control		Experimental	
	n	%	*n*	%	*n*	%
Gender						
Male	29	49.1	16	51.8	14	48.2
Female	30	50.8	14	48.2	16	51.8
Race						
European American	30	50.8	19	65.5	21	70.0
African American	13	22.0	6	26.7	8	26.0
Hispanic American	2	03.4	2	6.9	0	0
Asian American	1	1.7	0	0	1	3.3

Researchers examined bivariate relationships between group status (i.e., experimental versus control) and specific variables that could modify the study results. For instance, data collected representing the participant's recent videogame play showed that 56.7% of the participants in the experimental group reported playing some video game within the past week, whereas 75.9% of the participants in the control group reported gameplay in the same timeframe. Likewise, an analysis revealed that 13.3% of the participants in the experimental group and

34.5% of the participants in the control group were using anti-depressant medication. To this end, all demographics were examined using a Chi-square analysis to determine if there is any relationship between the categorical variables. Due to not having a sufficient count of 5 for each variable, two variables, race and age, were recoded. Race was recoded in this analysis to White and Non-White, meanwhile, all ages were recoded to into the variables of 25 and younger or 26 and older.

Table 2

*Frequencies and Chi-Square Results for Group by Demographics Comparison (*N = 59*)*

	Control (n = 29)		Experimental (n = 30)		X^2 (p)
	n	%	*n*	%	
White	19	63.3	21	70.0	0.30 (.78)
Non-White	11	36.7	9	30.0	
25 and younger	14	48.3	16	53.3	0.15 (.79)
26 and older	15	51.7	14	46.7	
Took Mediation	10	34.5	4	13.3	3.60 (.07)
No Medication	19	65.6	26	86.7	
Male	16	53.3	14	46.7	0.26 (.79)
Female	14	46.7	16	53.3	
Recent Gaming	22	75.9	17	56.7	2.90 (.23)
No Gamer Experience	7	24.1	13	43.3	

An analysis of the variables in Table 2 showed that none of these variables had a significant interaction between groups. Moreover, an analysis of the log sheet tracking the participants in the experimental group’s use of Casual Video Games (CVGs) during the month-long intervention revealed the participants played CVGs three times a week, as prescribed, for an average time of 40.7 minutes. The minimum duration of time participants spent playing CVGs was 30 minutes, and the maximum time of CVG play was 68 minutes.

Hypotheses Testing

This purpose of this study is to test the hypothesis that there will be a significant decrease in Total Mood Disturbance (TMD) scores measured by the Profile of Mood States (POMS) between the experimental and control groups. To that end, a repeated measures analysis of variance (ANOVA) was utilized to determine differences between the experimental groups and control group throughout the study. In Table 3, the researchers used a between group analysis to determine if there is an overall significant different between the composite TMD scores of the control group and the experimental group.

Table 3

Between Group Test for TMD Scores

Group	*n*	*M*	*SD*	Mean Difference	*F*	*p*
Control	29	38.5	7.9	19.5	6.1	.017
Experimental	30	19.0	7.9	-19.5	6.1	.017

Between-group analyses, including all measurement times, for the experimental and control group TMD scores were significant, F (1, 56) = 6.1, p = .017 (see Table 2). These findings indicate prescribed CVG play significantly improved participants' TMD scores. The analysis of data from Table 3 did not show where the most significant changes for TMD took place within each group, as it is a calculation of all four measurement times. The researchers used a repeated measures ANOVA to determine if a significant interaction of group by time occurred. However, data violated the assumption of sphericity (X^2 = 39.7, df = 2, p < .001), therefore degrees of freedom were corrected using the Greenhouse-Geisser estimates of sphericity. After these corrections, the analysis revealed a significant interaction between groups and time, F (2.12, 56) = 5.82, $p < .05$.

Table 4

Between Group Tests for TMD Scores at Time 1, Time 2, Time 3, and Time 4

Time	Group	Group	Mean Difference	*SD*	*p*
1	Control	Experimental	0.2	11.2	.982
2	Control	Experimental	24.4	9.7	.002
3	Control	Experimental	23.9	3.9	.020
4	Control	Experimental	29.6	14.2	<.001

The comparison of groups by time in Table 4 revealed no significant differences in TMD scores between the experimental and control groups at the initial baseline assessment, Time 1. At the end of the first session, Time 2, TMD scores for the control and experimental groups were significantly different, $p = .002$. This change between Time 1 and Time 2 signifies that prescribed CVGs may have a substantial short-term effect on TMD scores. Similar results come when looking at the long-term effects of prescribed CVG play, as data from Time 3 revealed a significant difference, $p = .020$, in TMD scores between control and experimental groups after one month of prescribed CVG play. Lastly, Time 4 shows a significant difference, $p < .001$, in TMD scores between the groups after the study. As Table 4 identified the significance of participant’s TMD scores between the groups, researchers conducted further analysis to determine the significance of change over time within each group.

Table 5

Pairwise Comparisons for TMD Scores

Group	Time	Time	*N*	Mean Difference	*SD*	*p*
Experimental	1	2	30	52.3	6.0	<.001
	1	3	30	37.1	5.6	<.001
	3	4	30	25.7	4.9	<.001
Control	1	2	29	28.1	6.1	<.001
	1	3	29	13.4	5.8	.026
	3	4	29	20.0	5.0	<.001

When examining the experimental group participant's TMD scores, data revealed that a significant change happened over the entirety of the study, F (3, 56) = 27.32, $p < .001$. Concurrent with Table 4, Table 5 shows a significant change between Time 1 and Time 2, $p < .001$, reflecting the short-term impact the prescribed CVGs had on the participant's TMD scores. Likewise, researchers found a significant change between Time 1 and Time 3, $p < .001$, indicating a strong impact of long-term use of CVGs on the participant's TMD scores. Significant changes between Time 2 and Time 3, $p < .05$, and between Time 3 and Time 4, $p < .001$, were also noted in Table 5, further substantiating the impact of prescribed CVG play had on the experimental group participants TMD scores.

Analysis revealed similar results when looking at the control group for changes over time F (3, 54) = 8.14, $p < .001$. Researchers found a significant change between all times for control groups. Respectively, there was a significant change in TMD scores between Time 1 and Time 2, $p < .01$, Time 2 and Time 3, $p < .05$, Time 1 and Time 3, $p < .05$, and Time 3 and Time 4, $p < .001$. Though the differences in Table 3 showed the experimental group displayed a more significant improvement in their TMD scores when compared to the control group participants, the researchers note the control group still showed significant improvement in their TMD scores overall throughout the study.

Table 6

Pairwise Comparison of POMS Dimensions within the Experimental Group

Variable	*n*	Time	*M*	Time	*M*	Mean Difference	*SD*	*p*
Anger								
	30	1	12.7	2	1.0	11.7	1.6	<.001
	30	1	12.7	3	6.9	5.8	1.4	<.001
	30	3	6.9	4	0.7	6.2	1.4	<.001
Anxiety								
	30	1	15.2	2	4.6	10.5	1.3	<.001
	30	1	15.2	3	7.8	7.4	1.8	<.001
	30	3	7.8	4	2.2	5.6	9.3	<.001
Fatigue								
	30	1	13.5	2	5.7	7.8	1.1	<.001
	30	1	13.5	3	8.6	4.9	0.9	<.001
	30	3	8.6	4	4.6	4.4	7.9	<.001
Depression								
	30	1	16.9	2	4.6	12.3	1.9	<.001
	30	1	16.9	3	8.4	8.5	1.8	<.001
	30	3	8.4	4	2.0	6.4	1.6	<.001
Confusion								
	30	1	11.6	2	3.90	7.7	1.3	<.001
	30	1	11.6	3	5.60	5.9	1.1	<.001
	30	3	5.7	4	0.06	5.6	0.8	<.001
Vigor								
	30	1	12.1	2	13.2	- 1.2	0.9	.18
	30	1	12.1	3	15.6	- 3.5	0.9	<.001
	30	3	15.6	4	13.1	2.4	0.9	.23

After finding a significant change in the participant's TMD scores within the experimental group, researchers conducted further analysis to determine what dimensions of TMD showed the most change. As seen in Table 5, five of the six variables, excluding vigor, showed a significant reduction between Time 1 and Time 2, $p < .001$, after the first session. The dimensions of Depression, Anger, and Anxiety all showed the most significant changes at this time. Likewise, all six variables showed a significant change after one month of CVG play, $p < .001$, between Time 1 and 3. After one month, the dimensions of anxiety and anger showed the most change. Most notably, vigor increased throughout the study and showed a significant change after one month of CVG play, $p < .001$, between Time 1 and Time 3.

Table 7

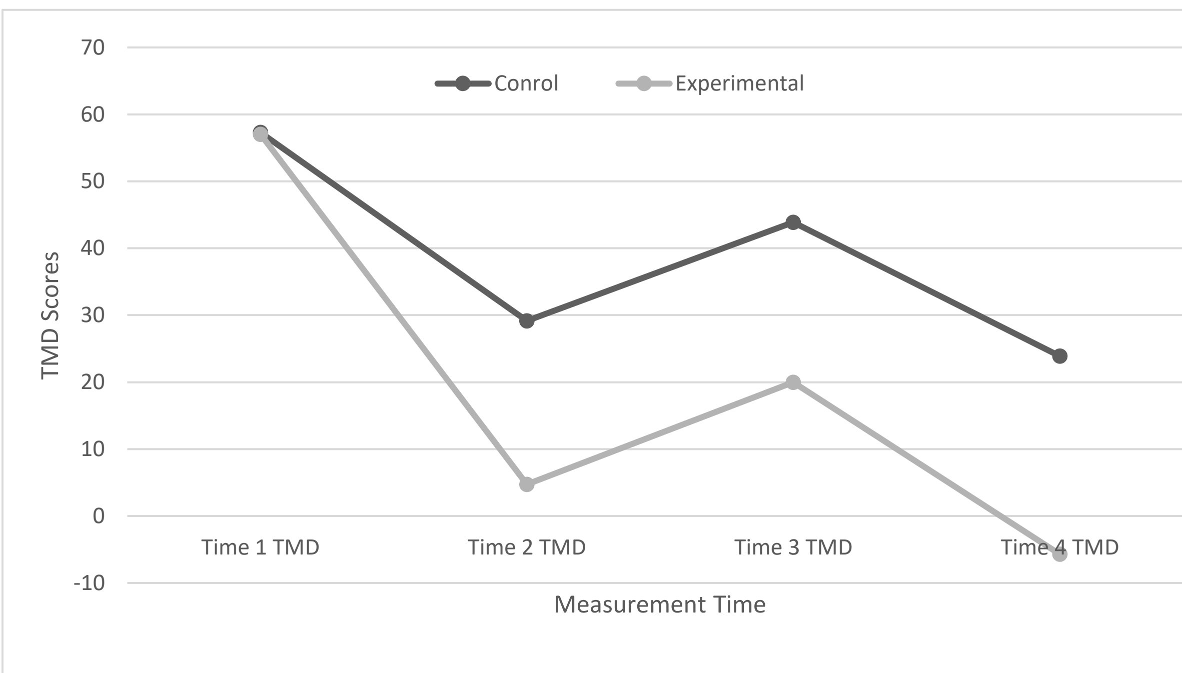
Pairwise Comparison of POMS Dimensions within the Control Group

Variable	*n*	Time	*M*	Time	*M*	Mean Difference	*SD*	*p*
Anger								
	29	1	14.5	2	4.1	10.4	1.2	<.001
	29	1	14.5	3	10.9	3.5	1.4	.19
	29	3	10.9	4	4.4	6.6	1.4	<.001
Anxiety								
	29	1	13.4	2	8.3	5.1	1.3	<.001
	29	1	13.4	3	10.8	2.6	1.2	.35
	29	3	10.8	4	6.6	4.2	0.9	<.001
Fatigue								
	29	1	13.1	2	9.2	3.9	1.1	<.001
	29	1	13.1	3	10.7	2.4	0.9	.015
	29	3	10.6	4	4.4	2.4	0.8	.006
Depression								
	29	1	18.9	2	9.2	9.6	2.0	<.001
	29	1	18.9	3	14.6	4.3	1.9	.260
	29	3	14.6	4	7.4	7.1	1.6	<.001
Confusion								
	29	1	11.6	2	8.6	3.0	1.3	.220
	29	1	11.6	3	9.9	1.6	1.1	.160
	29	3	9.9	4	-4.4	5.6	0.8	.001
Vigor								
	29	1	12.3	2	8.2	4.1	0.9	<.001
	29	1	12.3	3	11.2	1.1	0.9	.250
	29	3	11.2	4	8.4	2.8	0.9	.020

After looking exclusively at the experimental group, one may remember that the participants in the control group also showed a significant change over time $F(1, 54) = 8.14$, $p < .001$, in their TMD scores. After further analysis of the control group participants' POM scores, Table 6 shows that all dimensions of TMD, except confusion, showed a significant reduction, $p < .001$, from their baseline scores at Time 2. Interestingly, the only dimension of TMD that showed significant change after one month was fatigue, $p = .015$, between Time 1 and Time 3. One notable factor in the control group is the decrease in Vigor throughout the study, whereas the experimental group showed increased vigor throughout the study. A visual comparison of the experimental group and the control group can be seen in Figure 1.

Figure 1

Overall TMD score Profile Plot between the Experimental and Control Groups



Note: Each data point resembles the mean TMD score of the respective groups at each measurement time.

Figure 1 shows the trajectory of the composite TMD scores between the experimental and control groups. The profile plot reveals that the experimental and control group have a parallel representation. Moreover, this figure provides a visual representation of the difference between the effects of CVGs on TMD scores compared to the control group utilizing bibliotherapy.

Summary of Results

This study concludes that prescribed CVG use significantly correlates with improvements in TMD scores of participants diagnosed with depression. The data collected in this study also reflect that prescribed CVG use significantly correlates to improvements in TMD scores after short-term and long-term use. This conclusion is evidenced by the significant change in participant’s TMD scores throughout one session and one month. Analysis of the dimensions of TMD further evidence that there was a significant improvement in all mood dimensions throughout the study for participants in the experimental group. However, there were only significant improvements in the control group participants in these exact dimensions between Time 1 and Time 2, not after one month.

CHAPTER V: DISCUSSION

Discussion of Findings

The purpose of this study was to examine the efficacy of utilizing prescribed Casual Video Games (CVGs) as a treatment strategy to improve Total Mood Disturbance (TMD) scores, as measured by the Profile of Mood States (POMS) assessment, in adults diagnosed with depression. This study examined one hypothesis using a repeated-measures analysis of variance (ANOVA) to determine if TMD scores decrease significantly more in an experimental group prescribed a regimen of CVGs compared to a control group utilizing a bibliotherapy task. The study used a randomized controlled research design that assigned the sample population into two groups. The researchers instructed the experimental group to play their choice of a CVG for a total of 30 minutes at least three times per week for 30 days. Meanwhile, the researchers instructed the control group to read a web-based computer task created by the National Institute of Mental Health (NIMH, 2021) and instructed not to play any CVGS for the month duration. Researchers screened participants using the Patient Health Questionnaire (PHQ-9) for measurements of depression, the State-Trait Anxiety Inventory (STAI) for measurements of anxiety, the POMS for measures of TMD, heart rate variability (HRV), and a NEXUS-10 system to measure electroencephalography readings.

Hypothesis

The hypothesis for this study is there will be a significant decrease in TMD scores as measured by the POMS between the experimental and control groups. The results of this study indicate a significant reduction in participant's TMD scores for both the control and the experimental group. Moreover, significant improvements were seen in TMD scores after both one-session and one-month increments, suggesting that prescribed CVGs can have an immediate and a long-term impact on TMD after continued use. To this end, the data collected in this study *supports* the hypothesis that a prescribed CVG can decrease TMD scores of adults with depression.

A further breakdown of the dimensions of the POMS assessment scores provided a clearer view of why the participant's TMD scores decreased significantly among both groups. For example, both groups showed a significant decrease in symptoms of depression between Time 1and Time 2, $p < .01$, after one 30-minute session, however, only the participants in the experimental group showed the same significant decrease in depression symptoms after one month, $p < .001$, between Time 1 and Time 3. These results from the POMS assessment coincide with results from previous studies on this same data set. Russoniello et al. (2013) found that participant's PHQ-9 depicted a significant difference in depression levels between experimental and control groups, $p < .001$, over time and showed significant differences in the experimental from Time 1 and Time 3 after the one-month increment.

Like depression scores, the participant's anxiety scores between the two groups showed significant decreases in anxiety symptoms after one 30-minute session, $p < .001$, but only the participants in the experimental group showed a significant decrease in anxiety symptoms after one month, $p < .01$, between Time 1 and Time 2. Fish (2011) reviewed this dataset for changes in anxiety levels measured by the STAI and found a significant between the control and experimental groups for state anxiety, $p < .01$, but no statistical difference between groups for trait anxiety overall. The data for the POMS assessment in this study showed significant changes for anxiety dimensions after one 30-minute session within the control group; Fish (2011) found no significant change in state anxiety, $p = .48$, or trait anxiety scores, $p = .135$, within the participants in the control group. The discrepancy between the findings of the two assessments is noteworthy; however, one can find a possible explanation when examining the internal consistency of the two assessments. Bourgeois et al. (2011) found the internal consistency of the POMS to be around .80 when assessing anxiety symptoms, whereas Spielberger (1983) found the internal consistency of the STAI assessment to be between .86 and .96, respectively.

One may find comparable results when reviewing other research studies examining the effects of CVGs on mental health outside of this dataset. For instance, Dennis and O'Toole (2014) examined the effectiveness of 25 minutes of CVG play on 78 anxious patients using the STAI and POMS assessment. The results from the study determined that the group that played CVGs for one session resulted in a reduction in their anxiety and stress levels compared to a placebo group F (3, 66) = 2.48, p = .07. Finally, Russoniello (2019) compared the effects of a prescribed 30 to 45 minutes of CVG play with a second anti-depressant medication on depression symptoms measured by the Quick Inventory of depressive symptoms, PHQ-9, and HRV assessments. Results indicated a single 30-minute prescription of CVG play was more effective at reducing treatment-resistant depression symptoms (Wald Chi-Square = 32.5, df = 1, p < .001) compared to the antidepressant medication

The results from the before-mentioned supplementary studies reflect similar improvements in mood after the short-term and long-term use of CVGs. In these studies, the researchers highlight key components that may further explain this study's results. For instance, Horovitz (2016) posits that CVGs effectively treat conditions like depression and anxiety because they perform as distractions from stressful stimuli such as a dentist appointment his test subjects were waiting on. Reinecke (2009) also alluded to this theory, after surveying 1,614 participants about gaming habits, found that many of the population used CVGs shortly after stressful situations to recover from the event. In all of these situations, the individual is resorting to using an activity or action to improve their mood. This behavior is reflective of the theoretical basis of this study.

For example, the Uses and Gratifications theory postulates that any stimulus that increases the feelings of positive emotions and opportunities to self-regulate draws the individual to that stimulus. In the examples above, the participants used CVGS as an opportunity to regulate their feelings of stress and anxiety. Moreover, the games provided opportunities to increase the feelings of positive emotions and experiences. One such positive emotion is the experience of flow. Nakamura and Csikszemtimihaly (2009) described flow as a subjective experience of intrinsically rewarding intense focus and lack of reflective self-consciousness garnered by situations of challenges requiring skill and adjustment. As the state of flow is intrinsically rewarding, people are more likely to seek out activities that promote flow experiences. Pine et al. (2020) allude to flow as a factor in why CVGs are effective at ameliorating stress. As the gamer reaches a state of flow, the person's concentration focuses on the game, not paying attention to any stressful stimulus. The result is a decrease in the experience prompting feelings of anxiety or depression. Likewise, another positive emotion explaining the significant influence of CVGs on scores stems from the concept of choice.

Stanhope et al. (2013) note that it is essential for practitioners to offer various treatment options to individuals with a mental-health-related illness, adding that such options correlate to higher adherence rates to treatment and better treatment outcomes. Furthermore, the choice in treatment strategy primarily promotes feelings of autonomy, which, in turn, may correlate to better coping strategies and adherence to treatment strategies and their effects. To this end, providing the individuals with a CVG as a stimulus gave the person an activity that promoted positive experiences and emotional regulation.

Moreover, the Broaden and Build theory explain the compounding effect of the consistent experience of these positive emotions and opportunities for self-regulation. Much like the prescription of CVGS three times a week for a month in this study, the theory posits that the more an individual interacts with these stimuli, the more there is an opportunity to build coping strategies and learn to regulate the experience of negative emotions. The significance of the experimental group lowering and maintaining their TMD scores after a month cannot be overstated. This prolonged decrease in TMD scores suggests that the participants were able to learn to regulate some of their emotions or use the CVGS as a stress-relieving technique. To this end, the participants were able to broaden their knowledge of techniques they can use to regulate their moods and possibly build on the coping strategies they already had. However, this is not only seen in the experimental group but also the control group.

As we have discussed why the experimental group showed such a significant improvement, it is equally important to discuss the changes in the control group. When analyzing the control group, one can see the TMD scores of participants in the control group showed improvements after the first session, Time 2, and after the one-month, Time 3. The control group participants showing such a significant improvement in their TMD scores should not come as a surprise. Researchers asked the participants in the control group to utilize a form of bibliotherapy as evidenced by utilizing the NIMH depression-based website. The researchers used the website to mimic a computer-related task. Gregory et al. (2004) highlighted bibliotherapy as an effective strategy to improve mood in adults diagnosed with depression. To this end, seeing improvement in a participant’s TMD scores after utilizing bibliotherapy strategies was expected.

Implications for Practice

This study has significant implications for recreational therapy (RT) providers looking for new treatment strategies when working with clients to decrease total mood disturbance symptoms. The results of this study depict a significant effect of a prescription of CVGs for improving a person's TMD scores after both short-term and long-term use. The benefit of RT providers using CVGs as a treatment option shows promise. Firstly, CVGs provide an avenue of treatment that alleviates the obstacles most treatment modalities face, such as high prices, limited availability, and negative stigma surrounding mental health treatment use.

One of the most common obstacles to obtaining mental health treatment is availability. Due to the rise and spread of the Coronavirus, hospitals and doctors' offices are filled. It can take a week, or even months, to see a healthcare professional for non-life-threatening conditions. In an article discussing the effect of the pandemic for the World Health Organization (WHO), Alison Bruneir (2020) noted that 93% of the world is seeing an uptick in demand for mental health services. Meanwhile, the WHO stated that 67% of these same countries are seeing significant disruptions in access to psychotherapy and medications for mental health care services. The result is that many of these countries are resorting to telehealth services on the phone or online. CVGs make the perfect adjunct therapy tool as practitioners can prescribe, obtain, and use away from the doctor's office. As the results of this study show, CVGs can be used as a treatment to impact mood when used as an at-home prescription. Likewise, RT providers can prescribe CVGs as a treatment strategy when resources and treatment availability are scarce. The applications for this type of treatment strategy could range from decreasing and preventing further feelings of anxiety before further treatment (e.g., an upcoming invasive surgery) in the short term or prescribing the use of CVGs to a client with difficulty treating depressive symptoms for a month. As shown in this study and the literature, recreational therapists can use a prescription of CVGs for both a preventive measure and concurrent treatment of mood disruption in conjunction with other treatment strategies like pharmacotherapy or psychotherapy.

Moreover, negative stigma is most notably associated with mental health treatments. For example, Pedersen and Paves (2017) conducted a research study to understand the way adults view mental health treatment. One third of the study's participants stated that they believe their peers would negatively view them if they sought out mental health treatment. As recreational therapy providers, leisure activities are structured to improve the functional abilities of those with disabilities or illnesses. Recreational therapy allows these individuals to engage in recreational or leisure activities that they may not view as a typical mental health treatment with a negative stigma attached, structured as a treatment to improve functional ability. As highlighted by Lundberg et al. (2011), recreational therapy provides individuals with disabilities or illnesses with activities, like adaptive sports, that help them improve functional ability, build social networks, and negate negative stigmatizations brought on by their conditions. This study provides evidence that RT providers can use CVGs as a prescribed adjunct treatment for mood disruption. To this end, CVGs also fall into the category of a popular recreational activity used to prevent and ameliorate mental illness symptoms while also being seen as an activity with little to no negative stigmatization attached. CVGs give RT providers yet another technique to help those with a disability or mental health illness that alleviates the obstacle of stigmatization that is generally associated with mental health treatment.

In relation to the concept of prevention, as mentioned above, this type of treatment gives RT providers a treatment strategy that aligns well with a popular model within the field, the

Recreational Therapy Medicine Model (RTM). The RTM model, highlighted by Russoniello (2013), states that recreational activities are structured to predict, prevent, or treat disease and illness. Therefore, the goal of any treatment strategy prescribed by RT providers for mood disruption needs to be applicable to the prevention and amelioration of mood disturbance symptoms. Lobel et al. (2014) suggested video games can be used by the individual as a stress reliever, distraction from stressful stimuli, or a method to help the gamer build stronger coping mechanisms. Similarly, Sauter et al. (2020) suggested that video games may be able to help predict mental health issues. Sauter et al. concluded that the type of video game (social or solo-play) and the purpose of playing the video game (distraction or achievement-based) are associated with feelings of depression or anxiety.

In summary, researchers are starting to examine the impacts of CVGs on mood and stress. An analysis of the results of this study show that a prescription of CVGs do have an impact on reducing TMD scores in short term and long-term periods. Used as a treatment technique, RT providers can prescribe CVGs as a treatment intervention to help prevent and treat symptoms of mood disturbance. There are any benefits to using CVGs as a treatment technique, including low cost, easy access, and reduced negative stigma compared to that of pharmacology or psychotherapy. However, additional research on the use of CVGs in this population could be beneficial in making the prescription of this technique more effective.

Future Study Suggestions

Future studies examining the effectiveness of CVGs should determine the efficacy of using different prescription amounts for CVG treatment. For instance, does a smaller increment of time at an increased frequency have the same results? Likewise, would an hour instead of 30 minutes per day substantially increase the effectiveness of CVGs on TMD? Doing so would allow healthcare professionals to determine an exact treatment methodology to follow when implementing treatment for TMD symptoms. Furthermore, future research studies should compare CVG treatment with anti-anxiety medications. As we have seen from Russoniello et al. (2019), CVGs compare favorably with antidepressants. Thus, research examining a comparison between a prescription of CVGs, and anti-anxiety medication will help recreational therapy practitioners determine if CVGs are an alternative treatment option for clients diagnosed with anxiety symptoms.

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APPENDIX A: IRB APPROVAL LETTER

EAST CAROLINA UNIVERSITY
University & Medical Center Institutional Review Board
4N-64 Brody Medical Sciences Building· Mail Stop 682
600 Moye Boulevard · Greenville, NC 27834
Office **252-744-2914** · Fax **252-744-2284** ·
rede.ecu.edu/umcirb/

Notification of Exempt Certification

From:	Social/Behavioral IRB
To:	Aaron Craven
CC:	Matthew Fish
Date:	3/26/2020
Re:	UMCIRB 19-002978 THE EFFECTIVENESS OF PRESCRIBED CASUAL VIDEO GAME PLAY IN REDUCING TOTAL MOOD DISTURBANCE: A RETROACTIVE ANALYSIS

I am pleased to inform you that your research submission has been certified as exempt on 3/26/2020. This study is eligible for Exempt Certification under category # 4b.

It is your responsibility to ensure that this research is conducted in the manner reported in your application and/or protocol, as well as being consistent with the ethical principles of the Belmont Report and your profession.

This research study does not require any additional interaction with the UMCIRB unless there are proposed changes to this study. Any change, prior to implementing that change, must be submitted to the UMCIRB for review and approval. The UMCIRB will determine if the change impacts the eligibility of the research for exempt status. If more substantive review is required, you will be notified within five business days.

Document	Description
212020 THE EFECTIVENESS OF PRESCRIBED CASUAL VIDEOGAME PLAY IN REDUCING TOTAL MOOD DISTURBANCE (Autosaved) (Autosaved) (Recovered) (Autosaved).docx(0.01)	Study Protocol or Grant Application

For research studies where a waiver of HIPAA Authorization has been approved, each of the waiver criteria in 45 CFR 164.512(i)(2)(ii) has been met. Additionally, the elements of PHI to be collected as described in items 1 and 2 of the Application for Waiver of Authorization have been determined to be the minimal necessary for the specified research.

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