Impact Psychological Symptom Severity on Leisure Time Exercise Behavior and Perceived Benefits and Barriers to Physical Exercise

Stacy Reuille-Dupont

A Dissertation Submitted to the Faculty of

The Chicago School of Professional Psychology

In Partial Fulfillment of the Requirements

For the Degree of Doctor of Philosophy in Clinical Psychology: Specialty Somatic Psychology

November 25, 2014

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

Impact of Psychological Symptom Severity on Leisure Time Exercise Behavior and Perceived Benefits and Barriers to Physical Exercise

---

A Dissertation Submitted to the Faculty of

The Chicago School of Professional Psychology

In Partial Fulfillment of the Requirements

For the Degree of Doctor of Philosophy in Clinical Psychology, Somatic Specialty

---

Stacy Ann Reuille-Dupont

2014

Approved by:

Erica Ellis, PsyD, Chairperson

Marlon Sukal, PhD, Committee Member

Gina Lasky, PhD, Committee Member

Acknowledgements

This project would not have been possible without the support and guidance from so many who mentored, cheered, and provided a listening ear when I needed to process my thoughts. I am so grateful for the holding that took place as I unfolded my learning around this branch of psychology and this "being human". I am so grateful, first and foremost, to my family, I could not have done this without your belief in me. Mom and Dad, you are my rocks. To Jeffrey, I am so blessed to have you in my life walking each step with me along my journey. To my children, who do not know what it's like to have a mother not in school, I am so proud of your accomplishments and growth. I hope watching me in this process has provided a foundation for your own personal paths of learning. To Colleen, Bridget, and Megan who always provided me with reflection on who I really am as I moved, and continue to move, toward my goals. To Melanie and Chad, your acceptance and excitement around my accomplishments has been unconditional. I am so grateful for the way you embrace me and cheer me on.

Thank you to Axis Health System and my adult outpatient team colleagues for partnering with me to complete data collection for this study. I cannot thank my supervisor Stephanie Allred, PhD enough. The support, sounding board, and grounding allowed me to complete this project, stay focused, and regulated throughout difficult ups and downs in the process. To Edmund Knighton, PhD who has allowed me opportunities to push my career development and choose new paths to grow as I worked to complete my journey through the somatic psychology department. And to my committee, Erica Ellis, PsyD, Marlon Sukal, PhD, and Gina Lasky, PhD, your attention to detail, pushing me to present the best work possible, the time and effort spent pouring over lines in my literature review, and open access to check in was such a solid foundation. The experience of your solid foundation allowed me to create this large last

assignment and build my ability to work autonomously with success. Finally, my teachers throughout my life have been so influential. I have spent most of my life in a learning environment and am blessed to have had so many teachers along my path that lit the way and created the spark for lifelong learning.

I appreciate and have deep gratitude for all those who have shown up along my journey. Thank you.

Dedication

I dedicate this project to my aunts, uncles, and in loving memory to my grandparents who all embraced and valued education. They pushed me to seek my own answers.

Abstract

Those with mental health issues often present in primary care with somatic symptoms, utilize more health care, and on average die younger. Physical exercise has the potential to be an effective treatment for comorbid physical and mental health symptoms; however, prescribing exercise for those with mental illness is more complicated. Although physical exercise is a possible intervention, more research is needed to further understand the complicated influences exercise may have on those in mental health outpatient with complicated presentations, trauma histories, disruption to the HPA axis, attachment bonds, and possible complicating substance use. Exercise is dose responsive and research has pointed out intensity of exercise performed matters when attempting to shift physical health. This study used three measurements of symptom severity: Trauma Symptom Checklist–40, Global Assessment of Functioning, and the Patient Health Questionnaire to assess 149 clients presenting for outpatient treatment in a rural community health center. Using the Exercise Benefits / Barriers Scale and the Godin Leisure Time Activity Questionnaire the perception of exercise benefits, barriers, time spent exercising, and intensity levels of exercise was assessed. Those with higher symptom cluster presentations exercised less often and less intensely. Those who had participated in physical exercise over seven days with strenuous or moderate intensity reported less symptoms related to somatoform disorder, depression, panic, and anxiety. Additional findings and implications for future research are discussed.

Table of Contents

List of Tables

Chapter 1: Introduction to the Study

Many clients in mental health outpatient treatment programs have experienced exposure to traumatic life experiences (Classen et al., 2011; Sarin & Nolen-Hoeksema, 2010; van der Kolk, Roth, Pelcovitz, Sunday & Spinazzola, 2005). Psychological trauma may be a risk factor for comorbid health disorders in outpatient clients (Schnurr & Spiro, 1999; Vieweg et al., 2007). Addressing both physical and mental health needs of those with trauma histories has the possibility to increase quality of life for many clients, along with decreasing medical complications and costs (Green et al., 2011; Hunter & Goddie, 2010).

Background of the Problem

It is well documented that many common causes of death are linked to obesity (Reilly & Kelly, 2011) and obesity may impact mental health. Mental health clients often have a number of physical health issues. For a variety of reasons they often state taking care of themselves is overwhelming. Colton and Manderscheid (2006) reported mental health clients died younger from causes similar to nonmentally ill cohorts. Those with mental illness died on average 13-30 years younger (between 49 and 60 years old) and at 1.2-4.9 times higher rates than those unaffected by mental health problems. Simon and colleagues (2006) found obesity was linked to mood disorders, raising the probability of a mood disorder by 25% and Scott and colleagues (2008) examined data from different countries and found obesity was significantly linked to mood disorders. Through a study of Medicaid claims, Jones and colleagues (2004) linked physical and mental health in over 74% of the populations studied. An area of research growth works to understand how psychological trauma impacts quality of life. The impacts of trauma are not just about mental and physical health they also impact brain development, narrowing of experience, and changes in physiology (McEwen, 2007; Schore, 2001). Those who have

experienced childhood traumas have more limbic system dysfunction (Cloitre et al., 2009; van der Kolk, 1994; van Dijke et al., 2011). This dysfunction leads to difficulties interacting with the world and others, increasing risk of developing PTSD type symptoms and physical illnesses. These difficulties lend themselves to creating increased stress on the body and mind. Psychological trauma may impact development of obesity related disorders and treatment providers may be more effective when considering how trauma and obesity co-occur thus offering a more complete whole person care model.

The Soma

Somatic experience is concerned with how the body experiences the event. Often, psychological events play a role in subsequent body expressions or vice versa. The word *soma*, meaning living body, finds its roots in ancient Greek, and is often used in biology related fields to identify the body walls of an organism. Physical sensations and physiological changes felt in the body are linked to the mind through memories, story, and life narratives about the event. The categorizing of felt sense creates a map of experiences for quick reference during future events. It is important for health care providers to understand that the body and mind work together to bring experiences to life. For many in mental health treatment somatic symptoms are clues to the mind (Sayar & Ak, 2001). According to Simon, VonKorff, Piccinelli, Fullerton, and Ormel (1999) over 60% of patients with depression presented for treatment with somatic symptoms. Porges (1998) outlined how physical changes interact with one's ability to socially engage via heart rate variability. In this outline named the polyvagal theory, Porges offers support to the complex nature of mental and physiological interactions that manifest as behavioral problems or mental dysfunction clients live with and react to. Much research points to a number of physical changes due to the stress response, such as, inflammation, elevated diurnal cortisol levels, and

changes in metabolic processes (Meaney et al., 1996; Schechter et al., 2004). As a result it is possible to note physiological changes, such as heart rate variability, following a course of psychological trauma treatment (Frustaci, Lanza, Fernandez, Giannantonio, & Pozzi, 2010). Bodywork can help build a bridge between the somatic experience (of a traumatic event) to meaning and words (Ogden, Minton, & Pain, 2006). This allows an individual to begin communicating about inner somatic experiences of hyper and hypo arousal (Holford, personal communication, April 5, 2013; Levine & Frederick, 1997), to become conscious of changes made, and apply these changes to a new way of being in the world (Keller & Kurtz, 2001; Kurtz, 1990).

The Mind

Stressful changes in the body result in changes to the brain (McEwen, 2007). In order to make sense from experiences, an individual must integrate both body sensations and emotions with the mind through insight and meaning. To integrate insight experience of body and mind must be present in psychotherapy sessions (Kurtz, 1985; Ogden, 2009). Siegel (2010a, 2009b) stated a healthy mind emerges from integration such as an integrated nervous system and healthy relationships. He described integration as linking of differentiated parts through the prefrontal cortex (PFC). The PFC links differentiated systems of the brain that interact with the body, and activation of these systems (social, somatic, limbic, cortical) promotes growth in integrated fibers of the brain (Siegel, 2010b). When these systems are not well integrated the person suffers from a variety of dysfunctions that may amplify each other. Coates (2010) drew the conclusion that given the difference in brain development and the tendency for trauma survivors to limit activities that might lead to hyperarousal, opportunities for healing experiences become limited. When trauma is experienced the brain is impacted by a cascade of stress hormones thus

vulnerability increases and dysfunction is compounded. According to Conrad (2008) the glucocorticoid vulnerability hypothesis stated the brain is vulnerable to stress related deficits. Physical exercise may offer a treatment option to this hormonal overwhelm. Although exercise also adds stress to the body, it seems to offer a healthy way to metabolize stress hormones (Duclos, Gouarne, & Bonnemaison, 2002; Wittert, Livesey, Espiner, & Donald, 1996). Integration of body and mind is important in psychological trauma treatment, co-occurring physical health disorders, and treatment must be done on both body and mind levels.

Physical Exercise as Treatment

Exercise may be an effective way to increase client integration between somatic experiences of trauma (hyper vs. hypo arousal) and allow space to make meaning of life events (Kurtz, 1990). Common exercise movement patterns are often bilateral in nature and may lend to addressing both psychological trauma and comorbid obesity related symptoms. Bilateral stimulation, or use of both sides of the body through tapping, eye shifts, or movement, has been implicated as an intervention to help clients integrate traumatic experiences, deal with anxieties, and decrease hyperarousal due to a number of mental health diagnoses (Bergmann, 2010; Bloomgarden & Calogero, 2008; Cahill, Carrigan, & Freuh, 1999; Pagani et al., 2012; Shapiro & Forrest, 2004; Stickgold, 2002). Physical exercise may offer a similar opportunity for individuals to process high emotional content using the dual attention focus that bilateral movement requires. It is known that the brain experiences events through both hemispheres (Bakan, 1969) and those traumatic events may disrupt the communication between hemispheres (Bergmann, 2010; Ogden, Minton, et al., 2006). Exercise enhanced learning, memory, and neuroplasticity may be beneficial to those who have experienced difficult life circumstances and continue to manifest disrupting trauma symptoms (McEwen, 2007; Sugarman, 2006). A number of studies have

pointed to positive neurological and endocrine responses to exercise (Ding, Vaynman, Akhavan, Ying, & Gomez-Pinilla, 2006; Droste et al., 2003; Fong et al., 2005). Research has shown the brain continues to change according to experiences (Isaacs, Anderson, Alcantara, Black, & Greenough, 1992; Raichlen & Gordon, 2011; Thomas et al., 1994). Based on findings in neuroplasticity research, it makes sense that exercise would offer an opportunity to build areas of the brain damaged through a variety of events (psychological or organically created).

The Problem Statement

Research has shown individuals who have experienced repeated life trauma events have increased risk of self-regulation disorders throughout the lifespan which may impact physical health (Dubose, 2011; Noll, Zeller, Trickett, & Putnam, 2007). Many who experience mental illness have a number of barriers to completing exercise at enough intensity to help them impact physical health (Glover, Ferron, & Whitley, 2013). This study aims to bridge the gap between mental health and exercise-based interventions. Exercise has shown to be an effective addition to treatment models addressing depression, anxiety, and serious mental illness (Carless & Douglas, 2008; Doyne et al., 1987; Dunn & Jewell, 2010; Dunn, Trivedi, & O'Neal, 2001; Kucyi, Alsuwaidan, Liaw, & McIntyre, 2010). However, very little research exists to support and understand possible pitfalls to using exercise interventions or gathering perceptions of benefits and barriers to physical exercise in a clinical population experiencing complex trauma symptomatology.

Research Question

There are many reasons to exercise and much research collected to date has continued to document the physical and mental health benefits of adding exercise to daily life (Daumit et al., 2013; Stathopoulou, Powers, Berry, Smits, & Otto, 2006; Warburton, Nicol, & Bredin, 2006).

However, many do not exercise despite knowledge that it is beneficial. As exercise continues to be recommended for health reasons it will be important to study how those with psychological trauma respond to intensity levels somatically, as intense exercise has the possibility to activate the autonomic and sympathetic nervous system responses similar to traumatic events. The research question of this study is: Do people with more mental health symptom severity participate in less exercise with less intensity than those who have less mental health symptom severity?

It adds to the current literature by asking the question of whether those with more mental health symptom severity exercise less often and less intensely than those with more mental health symptom severity. In addition, other factors were considered to address the complexity of client presentations at a rural community mental health center. Factors such as number of diagnoses, substance use, income, education, and prior knowledge and/or participation in exercise were examined to better understand how those with psychological trauma as an expressed treatment goal may be impacted by other confounding mental and somatic symptoms. Hypotheses for this study are outlined in chapter three titled methodology.

As will be presented below, to impact physical health one must exercise with enough intensity to change metabolic systems (Ohkawara, Tanaka, Miyachi, Jshikawa-Takata, & Tabata, 2007; Ross et al., 2004; Tjønna et al., 2008). Often clients are told to exercise due to physical health needs without accommodations for successful coping (Dubose, 2011) or enough direction to understand what is needed to impact physical change (Donnelly et al., 2009). This leads many to exercise at lower than needed intensities or to quit their exercise program prematurely (Murcia, Gimeno, & Comacho, 2007). According to Dunn, Trivedi, and O'Neal (2001) exercise had the potential for dose response in mental health and physical health symptoms, however

there is a lack of evidence in this area and more study is needed. Exercise offers an opportunity to understand the difficulties those with hyper and hypo arousal due to psychological trauma face. It can teach body awareness, healthy self-soothing techniques, and mindfulness through movement, breath, and witnessing the natural arousal of the autonomic nervous system (e.g. heart rate, blood pressure, and respiratory increases; Wang, Taylor, Pearl, & Chang, 2004). At this time, research is limited in understanding how trauma survivors experience physical exercise, how they use it to cope, and what mitigates successful participation in exercise with enough intensity to impact physical health needs.

Application of Results

Exercise as a psychological trauma treatment option may benefit outpatient populations by decreasing symptoms that have the potential to lower overall health care costs. Following a review of the literature on the development of complex trauma, co-occurring mental health diagnoses, and physical health disorders, plus literature on how exercise benefits physical and mental health, this study will add to current literature and offer clinical mental health practitioners information regarding how mental and physical symptoms add to barriers those with psychological trauma and multiple diagnoses face when completing physical exercise even when they endorse benefits of physical exercise. This data has implications in how physical exercise is introduced, promoted, and taught to those in mental health outpatient treatment.

Current exercise patterns for the population studied were examined in relation to presenting mental health symptom severity. Factors such as previous exercise behavior and knowledge of how exercise helps decrease symptoms are discussed as factors that influence participant engagement in physical exercise. Discussion includes the differentiation of how presenting symptoms influenced time spent exercising and intensity of exercise performed. As a

result, information to implement exercise into mental health treatment with a clinical outpatient population experiencing comorbid complex trauma and physical health symptoms will be discussed.

Theoretical Framework

A number of theories play into this study. The complexity of those who present for treatment at community mental health lends itself to the need for understanding of how psychological trauma links to mental and physical health issues, as well as an understanding of childhood trauma influences, somatic impacts, attachment development, learning theories, and neurological changes as a result of psychological trauma. Other theories pertinent to this study relate to the exercise science realm. It is important for one to understand how physical movement impacts neurological development, development of the self, and physiological impacts for positive health gains. Below outlines a number of studies that point to the theoretical underpinnings of this study.

Development of Complex Trauma

Building on theories related to concepts developed by Janet and continually studied throughout the study of psychology (van der Hart & Horst, 1989), this study embraces the theory that psychological trauma affects the mind and body. Individual environments play a large role in brain development and may mediate trauma symptom manifestation. According to Kremen and colleagues (2010) environmental experiences played a large role in individual brain region development in identical twins. In a study to better understand how to assess for trauma using psychological tools, Wolf, Reinhard, Cozolino, Caldwell, and Asamen (2009) looked at scale eight of the Minnesota Multiphasic Personality Inventory to ascertain if this scale would pick up complex trauma symptoms as they have been outlined and differentiated by a number of

researchers over the last decade. Wolf and colleagues stated, "neuroscience research in the area of trauma indicates chronic stress resulting from child abuse may alter brain development and functioning, especially when trauma occurs early in development" (p. 50). Therefore, trauma events in childhood may be underlying other presenting mental health diagnoses.

Fetal response to maternal stress. According to McCarty (2009) development of the self begins long before birth and may even begin prior to conception. Research continues to show mother and child are linked on a biological and emotional level from conception through early childhood (Maret, 2009; Schore, 2010b; Van den Bergh et al., 1989). Dipietro, Hilton, Hawkins, Costigan, and Pressman (2002) stated even if maternal stress is minor it can impact the fetus through "exaggerated, not mitigated, effects during the postnatal period and beyond" (p. 665). Van den Bergh, Mulder, Mennes, and Glover (2005) reviewed the literature and found maternal stress was implicated in a variety of problems from low birth weight to adolescent behavioral issues. They state the mother's level of cortisol (a stress hormone related to the hypothalamic-pituitary-adrenal axis (HPA) could change the fetal environment and produce long lasting effects on neuroendocrine function, prefrontal cortex development, and the HPA axis all of which impact cognitive, behavioral, and emotional regulation. Purcell and colleagues (2011) investigated effects of stress on maternal care, milk composition, and pup behavior in rats to further support studies that have shown negative utero experiences contribute to chronic disease and obesity in adulthood. They stated "an individual's response to stress is crucial to maintaining homeostasis. In the short term, changes in activity of the stress reactive HPA axis can modulate energy balance" (Purcell et al., 2011, p. 474). However, early life experiences program the HPA axis that may impact body composition leading to a number of obesity related health issues. It is not surprising that Cloitre and colleagues (2009) spoke about impact of childhood traumas on

increased complexity of adult symptom manifestation which can include difficulty relating to others and managing emotions.

Attachment and disrupted social relationships. Attachment theory purposes that humans form social bonds (Ainsworth, 1969; Bowlby, 1958). Bowlby and Ainsworth are two theorists who spent much of their career studying how humans form these attachments (Bretherton, 1992). Attachment theory now includes adult attachment (Allen & Land, 1999; Crowell & Treboux, 1995), which offers a framework for using exercise as a mental health treatment. Research has shown social interaction, mirror neurons, and development of empathy are all somatically based (Carr, Iacoboni, Dubeau, Mazziotta, & Lenzi, 2003; Ginot, 2007; Lewis, Amini, & Lannon, 2001; Schore, 2010a; Wilkinson, 2010). Porges's polyvagal theory (2007, 1998) outlined the cascade of somatic processes effected by dangerous situations (for the organism). Due to the somatic nature of human attachment, traumatic wounding creates deficits in one's ability to attach successfully. van der Kolk and colleagues (2005) said the prolonged nature of interpersonal trauma that begins in childhood leads to difficulty in function and the presence of highly interrelated symptoms that cluster together. They outlined a series of symptom clusters related to "affect dysregulation, aggression against self and others, dissociative symptoms, somatization, and character pathology" (van der Kolk et al., 2005, pp. 394-395). It appeared those with both disorders of extreme stress not otherwise specified (DESNOS) and posttraumatic stress disorder (PTSD) were more likely to seek treatment which led the authors to state it might be complex trauma symptomatology that drove people into treatment. Cloitre and colleagues (2009) found a significant relationship between symptom complexity (anxiety, self-regulation, anger, dissociation, aggressive, or avoidant behaviors) and cumulative trauma. A presence of childhood cumulative trauma increased the risk of adult mental health issues.

Increased adult mental health symptom manifestation as a result of psychological trauma. van der Hart, Nijenhuis, and Steele (2005) reviewed literature on how trauma may impact daily functioning and contribute to dissociation of personality. Trauma survivors may unconsciously avoid new experiences and do not benefit from experience related brain changes (Kremen et al., 2010; Meaney, 1996). Trauma does not just impact the brain it also impacts the body, it may make it difficult to get an accurate diagnosis, have implications for co-occurring disorders, and add to increased physical health problems. As noted above this pattern of dysregulation becomes more complex when it begins in childhood and is then repeated or sustained (Cloitre et al., 2009; Ford & Smith, 2007; Sandberg, 2010; van der Kolk et al., 2005). As literature above shows, psychological trauma impacts development from conception through the life cycle. Many are driven into treatment due to complex symptom manifestation and self-regulation difficulties. One reason PTSD and DESNOS may be so damaging and multifaceted lies within the disruption of physiology.

Brain Development and Movement

Bilateral stimulation, learning, and neurodevelopment. Understanding how movement impacts learning often starts with a review of learning theories (Greenough, Black, & Wallace, 1987; Schunk, 2012). Exercise may serve as a tool to help bridge neurocognitive deficits through bilateral stimulation which requires both hemispheres of the brain to work together (Gutnik & Hyland, 1997). Bilateral stimulation, or the use of movement, sound, etc with both sides of the body simultaneously, has had positive results helping people calm anxiety states, process trauma, and has been implicated in ability to learn and retain new information more efficiently (Bergmann, 2010; Bloomgarden & Calogero, 2008; Shapiro & Forrest, 2004; Sifft & Khalsa, 1991; Stickgold, 2002). Physical exercise also offers opportunities for brain growth through

tactile stimulation. According to Nieuwenhuis and colleagues (2013) tactile stimulation had similar results to bilateral saccadic eye movements on memory retrieval and suggested this benefit is a result of rapidly alternating hemispheric activation in the brain. Sifft and Khalsa (1991) found learning was enhanced in both a bilateral movement group and a group using the educational learning movement curriculum (Brain Gym) over nonmovement oriented controls. According to Schwartz, Davidson, and Maer (1975) right versus left hemispheres of the brain are key in affect versus cognitive processes and occur in complex tasks. They stated there is a difference in hemispheric patterning with the right hemisphere holding a special role in emotional regulation and involved in cognitive tasks processed in the left hemisphere. To build strength in a neural pathway one must practice the experience repeatedly (Davidson et al., 2003; Lazar et al., 2005). Exercise uses a variety of bilateral movement patterns to effectively raise physiological intensity to levels impacting fitness (Donnelly et al., 2009), and research shows that bilateral stimulation can help regulate the autonomic nervous system through neurobiological means (Bergmann, 2010; Schwartz, Davidson, & Maer, 1975; Shapiro & Forrest, 2004). Herkt and colleagues (2014) found evidence for the neurobiological unpinning of methods (e.g. EMDR) utilizing bilateral stimulation to reintegrate information. The above areas point to the variety of ways the human brain is changed. Humans have the ability and capacity to rewire the brain by having different experiences or feelings (Elbert et al., 1994; Kucyi et al., 2010; Kurtz, 1985; Lazar et al., 2005; Thomas et al., 1994).

Mindful movement. Recent research has suggested that the brain rewires itself due to experience throughout the life span (Creswell, Way, Eisenberger, & Lieberman, 2007; Thomas et al., 1994). This process of wiring according to new information is called neuroplasticity. As a biological process this makes sense, the organism needs a way to continually update information

based on what is needed to survive an environment. It would make sense that neuroplasticity can support or change patterns of development based on new experiences. Mindfulness is the key to help one pause, take notice, and offer choices around new experiences versus repeating old coping patterns (Allen et al., 2006; Kurtz, 1990; Siegel, 2009a). Integration allows us to link feelings, emotions, behaviors, and thoughts. It is not simply cognitive repetition (Creswell et al., 2007; Levine, 1997). Movement can become a large piece of integrating new experiences by allowing words and meaning to arise out of mindfulness while standing witness to the new experience using somatic means. Witnessing and reporting on these new experiences are what build neuroplasticity in the brain (Allen et al., 2006; Davidson et al., 2003; Hanson, 2010; Lazar et al., 2005; Linehan, 1993).

Exercise Theory

Physical exercise theories encompass a wide range of physiology and biomechanics. For this study physiology is examined more closely than biomechanical movement patterns, however as noted above bilateral stimulation is important as a component of learning and regulating of the autonomic nervous system. The study of exercise physiology is concerned with how physical exercise impacts the systems of the body (Pate & Durstine, 2004). In order to positively affect physical health issues, Tjønna and colleagues (2008) reported that intensity matters. Although it is not understood exactly how exercise impacts mental health (Solmon, 2001), it may be through processes that impact biology, physiology, and neurochemistry linked to psychological states. Porges's (1998) polyvagal theory discussed below, provides a link between physiology and psychology. When taken together theories of exercise science, physiology, and psychology offer a conceptualization of how the whole person experiences life. Outlined below are number of exercise science theoretical considerations involved in this study.

Exercise and the endocrine system. Exercise positively impacts the endocrine system, even though the body considers it to be a stress, it appears to help regulate the stress response (Dietrich & McDaniel, 2004; Droste et al., 2003; Wittert et al., 1996) and create adaptation responses (McEwen, 2007; Miller, Koceja, & Hamilton, 1997). These responses deepen an individual's ability to handle life stressors. Tharp (1975) discussed positive changes in the body's ability to respond to stress as a result of physical training through exercise. It appears that physical exercise training protectively adapts the body's response to the secretion of HPA axis activity (Duclos et al., 2002), and adapts to different types of exercise through different hormonal pathways based on metabolic need (Stokes, Gilbert, Hall, Andrews, & Thompson, 2012). According to Wittert, Livesey, Espiner, and Donald (1996) exercise is a stressor that impacted the HPA axis and reported it does so in a way that may protect from harmful effects extended elevated cortisol levels may have on the body.

Exercise and mood. Anaerobic and aerobic exercise have also been shown to be effective at addressing mental health symptoms (Atlantis, Chow, Kirby, & Singh, 2004; Martinsen, Hoffart, & Solberg, 1989; Netz & Lidor, 2003; Peluso & Guerra de Andrade, 2005; Wadden et al., 1997). Schwartz, Davidson, and Goleman (1978) found those in the exercise group reported less somatic anxiety symptoms but more cognitive anxiety dysregulation, while Wang, Taylor, Pearl, and Chang (2004) found tai chi increased physical and mental health scores. Exercise increases blood serum neurotransmitter levels and can help decrease depression symptoms (Dietrich & McDaniel, 2004; Martinsen et al., 1989; Wipfli, 2008; Wipfli, Landers, Nagoshi, & Ringenbach, 2011).

Building motivation, self-efficacy, and confidence. According to Bandura's (1971) social learning theory humans learn through social exchange. Exercise has the potential to build

in positive psychological constructs, such as internal motivation and social engagement (Dunlop & Beauchamp, 2012; Fraser & Spink, 2002; McGale, McArdle, & Gaffney, 2011; Morgan, 2010; Mutrie et al., 2007; Wing & Jeffery, 1999). Edmunds, Ntoumanis, and Duda (2006) stated findings supported the claim that one must place some value on exercise behaviors before they will regularly commit to consistent activity that will meet health related goals. This means that a program to meet the needs of those with mental health issues must address the difficulties those mental illness face and be prepared to help clients move from externally motivated reasons to more intrinsic reasons placing value and enjoyment on activities being performed (Edmunds, Ntoumanis, & Duda, 2006; Murcia et al., 2007). Therefore it is imperative that mental and physical health practitioners better understand perceived benefits and barriers to physical exercise those with traumatic symptomatology possess. Chapter two outlines the literature addressing complexity of psychological trauma and physical exercise as a means to impact positive physical and mental health change. Chapter three will review the methodology and tools used to measure trauma symptoms, physical exercise behaviors, and co-occurring somatic and mental health symptoms. Chapters four and five present the findings and conclusions to this study.

Chapter 2: Review of the Literature

As noted above, those experiencing psychological trauma may have a complex set of issues upon presentation for treatment. The systems impacted reach further than the mind alone and contribute to a variety of physical and mental constructs causing concern. As will be shown below trauma impacts brain development and physiological systems of the body, and may make it difficult to get an accurate diagnosis, have implications for co-occurring disorders, and add to increased physical health problems. Regardless of age at the time of psychological trauma wounding, movement has potential to bring clients back into their body, help teach self-regulation skills, offer social engagement, and support neurodevelopment. Literature on physical exercise shows movement has the possibility to rebuild brain structures through neuroplasticity and somatic self-awareness (Elbert et al., 1994; Fong et al., 2005; Lazar et al., 2005). It is known that many struggle to follow through with exercise recommendations regardless of mental health status. Drawing from a wide base of psychological and physiological research, this study offers insight into what may hinder exercise behaviors of those seeking treatment in a rural outpatient setting.

The Wide Reach of Psychological Trauma

PTSD is a relatively new diagnosis in the history of psychology, however symptoms of it can be traced back to Janet and Freud's work in the late 1800s (Gingrich, 2009; van der Hart & Horst, 1989). It was not until the 1970s when links between symptoms were labeled under the posttraumatic stress heading (PTSD; van der Kolk & Courtois, 2005; van der Kolk, et al., 2005). Over time it has become clear that many people have other trauma responses outside PTSD criteria and research shows disorders of extreme stress not otherwise specified (DESNOS) symptoms bring many into treatment (Tummala-Narra, Kallivayalil, Singer, & Andreini 2011;

van der Kolk & Courtois, 2005; van Dijke et al., 2011). Ford & Smith (2007) found "extensive trauma exposure and prevalent PTSD among adults in outpatient SUD [substance use disorders] … the results suggest that PTSD alone may not be sufficient to characterize the impairments confronting many SUD patients" (p. 201). In addition to the impact of trauma on the body, other psychopathology may be co-occurring when clients present for treatment (Briere, Elliot, Harris, & Cotman, 1995; Cloitre et al., 2009; Zlotnick et al., 1996). Often depression, anxiety, substance use disorders, and decreased ability to meet the needs of daily life activities are also impacting the client's quality of life and become a focus of treatment (Ford & Smith, 2007; Kaehler & Freyd, 2011; Tummala-Narra, et al., 2011; van der Kolk et al., 2005). The age of the client, time of trauma, and nature of the trauma(s) plays a prominent role in subsequent mental health symptoms as an adult (Briere & Spinazzola, 2005; Wolf, Reinhard, Cozolino, Caldwell, & Asamen, 2009).

Traumatic Dysregulation of the Autonomic Nervous System

Trauma is not just about the mental issues related to witnessing or being perpetrated against. It is also about physical development, social connection, and learning. Psychological trauma often impacts the body. The human heart rate is an autonomic function that can be used to track psychological trauma. Using heart rate variability (the time between beats) emotional arousal can be measured (Frustaci, Lanza, Fernandez, Giannantonio, & Pozzi, 2010). According to the polyvagal theory the heart is controlled by the vagus nerve which is part of the autonomic nervous system. The autonomic nervous system (sympathetic fight/flight and parasympathetic rest/digest) is mediated by the two branches of the vagus nerve (ventral and dorsal). These two branches are activated by perception of threat in the environment. Mammals have an evolved myleniated ventral version of the vagal motor system which allows for social engagement with

other creatures and the environment (Porges, 2007). When the environment is deemed safe the ventral vagal portion slows the heart which dampens the stress response of the HPA-axis, and the person is able to self-soothe, calm, and socialize (Porges, 1998, 2007). It is through this social engagement that higher orders of being (thinking and feeling) are able to happen. In this state neuropeptides such as oxytocin and vasopressin are released resulting in a calming of the organism and connection to the environment (Porges, 2001).

The person detects safety using a network of physiological markers such as facial recognition, limbic resonance, and nervous system monitoring known as neuroception (Porges, 2007). Neuroception is a neural process that detects threat and modulates the vagal output. The information gathered through sensory input is then processed and responded to using physiology systems such as heart rate variability, sweat rates, and the respiratory rate. The mammal has increased (over reptiles) neural control of the vagal system thus engagement with the environment can be completed "without the severe biological cost of the metabolic excitation associated with sympathetic adrenal activation" (Porges, 2001, p. 129). These behavioral and emotional reactions depend on intricate systems of detection (neuroception) in the organism to determine the safety of the environment. This capacity is significantly disrupted in trauma victims.

When an organism is afraid there is "potential for greater dependence on the sympathetic excitation of the cardiovascular system with associated health risks (e.g. hypertension) and behavioral (e.g. irritable and reactive) costs" (Porges, 2001, p. 130). As will be outlined below repetitive use of the sympathetic nervous system creates neurological changes in the brain, and therefore adaptive behaviors in everyday relating to self, others, and the world. These changes may negatively impact an individual's ability to socially engage with the world in healthy ways

due to vagal tone and quicker responses of the stress system, even when the environment is actually safe. When one has difficulties regulating the ventral vagus nerve, also known as the vagal brake, the dorsal motor nucleus of the vagus takes over. This branch of the vagal system activates hyper or hypo arousal in the form of survival responses and increased HPA-axis activity preparing the individual to mobilize against threat. As the vagal brake of the ventral system decreases its influence the individual is not able to spontaneously socially engage with surroundings, in other words create experiences that offer potential to rewire the brain for more positive living patterns. Porges (2001) stated the metabolic cost to the organism is great when the unmyleinated dorsal vagus controls the system. The dorsal vagus results in slowing physiologic processes sometimes to the point of death (via apnea and bradycardia). This hypoarousal creates a cascade of stress responses in the endocrine system through the sympathetic-adrenal system. The defensive strategies result in both passive immobilization with decreased heart rate and a drop in blood pressure or fight and flight responses that increase heart rate, respiratory rates, and raise blood pressure. These survival responses require much energy to execute and the metabolic cost to the individual is high.

Lazar and colleagues (2005) showed that repetitive behaviors created changes in the brain associated with the areas being used, and Larsen, Tzeng, Sin, and Galletly (2010) noted how the respiratory and cardiac systems influence each other. Although research continues to grow in this area, it appears heart rate variability is linked to breathing. Larsen and colleagues showed timing of the respiratory system is bidirectional between the heart and the lungs, each system influencing the other. When breathing becomes restricted due to physiological changes (purposefully or not) the stress response is elicited and pro inflammatory cytokines are released (Vassilakopoulos, Zakynthinos, Roussos, & Economou, 1999). Using the theories of

neuroplasticity, links between respiratory rates and cardiac output, and the polyvagal theory it would make sense that a person exposed to chronic stress would have less positive social engagement experiences and would be prone to quickly respond to stresses with a flood of chemical changes in the body. Although all animals have a physiological stress response, those with chronic stress would then have a more robust neurological wiring for this response. In the case of trauma the organism cycles through hyper and hypoarousal patterns. Chronic stress on the other hand creates a pattern of consistent hyperarousal. As will be outlined below these repetitive stress responses have detrimental effects on physical health and mental capabilities.

Hypothalamic-pituitary-adrenal axis. The body is impacted through a series of chemical responses of the endocrine system, most notably the hypothalamic-pituitary-adrenal axis (HPA axis; Ogden, Minton et al., 2006; Ogden, Pain, & Fisher, 2006; Van den Bergh et al., 2005). Similar to any learned response in the body, the HPA axis response to trauma becomes conditioned as a primary response to life events and drives biological responses such as flight, fight, freeze, or feigning death (Ogden, Minton et al., 2006). Urry and colleagues (2006) considered how the amygdala, medial prefrontal cortex, and cortisol secretions are impacted by negative affect. They recruited 19 individuals from a larger sample of the Wisconsin Longitudinal Study and studied brain activity to laboratory exercises using fMRI. They reported participants able to mediate negative affect experience had less amygdala activation and better ability to activate the ventromedial prefrontal cortex bilaterally. In addition, those who were able to down regulate the negative affect experience also had a more adaptive diurnal cortisol secretion rhythm. They stated ability to regulate negative affect states has implications for regulation of the endocrine system, overall health, and wellbeing.

Klaassens (2010) explored how trauma impacts development by comparing trauma

exposed and non trauma exposed adults. She found those who had been exposed to childhood trauma had blunted cortisol and adrenocorticotropic hormone (ACTH) responses to the dexamethasone/corticotropinreleasing hormone (Dex/CRH) challenge test and that “the HPA axis regulation is durably changed by exposure to sustained childhood trauma" (Klaassens, 2010, p. 2). In a review of the literature on how the psychobiology of early life stress influences the corticotropinreleasing factor, anxiety, and depression, Gillespie and Nemeroff (2007) stated early life stress leads to disruption in neural and endocrine systems which continues into adulthood “to form a consistent hyper responsiveness of the HPA axis to environmental stress” (p. 87). Thrivikraman, Nemeroff, and Plotsky (2000) found the HPA axis is regulated through at least two different pathways and glucocorticoids play a role in mediating these actions.

Cortisol changes. Glucocorticoids are steroid hormones that bind to glucocorticoid receptors and have a role in metabolizing glucose for cells. Another glucocorticoid role is to help regulate the immune system, although too much of these steroids may cause damage. Cortisol is a glucocorticoid and an important human hormone for a variety of bodily functions. Although cortisol and trauma research continues to be conflicting, some studies reported increased cortisol in trauma survivors and others reported decreased levels, this area may offer insight into negative health effects trauma may have on the body. Elzinga, Schmahl, Vemetten, van Dyck, and Bremner (2003) studied 12 women with PTSD compared to 12 women without PTSD symptoms. They stated hyper and hypo arousal cycles may be compensatory and help victims regulate cortisol levels back to baseline by suppressing cortisol following a stress related surge. They measured cortisol levels and memory recall in both groups as they were exposed to a personalized trauma script. The authors stated women afflicted with PTSD symptoms had significantly higher cortisol levels when exposed to the script and then rapidly decreased those

levels during the recovery phase. The release of stress hormones and subsequent disruption in endocrine function may be problematic for a lifetime. Weissbecker, Floyd, Dedert, Salmon, and Spehton (2004) found diurnal cortisol levels were flattened in those with childhood abuse. In 85 women with fibromyalgia those with childhood abuse (physical, sexual, emotional neglect/abuse) had higher levels of wakening cortisol than those without adverse childhood experiences. As the stress response continues to mount in those exposed to trauma, damage to the brain may result.

N**europlasticity as a result of chronic stress.** Through changes to brain structures it is possible to suggest that one would experience long term cognitive changes that could transmit to difficulties in emotional regulation, relationship building, and behavior manifestation. Due to neuroplasticity the brain changes according to new experiences (Creswell et al., 2007; Lazar et al., 2005). When the stress happens early in life, changes to the brain may remain throughout a lifetime. Glucocorticoids are an end product of the HPA axis stress response (Meaney et al., 1996). In a study using rats, Meaney and colleagues (1996) found early environmental stress led to a disrupted HPA axis throughout the life span of the animal and these disruptions created later life problems.

A number of studies have shown chronically elevated glucocorticoid levels may damage hippocampal neurons impacting cognition and memory formation (Husain et al., 2010). Lucassen and colleagues (2010) reviewed literature on hippocampal plasticity and stated chronic stress appears to lead to decreased hippocampal neurogenesis. They suggested this may be a factor contributing to increased pathology of mood disorders. In a review of the literature, McEwen (2001) stated "the hippocampus, amygdala, and prefrontal cortex are three brain areas that show morphological changes as a result of stress related disorders such as depression and PTSD" (p.

272). He reported the HPA axis appears to play a role in these changes and seem to begin as protective however repeated exposure to high levels of stress hormones, adrenal steroids, and glucocorticoids resulted in damage. There is some evidence to show some changes are reversible (Conrad, 2008; McEwen, 2007, 2001). Conrad (2008) discussed the glucocorticoid vulnerability hypothesis. She stated that although elevated gulcocorticoid / HPA axis damage to the hippocampus appears to be reversible, the longer one is exposed to elevated stress hormones the more likely they will suffer a metabolic event in conjunction with elevated levels and suffer permanent damage to the brain structures. As noted above, there are a number of changes in physiology as a result of traumatic stress and these may increase mental health symptom manifestation. The neurological and endocrine changes due to negative early environment experiences may be linked to a variety of socioemotional and physical health issues manifested into adulthood. As outlined above, it is often the symptom manifestation of complex trauma or DESNOS that bring clients into treatment. The research below outlines some of these psychological issues and discusses how trauma may negatively impact physical health.

Comorbid Physical and Mental Health

Many who experience trauma symptoms have physical health problems and co-occurring mental health diagnoses. Primary care physicians are often the first point of contact for individuals with mental health issues (Hunter & Goddie, 2010) and many mental health symptoms are illuminated through somatic difficulties. Avasthi and colleagues (2008) reported on 500 subjects presenting at a primary care clinic, 42% had at least one psychiatric diagnosis in addition to the physical health issue they presented with. Jackson, Houston, Hanling, Terhaar, and Yun (2001) stated 25% of patients presenting for primary care had a co-occurring mental health diagnosis. They surveyed 250 adult patients in a walk in primary care clinic using the

Patient Health Questionnaire and found those with more physical health complications often had a mental health disorder, too. Spitzer, Kroenke, and Williams (1999) reported patients with mental health diagnoses use more health care than those without mental health issues and state those with a mental health diagnosis have more dysfunction overall. Jones and colleagues (2004) studied the prevalence of mental health and physical health diagnoses. They chose 147 people in two psychiatric programs in Massachusetts, and compared them to a larger study sample of 11,185 using data from Medicaid claims and the Structured Clinical Interview for the DSM-IV conducted by medical faculty. Jones and colleagues also compared the Massachusetts sample to a national sample regarding health conditions. They reported 53% were treated for one co-occurring physical health condition, 30% for two, and 20% for three. Co-occurring health conditions were diverse with pulmonary disease the most pervasive. Newcomer, Steiner, and Bayliss (2011) performed cluster analysis on 15,480 health maintenance organization members. They identified 17 common medical conditions that utilized the top 20% of total health care costs over the two year study period and created 10 cluster groups. They "noted a high prevalence of mental health conditions and obesity across all clusters, suggesting that these two conditions should be addressed in most, if not all, comprehensive care management plans" (Newcomer et al., 2011, p. e328). In the study 58.7% of participants were obese and 47.5% had a mental illness diagnosis. The authors stated new strategies are needed to provide appropriate care for those with multiple morbidities. Kroenke, Spitzer, and Williams (2002) considered patients' somatization of symptoms, which often serve as the impetus for entering primary care clinics for treatment options. They reported the higher the level of somatic symptom manifestation, the more overall difficulty. Although they stated the somatic symptoms did not always correlate with mental health symptoms they did report those with somatic symptoms may have co-occurring

depression symptoms 40-60% of the time. In addition, those with higher levels of somatic difficulties have more disability days, higher health care utilization, and more relationship stress.

Psychological implications in physical health. Self-regulation and lack of emotional intelligence may play a role in developing physical health problems. In a study with 237 participants diagnosed with hypertension, Jula, Salminen, and Saarijärvi (1999) found men and women with high blood pressure (HBP) also had more difficulty identifying and describing emotions and were more externally oriented in thinking with less daydreaming. Women with HBP were more likely to somatize their symptoms. Alexithymia (an inability to describe internal emotional states) was associated with HBP outside of physical health or unhealthy lifestyle factors like sodium or alcohol intake. Coker, Smith, Bethea, King, and McKeown (2000) screened 1,152 women in family practice clinics for intimate partner violence. Those who reported psychological and physical trauma also reported their mental and physical health as poor and those with physical trauma had more than five doctor visits within the last year. The study showed that although psychological trauma did not account for as many doctor visits, its relationship to poor physical health outcomes was just as strong as physical trauma. What brought many of the women into primary care were significant symptoms such as chronic pain, gastrointestinal problems, frequent headaches, sexually transmitted diseases, and more functional complaints such as speech impediments and difficulty seeing even with glasses. Similarly, Kroenke, Spitzer, and Williams (2001) demonstrated that those meeting criteria for depression also had difficulties with general physical health, increased bodily pain scales, and decreased overall role performance in social and physical situations.

Trauma and physical health. Beckham and colleagues (1998) reported combat veterans with PTSD had more health problems than combat veterans without PTSD. Schnurr and Spiro

(1999) found PTSD to be a factor in poor health status compared to veterans who did not have combat exposure PTSD. They stated PTSD seems to influence physical health through a series of possible routes (behavioral, biological, and psychological) and say "PTSD may be distinctive among psychiatric disorders in terms of its effects on health" (Schnurr & Spiro, 1999, p. 358). In a review of the literature on trauma implications and physical health Kendell-Tacket (2009) stated many who have experienced traumatic events have a higher rate of physical health problems that could be the result of disruption in the HPA axis and the inflammation response. She stated posttraumatic stress altered the stress response by down regulating pro inflammatory cytokines. Spitzer and colleagues (2009) studied PTSD and physical health implications. They reported findings suggest a strong association between PTSD and cardiovascular disease. The authors stated they studied the relationship of trauma to physical health while controlling for sociodemographic factors, other mental health diagnoses, and substance use disorders. Spitzer and colleagues reported those with trauma histories without symptoms of PTSD had a lower incidence of physical health problems and those without trauma histories had the lowest rate of comorbid physical and mental health issues. The authors went onto state a number of chronic and common diseases linked to PTSD however report more research in this area is needed. They stated "our results are predominantly consistent with findings across different populations. It is not premature to conclude that trauma and PTSD are closely associated with cardiovascular and pulmonary conditions, whereas the relationship to other medical conditions remains inconclusive" (Spitzer et al., 2009, p. 10151016). Spitzler and colleagues linked results to other studies showing evidence of HPA axis disruption and inflammatory responses as possible explanations for increased physical health problems for those with trauma histories.

Trauma and Obesity. Obesity may be linked to traumatic experiences disrupting self-

regulation and the nervous system, chronic disease, higher utilization of health care, and more disruptions in daily life activities. Haskell and colleagues (2010) studied veterans returning from war and found there are gender differences in the presentation of mental health issues and comorbid physical health problems, including obesity, associated with PTSD. They suggested treatment providers be prepared to treat both mental and physical health problems of returning vets. Vieweg and colleagues (2007) reported findings "provide preliminary evidence that PTSD is a risk factor for overweight and obesity among male military veterans" (Vieweg et al., 2007, p. 486). The authors stated obesity levels in male military veterans exceed national levels among the general population and obesity was more likely to occur when a veteran had PTSD and a comorbid medical condition.

Traumatic experiences can lead to unhealthy coping skills in mental health clients and in turn to obesity related health problems. In a study done on 9,125 participants within the United States Simon and colleagues (2006) stated obesity "was associated with significant increases in lifetime diagnosis of depression, bipolar disorder, and panic disorder or agoraphobia" (p. 824). Although social and cultural factors play a role in obesity, Simon and colleagues commented that obesity increased the odds of an anxiety or mood disorder by 25% and decreased odds of a substance use disorder by 25%. In an epidemiological study over a 10 year period with a representative sample, Perkonigg, Owashi, Stein, Kirschbaum, and Wittchen (2009) found traumatic events were linked to obesity rates in both men and women however appeared to have different underling meanings. For example, obesity in women was associated with assaultive traumatic exposure rather than combat and who may or may not meet DSM-IV criteria for PTSD. Men on the other hand were more likely to meet DSM-IV criteria for PTSD and were more likely to suffer from comorbid obesity when a lack of self-competence was present. The

authors stated self-competence was a protective factor against obesity. They suggested sympathetic nervous system arousal may be connected to obesity in trauma victims. Physical exercise may offer an opportunity to build confidence while decreasing obesity related problems.

Overeating may serve to decrease an overactive sympathetic nervous system. Dallman and colleagues (2003) reviewed literature related to chronic stress and obesity and proposed a model of stress eating. They stated chronic stress disrupted the HPA axis and produced desire to over or under eat, both in turn influence weight. They stated those that chose to overeat as a result of chronic stress were doing so to relieve activity in the stress response network and those who overeat as a result of stress have "decreased corticotropin-releasing factor mRNA, catecholamine concentrations, and hypothalamo-pituitary-adrenal activity" (p. 11696). As a result those under chronic stress are able to decrease anxiety that comes with stress responses by using food. Dallman and colleagues also stated when the stress response network was activated individuals are more likely to store extra calories as abdominal fat. This can lead to more health risks in humans. Noll and colleagues (2007) followed 84 abused and 102 nonabused females (starting mean age 11) over a 20 year period. At all six measurement points abused subjects were more likely to be obese. Felitti (1993) interviewed 100 very low calorie diet patients in a structured weight loss program to better understand what led to obesity. He compared results of interviews with overweight patients to 100 interviews of never overweight adults and found those who were obese had higher rates of chronic depression, early parental loss, parental alcoholism, marital dysfunction, nonsexual childhood abuse, and childhood sexual abuse.

In efforts to control overactive nervous systems using food, obesity may be the result of consumptive coping and self-harming/ abuse through disordered eating patterns. Tagay, Schlegl, and Wolfgang (2010) reported sexual traumatizations increased the risk of developing an eating

disorder. As predicted, Tagay and colleagues stated PTSD is under diagnosed in eating disorder patients, and those experiencing PTSD symptoms often reported more somatic disorders than patients without PTSD. Sarin and Nolen-Hoeksema (2010) stated individuals with childhood sexual abuse (CSA) histories utilized more consumptive coping behaviors than non-CSA survivors. The nature of these disorders point to the unconscious and biological nature of these coping activities which suggests they were learned early in life. This is of concern as it can lead to other health problems such as substance abuse, eating disorders, and physical health problems. In a review of the literature done by Gustafson and Sarwer (2004) there is evidence of a link between childhood sexual abuse and eating disorders, with a stronger link to bulimia nervosa than anorexia nervosa. The authors stated "most of the evidence to date suggests a small, positive correlation between CSA and obesity. This relationship appears to be particularly strong in cases of more severe sexual abuse" (Gustafson & Sarwer, 2004, p. 131132). In a study on issues related to complex trauma and obesity, Liebenberg and Papaikonomou (2010) looked at how complex trauma may be a precursor to self-harming/abusing behaviors and how obesity may present as a self-abusing behavior. When participants were feeling emotionally out of control, food was a common way they compensated increasing their risk for other physical and mental health problems.

Due to symptoms related to the social environment (attachment, care giving, isolation, etc) and changes in physiology as a result of being exposed to high level chronic stress many with trauma histories have disrupted HPA axis responses, brain development changes, and increased physical health problems. Exercise is one way to deal with related psychological complications and may offer benefits of increased quality of sleep, neurogensis, and HPA axis regulation (Atlantis et al., 2004; Pajonk et al., 2010; Stokes et al., 2012; Wittert et al.,1996). In

addition, exercise increases physical health, builds self-efficacy, and has been linked to increased quality of life.

Exercise

Physical exercise

Regular exercise helps reduce obesity related disorders. The American College of Sports Medicine's (ACSM) position on exercise and physical health states a combination of anaerobic and aerobic exercise is recommended for weight loss and individuals should aim for 30 minutes of physical activity per day for health (Donnelly et al., 2009). Aerobic exercise is defined as activities that work large muscle groups of the body over time (minutes to hours) and utilize the aerobic energy system as the primary energy source (Yoke, 2010). Anaerobic exercise is performed in shorter bursts of energy utilizing a combination of energy systems and may include compound movement patterns or isolation exercises targeted for muscle hypertrophy (Yoke, 2010). To positively impact physical health, intensity matters. Godin and Shephard (1985) found when participants had a combination of light and strenuous activity they were more likely to fall within the fit categories outlined by VO2 Max (the maximum amount of oxygen one can uptake and use for muscle performance) and healthy body fat percentage rates. Another study comparing high versus moderate intensity exercise programming in coronary artery disease patients showed high intensity to be more effective for developing VO2 peak despite the presence of coronary artery disease (Rognmo, Hetland, Helgerud, Hoff, & Slørdahl, 2004). Sesso, Paffenbarger, and Lee (2000) assessed 12,516 men who were part of the Harvard Alumni Study (followed from 1977-1993) to determine the level of physical activity that was necessary to lower risk of coronary heart disease (CHD). This longitudinal study found vigorous (> 6 METS, a measure of energy expenditure known as metabolic equivalents) activity decreased

CHD risk factors by approximately 20%, however moderate exercise expenditure (> 4-6 METS) impacts (for decreased risk) were not as clear. Exercise is important for healthy physiological functioning and health body fat percentages.

Physical exercise and health gains

In addition to intensity, regular participation in exercise and healthy caloric consumption creates the needed elements for positive health gains. Ohkawara, Tanaka, Miyachi, Ishikawa, Takata, and Tabata (2007) reviewed literature on dose response between aerobic exercise and visceral fat reduction. They found research points to a dose response between fat loss and aerobic exercise with as little as 10 METs per week. Ohkawara and colleagues discussed energy expenditure needed to impact fat loss and say visceral fat reduction is linked to weight loss however may occur without weight loss in obese subjects. Georgiades and colleagues (2000) found it was exercise and diet that altered resting and stress induced high blood pressure. Ninety-nine participants were randomly assigned to an exercise, exercise plus diet, or wait listed control group and tested pre and post intervention at six months. Both activity groups had significantly lower blood pressure responses to a series of mental stresses and higher levels of stroke volume and cardiac output. The exercise and diet group was able to lower diastolic blood pressure significantly over the exercise only and control groups. Jakicic, Marcus, Gallagher, and Napolitano (2003) studied effects of exercise duration and intensity on weight loss. The researchers randomized 184 sedentary women into four exercise groups of varying duration and intensity. Participants who completed the study (12 months) increased cardiovascular fitness and decreased overall weight regardless of the experiment group they were assigned to. Findings showed both moderate and vigorous exercise impacted weight loss, however over the course of 12 months the amount of activity per week was important. The authors suggested a minimum of

150 minutes of moderate to vigorous physical exercise and stated caloric monitoring should be prescribed to impact weight loss efforts.

Exercise may offer relief to those dealing with metabolic disease or chronic pain. In a study with obese women, researchers found that diet, aerobic, and anaerobic exercise contributed to a decrease in weight and blood glucose levels (Weinstock, Huiliang, & Wadden, 1998). Ross and colleagues (2004) compared weight loss on insulin resistance and reduction in fat mass. They reported fitness levels mattered. They stated the exercise groups, regardless of weight loss, positively increased fitness levels. Daily exercise was important to maintaining a healthy lifestyle and appropriate body fat percentage in participants. The group that did not lose weight despite regular exercise decreased abdominal fat levels. This is of importance because higher levels of abdominal and visceral fat are associated with higher levels of disease and death. This finding gives strength to the importance of including exercise (even when weight loss does not happen) as part of a healthy lifestyle. Insulin resistance was improved in the exercise with weight loss group by 32%, but significant findings were not present for the exercise without weight loss or dieting weight loss without exercise groups. The authors stated this finding also speaks to the need for exercise and weight loss as part of increasing health and changing metabolic patterns. Nicols & Glenn (1994) compared pain scales and psychological affective states in three groups diagnosed with fibromyalgia. The exercise group had decreases in pain scores and higher affect scores however those in the experimental walking group had higher physical disability scores following the experiment. They stated the small sample size may have contributed to nonsignificant results despite measures of pain and affect showing change. In addition to addressing physical health, exercise has been shown to positively impact mental health. One way exercise may impact mental health is through the development of neurons as a result of new

experiences.

Exercise and neurobiology

Those suffering from brain changes due to chronic stress responses and elevated HPA axis function may benefit from physical exercise as it may promote challenging oneself within a safe and supported environment. As seen above a number of studies show how chronic stress may negatively impact brain structures via elevated glucocorticoids. Although literature points to negative effects of stress, there is promise in the brain's ability to reorganize itself based on new experiences (Creswell et al., 2007; Davidson et al., 2003; Fong et al., 2005; McEwen, 2007; Thomas et al., 1994). Exercise has been shown to positively influence neuroplasticity (Dishman et al., 2006; McEwen, 2001) and may offer hope to those who have suffered stress related hippocampal dendritic retraction, as brain size may be linked to exercise activity (Raichlen & Gordon, 2011). A number of studies show links between exercise and neuroplasticity. Dranovsky and Leonardo (2012) pointed to research linking hippocampal stress changes with decreases in ability to explore novel situations. Davidson and colleagues (2003) found immune system function was increased with mindful meditation practice, and in a study done by Pajonk and colleagues (2010) participants increased hippocampal volume as a result of aerobic exercise. This was true for the experiment group diagnosed with schizophrenia and the non schizophrenic control group. They stated exercise training increased hippocampal volume by 14% and those in the exercise group increased their aerobic fitness as well. They stated the correlation between aerobic fitness and hippocampal volume increases were positive. Panjok and colleagues reported this was evidence that exercise impacts neuroplasticity.

As a result of experiencing the brain is changed and neuron connections are built. Isaacs, Anderson, Alcantara, Black, and Greenough (1992) found adult rats in a complex motor learning

group had increased mitochondria in the Purkinje cells (GABAergic neurons in the cerebellar cortex) suggesting that movement learning increases blood vessel and neuron cell growth. Ding, Vaynman, Akhavan, Ying, and Gomez-Pinilla (2006) showed exercise increased learning and memory recall in rats through a variety of neurotrophic factors like brain derived neurotrophic factor (BDNF), which is important in hippocampal synapses growth, and insulin like growth factor-1 (IGF-1), which is important for nerve growth and provides support for cognitive functions. Ding and colleagues stated the IGF-1 may hold a mediating role in exercise facilitated synaptic growth, memory, and learning. As Meaney and colleagues (1996) reported (discussed above), rats exposed to early life stress were vulnerable to increased stress responses throughout the lifespan, but McEwen (2001) reported these brain changes were reversible. In a meta-analysis on neurocognitive function and bipolar disorder, Kucyi, Alsuwaidan, Liauw, and McIntyre (2010) reported many studies show improved cognitive function in response to exercise and stated this may be a factor of increasing blood flow to sections of the brain, neurotrophins (e.g. BDNF and IGFI), and catecholamines while decreasing inflammation and oxidative stress. They stated more research needs to be done to better understand how exercise could help those suffering from cognitive deficits as a result of bipolar disorder.

Exercise as a Component of Mental Health Treatment: An Area of Further Study

Exercise has been shown to be an effective method to alleviate a variety of mental health issues and comorbid physical health related disorders (Weinstock et al., 1998). Martinsen, Hoffart, and Solberg (1989) found exercise seems to be an effective treatment to meet the goals of helping clients experience mastery and self-efficacy thereby helping them increase self-esteem and confidence in their abilities. Peluso and Guerra de Andrade (2005) stated the effects between physical activity and mood appear to be a combination of psychobiological factors between

exercise physiology, distraction, self-efficacy, social interactions, and neurochemistry. The concepts above are further supported by Netz and Lidor (2003) in a study on the mood altering effects of mindful versus aerobic exercise modes. They found that low intensity exercise increased mood over higher intensity dancing.

Lacking in the literature is empirical data on how survivors of trauma respond to and use exercise to cope with overwhelming physical and psychological responses to traumatic psychological wounding. It is also unclear how or if survivors exercise with enough intensity to impact physical health change or if attempting exercise at higher intensities result in sympathetic nervous system activation. It may be possible that those with elevated sympathetic nervous systems are more sensitive to the physiological changes exercise creates. If so, exercising at high intensities may activate a trauma response unintentionally. Dubose (2011) investigated trauma symptom hyperarousal and exercise behavior in college students and found those with higher trauma symptom hyperarousal exercised less than those with less symptoms. He reported more study is needed to understand the relationship between exercise and PTSD hyperarousal symptom reduction. Noble (2013) reported although exercise was a contributor to psychological flourishing in college students it did not "offer unique benefits for trauma exposed individuals when compared to college students with lesser traumatic experiences" (p. 40).

Daumit and colleagues (2013) reported a behavioral weightloss intervention was successful with serious mentally ill patients, however Glover, Ferron, and Whitley (2013) interviewed 31 people with serious mental illness to better understand the barriers to exercise they faced. Three themes emerged from the interviews. Clients stated they struggled with medication side effects, comorbid physical health problems, and time spent focused on mental illness symptoms. They reported clinicians must address the barriers those with mental illness

have if they are to impact behavior change in this area. More research is needed in both areas above (understanding trauma and mental illness impacts on physical activity) if sedentary behavior change in mental health outpatient populations will be successful. As seen in the literature above many do not present with PTSD symptoms alone. What drives clients into treatment is often the manifestation of complex trauma symptoms which may not present as hyper or hypo arousal. The research on physical health shows those who have mental health issues often report "greater stress, worse functioning in all aspects of their life, and greater worry ... patients with mental disorders consequently have higher utilization rates of health care services" (Jackson, Houston, Hanling, Terhaar, & Yun, 2001, p. 878). For these reasons more information is needed to better understand how exercise "as a truly multimodal form of therapy ... as an efficacious and beneficent treatment that is “drug-free'" and possesses very few known side effects" (Dubose, 2011, p. 33) could help those who present in outpatient treatment with trauma experiences, co-occurring mental health diagnoses, and somatic symptoms without resulting in an overwhelmed sympathetic nervous system.

Effective exercise programming has the potential to be a key piece of mental health treatment (Daumit et al., 2013). Understanding the benefits and barriers to physical exercise in trauma victims has large multiagency consequences, however more information is needed to create effective programs that address the psychological needs of those presenting for outpatient mental health treatment with co-occurring physical health problems. Jones and colleagues (2004) reported "few services exist that are tailored to the needs of the many persons with mental illness who already have serious physical problems” (p. 7). They also said "there is an immediate need for population specific interdisciplinary research to guide the design of integrated mental and physical health care" (p. 7).

This study aims to gather data to help fill that gap. Through a series of measurement tools aimed at capturing the level of symptom severity and level of exercise intensity performed, better understanding of how symptoms, co-occurring disorders, and resources, such as, income and education may be impacting the complex trauma survivor's ability to participate in exercise at levels to positively impact physical health. It is hypothesized that clients presenting in outpatient treatment who have more mental health symptom severity, lower income, and less education will exercise at lower intensities and less hours per week than those without as many symptom difficulties or with additional resources such as income and education. In addition, it is hypothesized that those with more symptoms will also perceive more barriers to exercise participation than their less symptomatic counter parts. Chapter three outlines methods used to determine answers to these hypotheses.

Chapter 3: Methodology

As demonstrated in the literature review, those with mental health experience physical health problems at a higher rate than nonmentally ill counterparts (Simon, et al., 1999; Simon, et al., 2006), use more health care overall (Spitzer, Kroenke, & Williams, 1999), and die at younger ages (Colton & Manderscheid, 2006). Many factors influence these statistics. Through anecdotal information this researcher has heard numerous examples of clients discontinuing or ignoring health care advice to become more physically active due to psychological trauma symptoms (e.g. numbing, hypervigilance, anxiety, physical pain, fear of new locations/people, inability to emotionally regulate when heart rate rises and sweat production begins). According to Tjønna and colleagues (2008), intensity level of physical exercise impacted the level of physical change that took place. Given that individuals living with mental illness often have co-occurring physical health conditions and have higher rates of health care utilization (Jackson et al., 2001), they are a population in which identifying effective treatment interventions to engage self-management techniques is essential. It is therefore important to understand how barriers such as somatic symptoms, fear, and hyper/hypo-arousal potentially impact the intensity of exercise individuals engage in to obtain/maintain physical health. In reviewing the literature it was found that more research is needed to better understand what keeps individuals experiencing psychological trauma from participating at levels with enough physical intensity to impact physical health so better interventions can be developed for this population.

This study aimed to gather data to better understand how those with psychological trauma perceive and participate in physical exercise along with consideration for how co-occurring mental and physical health conditions manifest during physical exercise. Examination of potential resources that positively influence successful follow through with physical exercise

recommendations is also included. The information that follows is the methodological design, psychometrics on measurement tools used, and statistical analysis. Participant demographics and collection sites are discussed and confounding variables included.

Research Design

In order to better understand what motivates or supports those who have experienced psychological trauma to exercise, this study compared two groups of participants. All participants were in mental health outpatient treatment and had mental health symptoms as a result of experiencing psychological trauma. Participants were grouped according to symptom severity based on Trauma Symptom Checklist-40, global assessment of functioning, and Patient Health Questionnaire scores. The symptom severity was predicted to influence the amount and the intensity level of regular exercise participation and the amount of perceived barriers to exercise. Trauma symptom severity, other co-occurring mental health symptoms, global assessment of functioning (GAF), perceived exercise benefits and barriers, and amount plus intensity of leisure time activity were measured using the Trauma Symptom Checklist-40 (TSC-40; Briere & Runtz, 1989), Patient Health Questionnaire (PHQ; Spitzer, Williams, & Kroenke, 1999), Daily Living Activities Scale -20 (DLA-20; Scott & Presmanes, 2001), Exercise Benefits/Barriers Scale (Sechrist, Walker, & Pender, 1985), and the Godin Leisure-Time Exercise Questionnaire (Godin & Shephard, 1985) respectively. Participants completed informed consent along with a questionnaire gathering basic demographic information and past exercise behavior experience. Data collection therapists completed a questionnaire delineating the client's diagnosis and DLA-20, as it is a clinical tool to objectively assess GAF scores. Participant demographics and results for above measurement tools were compared using a Mann Whitney *U* test, multiple regression, and Spearman (r_s) correlations to better understand how multiple

variables are being affected by the presence of trauma symptoms and co-occurring somatic issues.

According to Faul, Erdfelder, Buchner, and Lang (2009) G*Power 3.1 analysis would require 149 participants to complete a statistically significant test with an effect size of .1 $\boldsymbol{\alpha}$ error probability .05, Power (1-β err prob) at .95 with two groups (symptom severity), eight predictors (diagnoses), and four response variables (exercise intensity, barriers, benefits, and time spent exercising per week). This helped control for Type I error, the possibility of concluding significant results when it was truly random chance (Meltzoff, 1998). By controlling for Type I through use of controlling statistical significance levels the possibility of Type II error increases (Hadley & Mitchell, 1995). Increasing the sample size to appropriate levels will help control for a type II error. The sample size for this study was determined using a formal process based on computerized mathematical models (Faul, Erdfelder, Lang, & Buchner, 2007; Soper. 2012).

Participants

Master's level psychotherapists collected data from current clients of a community mental health center in three small (< 20,000) rural Southwestern Colorado towns. Therapists collecting data were licensed by the state of Colorado or unlicensed. Unlicensed therapists were registered with the State of Colorado and followed unlicensed registered psychotherapist guidelines for supervision and oversight. Participants were recruited from local mental health practitioners in Southwestern Colorado via flyers posted throughout offices and through personal contact with local practicing therapists, psychiatric medical staff, and case managers working directly with outpatient clients. Participants were asked to sign written informed consent forms prior to participation.

Clients were between the ages of 18-71 years of age and receiving outpatient therapy. Demographics such as age, gender, current income, education level, and past physical exercise experience were collected to compare groups in an attempt to better understand differences and identify possible resources (income, education). Clinical diagnoses were based on the American Psychiatric Association's (2000) Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision (DSM-IV-TR) criteria. This is a common and accepted industry tool for therapist diagnostic evaluation and was the version in circulation at the time this study was begun. Diagnosis categories as outlined in the DSM-IV-TR and symptom (mental and physical) elevation were measured via self-report measures to better understand what may contribute to one's ability to perform or avoid physical exercise. This sample collection was a sample of convenience. Using a variety of therapists to collect data diversified the sample in regards to symptoms, diagnoses, gender, age, income, education, and physical exercise experience. Due to this collection method is was not possible to randomize groups as it was a self-report post-facto design.

Data Collection

Data collection happened in one phase. Recruiting therapists offered participation to clients in treatment. Some clients saw flyers or spoke with clients who had already participated and asked staff to participate, as well. They were given the informed consent, offered an opportunity to ask questions, and upon signing the informed consent offered the packet of self report measures. Clients were asked to complete a demographic and exercise history questionnaire in addition to the standardized measurement tools measuring trauma symptom severity, co-occurring mental health symptom manifestation, somatic problems, perception of exercise benefits/barriers, and leisure time activities. Collection therapists were asked to provide

the diagnoses and DLA-20. All clients completed the TSC-40 in the presence of their therapist, and most clients completed the full set of measurements within 20 minutes of receiving them, again in the presence of their therapist. However, some clients elected to complete the GLTEQ, EBBS, PHQ, and demographic form at home and return or in the waiting room. All staff collecting data were provided two file folders. One file was marked completed informed consent and the other completed measurement tools. All packets were numbered and were tracked to therapists involved in the study. Upon completing the reports, staff collecting completed measures scanned for completion, requested additional information if needed, and separated the packets placing the informed consent in one folder and the measurement tools in the other to protect the identity of the client as the informed consent included names and the measurement packets did not.

At the close of the day all completed measures were placed in this researcher's confidential mailbox or in a sealed envelope for interoffice mail. The mail room where these are stored is locked at the end of each business day and only staff allowed entry during working hours. This researcher then transferred completed items to labeled files (informed consent or completed measures) within the records department in a file cabinet that was locked daily and the key held by records department staff. This researcher then retrieved and scored completed data packets periodically throughout the data collection process. During this phase this researcher double checked packet numbers to ensure that all participants had a completed informed consent, had completed all measures completely, and that providers had attached a DLA-20 and DSM-IV-TR diagnosis. Packet numbers and any identifying information written on forms were then blacked out with a sharpie marker and replaced with consecutive numbers corresponding to an excel spreadsheet. This spreadsheet was then used with SPSS statistical

software for analysis. Informed consent forms were not numbered so linking indentifying information with completed measures was no longer possible. Measurement tools mentioned above are explained in further detail below and contained in appendices A.

Measurement Tools

To better understand the relationships between physical exercise activity and mental health symptoms a number of measurement tools were used. At this point a measuring tool for the above does not exist. Measurement tools were selected to address the complexity of the participants in outpatient treatment, trauma histories, mental health symptomatology, perception of physical activity barriers or benefits, and actual participation in physical exercise.

Trauma Symptom Checklist-40 (TSC-40)

The TSC-40 is used to evaluate trauma symptoms (childhood or adult events) in adults and assess symptom clusters some survivors experience (Briere & Runtz, 1989). The TSC-40 looks at six subscales: dissociation, anxiety, depression, sexual abuse trauma index, sleep disturbance, and sexual problems. Each sub scale is measured with a likert scale of 0-3 (3 being often). According to Briere and Runtz (1996) Cronbach's alpha for the TSC-40 ranged between .89 and .91, sub-scales range from .66 to .77. Elliott and Briere (1992) normed the TSC-40 on 2,963 professional women from twelve professions outlined by Holland's typology: attorneys, certified public accountants, chemists, engineers, financial analysts, fine artists, microbiologists, musicians, nurse practitioners, occupational therapists, social workers, and statisticians. Women were placed in one of two groups based on report of sexual abuse prior to age 16 by someone five or more years their senior. Elliott and Briere reported total reliability at Cronbach's alpha of .90. According to Coolican (2009) strong reliability falls between .75 and 1 when using Cronbach’s alpha measure. In addition, discriminant analysis indicated the TSC-40 was able to

discriminate between abused and nonabused participants and those who reported abuse had higher scores overall.

Zlotnick and colleagues (1996) tested the TSC-40 on 130 psychiatric inpatient women. To establish convergent validity they used the Dissociation Experiences Scale, the anxiety and depression scales from the Symptom Checklist-90, and the self-rating traumatic stress scale. Zlotnick and colleagues stated the TSC-40 correctly identified 84% of cases and those with a history of sexual abuse scored significantly higher than those without abuse histories. They reported convergent validity was established on each subscale and discriminant validity was supported using the Multidimensional Scale of Perceived Social Support.

Ghee, Johnson, and Burlew (2010) looked at previous TSC-40 statistical evidence then normed the sample on a group of female substance abuse residential treatment patients. They wanted to control for social economic class, ethnicity, and determine if this measure was reliable on a sample where mental health symptoms were more complex than in the original study. On a sample of 104 African American and European American women who were statistically matched for demographics, they found the mean score was 48.1 which was significantly higher than Elliott and Briere's (1992) sample of professional women. In addition, Ghee and colleagues used the Modified PTSD Symptom Scale Self Report and found a high level of trauma within their sample. The TSC-40 has continued to be used as a highly valid and reliable research tool to better understand symptoms associated with surviving abuse.

Daily Living Activities Scale–20 (DLA-20)

The Daily Living Activities Scale-20 (Scott & Presmanes, 2001) allows clinicians to rate clients on 20 items to assess global assessment of functioning, clinical status, and help service providers treatment plan. Scott and Presmanes (2001) performed two studies to determine

psychometric properties for the DLA-20. In study one 85 people with serious mental illness were assessed. Cronbach's alpha was .83 for interrater reliability and .97 for internal consistency. ANOVA results showed significance for the DLA-20's ability to differentiate based on mental health symptom severity. A Pearson's *r* of .77 showed the scale had strong correlation for convergent validity. In study two, Scott and Presmanes used a variety of methods on 886 people with different diagnoses. They categorized clients according to severity. Category one contained people with severe mental illness (schizophrenia, paranoia, schizoaffective, and other psychotic disorders). People with major affective and dysthymic disorders, substance use, anxiety, and adjustment disorders were placed in category two. Clients in each group were assessed using the DLA-20, Global Assessment of Functioning (GAF), which assesses impairment to emotional disturbances, and Behavioral and Symptom Identification Scale (BASIS-32) that looks at symptomatology and level of functioning to better determine the DLA-20's ability to categorize symptom severity and sensitivity to change over time. A t-test was significant for concurrent validity around severity of diagnosis and stratification of care. Convergent validity was supported with a high correlation ($r > .6$) between the DLA-20 and GAF. Discriminant validity was shown by a low correlation ($r < .6$) between the DLA-20 and BASIS-32. Scott and Presmanes reported all measures had a significant score regarding sensitivity to change over a six month period.

Exercise Benefits and Barriers Scale (EBBS)

The Exercise Benefits/Barrier Scale gathers data on perceptions regarding participating in exercise. Developed by Sechrist, Walker, and Pender (1987) this scale is designed to better understand how people perceived participating in exercise. Normed on sample of 650 participants the Exercise Benefits/Barriers Scale was found to have a Cronbach's alpha of .954

(full scale 43 questions). The scale can be split into two, benefits (29 questions, Cronbach's alpha .954) and barriers (14 questions, Cronbach's alpha .866). Test-retest reliability was tested in two phases two weeks apart and resulted in a score of .89 for the total instrument, .89 for the benefits scale, and .77 for the barriers scale.

Godin Leisure Time Exercise Questionnaire (GLTEQ)

The Godin Leisure Time Exercise Questionnaire was developed to quickly assess level of physical activity. In a study done on 306 healthy adults the GLTEQ had strong test-retest reliability over a two week period. On measures of VO2 Max and body fat percentage, both measures of how fit an individual is, the GLTEQ's Cronbach's alpha scores were .83 and .85 respectively (Godin & Shephard, 1985). The authors of the psychometric test reported the test had a total reliability of .74 overall. Separate scale results showed correlations of: strenuous .94, moderate activity .46, and light .48. On the sweat inducing scale a correlation of .80 was reported. Godin and Shephard (1985) reported 69% of the time the test was able to identify fit participants based on VO2 Max and 66% correct for body fat percentage. Godin and Shephard offered possible reasons for lower correlations on moderate and low activity, citing many people have different metabolic rates, eating habits, and perceptions of what constitutes leisure time activity.

Jacobs, Ainsworth, Hartman, and Leon (1993) looked at psychometric properties of 10 physical activity tests. In regards to the GLTEQ stronger correlations were reported on heavy exercise and usual sweat scales (.84, .69 respectively) over light or moderate ranges (.24, .36 respectively). They noted testing physical activity is difficult because there are many facets to completing regular exercise. These complications include factors such as being underweight but over fat as measured through body fat calculations or that many in the sample considered

exercise to be of high intensity varieties rather than the broad range between sleeping and high VO2 Max calculations. Using a sample of 78 adult participants tested 1 month apart Jacobs and colleagues found a reliability coefficient of .62.

Patient Health Questionnaire (PHQ)

The Patient Health Questionnaire was developed to assess eight diagnoses (Kroenke, Spitzer, & Williams, 2002). The questionnaire is designed to capture symptoms related to the DSM-IV diagnosis criteria of major depressive disorder, panic disorder, and bulimia nervosa along with symptoms (but not complete diagnosis criteria) for depressive disorder NOS, anxiety disorder NOS, alcohol abuse and dependence, binge eating disorder, and somatoform disorder. In a study done with 3,000 primary care patients, Spitzer and colleagues (1999) found the PHQ correlated to six of the SF-20 scales ranging from .27 for pain to .53 for mental health. They also stated the PHQ depression scale ranges from .33 for pain to .73 for mental health. The study included correlations with mental health providers who conducted blind interviews with participants. When compared to interviews, the PHQ had a correlation of .84 and did not have a tendency to over or under diagnosis.

Avasthi and colleagues (2008) worked with 500 primary care patients in India. They found the PHQ had positive correlation between physician and PHQ diagnosis 52% of the time correlating at .363. They stated the PHQ was time efficient, useful for gathering psychiatric diagnosis by a physician, and increased the identification of individuals with psychiatric morbidity. Löwe and colleagues (2004) compared the PHQ to the Hospital Anxiety and Depression Scale and the World Health Organization Well Being Index-Five and reported the PHQ was “significantly superior to both the HADS and the WBI-5” (p. 131). In their study they found internal consistency (Cronbach’s alpha) of the PHQ to be .88, stating the screening tool

found 74-98% of depression disorder compared to 40% of physicians and took less than three minutes to administer. The PHQ can be broken into a variety of measures including the PHQ-9 that assesses for depression, PHQ-15 that looks at somatic symptoms, and GAD-7 which measures anxiety.

PHQ-9. Kroenke and colleagues (2001) stated internal reliability of the PHQ-9 had a Cronbach's alpha of .89 and correlation between the self-administered PHQ-9 and an interview done with a mental health professional over the telephone to be .84. They also compared the PHQ-9 to a number of other measures of depression and stated the area under the curve was .95 for the PHQ-9, the highest of all measures looked at.

PHQ-15. In two studies done on a total of 6,000 people from a variety of primary care locations the PHQ-15 had a Cronbach's alpha of .80 (Kroenke et al., 2002), which is considered strong reliability (Coolican, 2009). According to Kroenke and colleagues (2002) the 15 individual symptoms showed moderate correlations with 45% between .20-.29, 33% between .10 -.19, 6% were less than .10, and 9% were greater than .4.

GAD-7. The Generalized Anxiety Disorder seven-question scale (GAD-7) was normed on 2,739 patients from a variety of primary care clinics around the United States (Spitzer, Kroenke, Williams, & Löwe, 2006). Of the 2,739 participants, 1,184 took only the GAD-7, 965 completed the GAD-7 and an interview with a mental health professional blind to the self report results, and 591 completed phase two which consisted of a one page questionnaire sent to their home six months after taking the GAD-7 in phase one. Phase two helped researchers understand how the GAD-7, which asked about symptoms over the last month, related to the DSM-IV diagnosis criteria requirement of six months. Spitzer, Kroenke, Williams, and Löwe (2006) reported the GAD-7 had internal consistency Cronbach's alpha of .92, test-retest reliability

intraclass correlation of .83, and intraclass correlation between the self-report GAD-7 and the mental health professional interview of .83. They also compared the GAD-7 to a number of other symptom checklists and report overall significant results. Participants filled out the Short Form-20 (SF-20), Beck Anxiety Inventory, and the Symptom Checklist-90. In regards to the SF-20 six domains correlated with the GAD-7. Severity of symptoms and impairment of function were reported as significant pairwise comparisons. The SF-20 Mental Health subscale had a strong correlation with the GAD-7 (Pearson's r = .75). On the Beck Anxiety Inventory and The Symptom Checklist - 90 the GAD-7 was again strongly correlated with Pearson's r at .72 & .74 respectively. In addition to the above, the authors compared the GAD-7 with the PHQ-8 (PHQ-9 minus one question regarding suicide) to factor out depression from anxiety symptoms when they present together. After completing factor analysis the authors determined depression and generalized anxiety disorder are distinct dimensions (Spitzer et al., 2006).

Data Analysis

Statistical data for hypotheses one thru three were analyzed using a Mann Whitney *U* test to compare the means of two groups (high vs. low symptom severity) with three levels (TSC-40, PHQ, DLA-20) on multiple dependent variables of exercise intensity, time spent exercising, and perceived benefits vs. barriers to exercise. This researcher then considered how independent variables of symptom manifestation impacted a variety of dependent variables on physical exercise. The Mann Whitney *U* test is a nonparametric statistic equivalent used to assess a between group design when the independent variable has two groups with three levels of symptom severity (Morgan, Leech, Gloeckner & Barrett, 2011). To address the overall research question statistical calculations compared group means to evaluate how independent variables of high verses low symptom severity impacted exercise participation, perception of benefits and

barriers to exercise, and intensity of leisure time activities. The data was tested for assumptions of normality using tests for skewness, kurtosis, and the Shapiro-Wilk's test and homogeneity was tested using Box's M test. Assumptions for parametric tests were not met and transformation of data equations failed to create normal distributions, therefore the Mann-Whitney *U* test was an appropriate option (Green & Salkind, 2003).

In hypotheses four and five the question of interest is better understanding of how dependent variables are related to each other. Spearman's r_s was chosen as the correlation statistic of choice when parametric assumptions were not met and Cohen's 1988 value was used to determine the relationship and variance between dependent variables that may be helpful for clinicians to understand. Perceived benefits of exercise and possible resources can help clinicians implement the data gathered through this study in real life treatment interventions. Correlations allow one to show how variables 'co-vary' or relate to each other (Coolican, 2009). These relationships (between data) help explain how independent variables relate to dependent variables and help one understand differences in the population via the coefficient of determination and nondetermination (Green & Salkind, 2003). In addition, Multiple regression was conducted on variables that did meet parametric assumptions and additional Spearman's r_s correlations were run on variables to further explore the data. The overall research question and original hypotheses are outlined below. Statistical calculations were analyzed using SPSS 20.

Research Question

Research Question: Do people with more mental health symptom severity participate in less exercise with less intensity than those who have less mental health symptom severity?

There will be a group difference: those with more symptom severity (higher TSC-40, PHQ, and lower DLA-20 scores) will exercise at lower intensities (GLTEQ), less hours per week

(GLTEQ), and will have more barriers to exercise (EBBS) than those with less symptom severity.

Table 1

Independent Variables

IV_1 = Higher Symptom Severity	IV_2 = Lower Symptom Severity	IV_3 = Number of Co-occurring Mental Health Diagnoses = μ_7	IV_4 = Education level = μ_{12}	IV_5 = Income level = μ_{13}
$IV_{1\text{-}1}$ = TSC-40 = μ_1 $IV_{1\text{-}2}$ = PHQ = μ_2 $IV_{1\text{-}3}$ = DLA-20 = μ_3	$IV_{2\text{-}1}$ = TSC-40 = μ_4 IV_{2-2} = PHQ = μ_5 $IV_{2\text{-}3}$ = DLA-20 = μ_6			

Note. TSC-40 – Trauma Symptom Checklist-40, PHQ – Patient Health Questionnaire, DLA-20 – Daily Living Activities Scale-20. Co-occurring mental health diagnoses are determined via the PHQ.

Table 2

Dependent Variables

DV_1 = Exercise Intensity Level = μ_8	DV_2 = Barriers to Exercise = μ_9	DV_3 = Benefits to Exercise = μ_{10}	DV_4= Time Spent Exercising = μ_{11}

Hypothesis 1: Those with more symptom severity will exercise less intensely than those with less symptom severity.

Ha_1: $\mu_1 + \mu_2 + \mu_3 > \mu_4 + \mu_5 + \mu_6 > \mu_8$

$H_{1\text{-}2}$: $\mu_7 > \mu_8$

H_{1o}: $\mu_1 + \mu_2 + \mu_3 = \mu_4 + \mu_5 + \mu_6 < \mu_8$

$\underline{H}_{1\text{-}2o}$: $\mu_7 < \mu_8$

Hypothesis 2: Those with more symptom severity will exercise less hours per week than those with less symptom severity.

H_2: $\mu_1 + \mu_2 + \mu_3 > \mu_4 + \mu_5 + \mu_6 > \mu_{11}$

$H_{2\text{-}2}$: $\mu_7 > \mu_{11}$

H_{2o}: $\mu_1 + \mu_2 + \mu_3 = \mu_4 + \mu_5 + \mu_6 < \mu_{11}$

$H_{2\text{-}2o}$: $\mu_7 < \mu_{11}$

Hypothesis 3: Those with more symptom severity will perceive more barriers to exercise than those with less symptom severity.

H_3: $\mu_1 + \mu_2 + \mu_3 > \mu_4 + \mu_5 + \mu_6 > \mu_9$

$H_{1\text{-}2}$: $\mu_7 > \mu_9$

H_{1o}: $\mu_1 + \mu_2 + \mu_3 = \mu_4 + \mu_5 + \mu_6 < \mu_9$

$H_{1\text{-}2o}$: $\mu_7 < \mu_9$

Hypothesis 4: There will be a positive correlation between education level and perceived benefits to exercise.

H_4: $\mu_{12} = \mu_{10}$

$H_{4o:}$ $\mu_{12} \neq \mu_{10}$

Hypothesis 5*:* There will be a positive correlation between income level and perceived benefits to exercise.

H_5: $\mu_{13} = \mu_{10}$

$H_{5o:}$ $\mu_{13} \neq \mu_{10}$

Confounding Variables and Limitations

Due to the nature of post-facto self-report data collection and the design of this study, there are many confounding variables and threats to validity. Although some diagnoses were screened out, such as psychosis, many were not which complicates treatment and may confound the ability to participate in physical exercise and structure the beliefs one may have about it. As noted in the literature review mental health treatment and presentation becomes more complex when clients are struggling in a variety of life domains (Classen et al., 2011). Clients who were actively psychotic, under the influence of drugs or alcohol (as measured by a positive toxicity screen or elevated blood alcohol concentration), in mental health crisis (presenting for crisis treatment), or hospitalized were not included in this study. Although, all clients in the study had identified psychological trauma as a treatment goal, PTSD was not specific to the criteria. This is confounding because many who experience psychological trauma often present with a variety symptom clusters and these individual symptom presentations do not create a clear category for analysis. To help contend with these confounding variables, the PHQ was used to identify

possible diagnoses and symptom clusters. This measure looks at somatic symptoms as well as a variety of mental health diagnoses. As a result it provided more comprehensive information about symptom presentation participants were experiencing. In addition, participating therapists were asked to identify client DSM-IV-TR diagnosis as part of the screening tools.

Another area of confounding data is the definition of physical exercise. Although the GLTEQ asks about specific physical factors (increased heart rate, sweating) many in this study identified it differently. Through written participant comments it was clear some did not include physical activity associated with work or outside of leisure time when others did include it. To truly gather this type of data it would include physiological markers that remain consistent across participants and would require teaching clients how to measure intensity levels. In this study participants were not provided information on these processes.

As noted above through discussion on heart rate variability, understanding physiology is another factor to understanding participant experiences of psychological trauma. Although the TSC-40 asked questions about physical symptoms it is unclear how hyper vs. hypo arousal symptoms were impacting those who participated or not in physical exercise. Due to the nature of the self-reports it was impossible to accurately assess these states as constant across the participant pool. As noted in the literature review these states are biological processes and have clear physiologic markers. Both areas are items for further research and the above confounding issues are further addressed in the limitations section in chapter five.

Role of Researcher

The role of the researcher in this study was to solicit local psychotherapists to offer participation to clients. Hadley and Mitchell (1995) reported a balance must be struck between providing services and doing research if one is to make sure they are giving the best service

possible to clients. This study provided this balance by allowing the researcher to continue to see clients while data was collected from a representative sample within the participating community mental health centers based on colleagues' caseloads. This also helped control for “appearing good” by clients on this researcher’s caseload and decreased possible pressure clients of this researcher may have felt if requested to participate. This method also kept integrity of the data by creating a layer between the data and researcher (Creswell, 2009).

This researcher provided measurement tools and training on completion of the tools for the therapists collecting data. Then the researcher scored and analyzed the data from completed participant packets as outlined above. The researcher had little or no contact with study participants with the exception of working with the client in some capacity in the past, in group (not as primary therapist), or requested participant communication with the researcher. All data was confidential according to the current mental health confidentiality laws in the state of Colorado, United States and participant identity was only collected on the informed consent forms which were separated from the data packets.

Ethical Protection

According to Posavac and Carey (2007) "the first responsibility of an evaluator, as it is with the basic researcher, is to protect people from harm" (p. 96). Participants signed written informed consent and the Institutional Review Board of The Chicago School of Professional Psychology and the collection sites approved the study prior to beginning data collection. Participants had free access to the local mental health crisis team as needed, and therapists remained available to participants throughout the study. Participants and collecting therapists were not compensated for participation in this study.

Creswell (2009) stated the researcher must work to protect identifying information, plan

for protection of vulnerable populations, and respect the rights of both participants and sites. The method and services available to participants effectively addressed these needs. Identifying information such as name of the participant, diagnosis, or treatment information was kept confidential. Data will continue to be stored for an appropriate amount of time according to American Psychological Association guidelines (American Psychological Association, 2010; Creswell, 2009).

Chapter 4: Results and Findings

To determine the impact of psychological trauma on participants' perception of physical exercise barriers and benefits, as well as, determining intensity levels when participating in physical exercise five measures were used. The Trauma Symptom Checklist-40 (TSC-40) was used to determine current level of disruption caused by trauma symptoms. The self-report Patient Health Questionnaire (PHQ) allowed for accounting of current level of functioning, symptom clusters, and both mental and somatic symptom manifestation. Clinicians collecting data used current DSM-IV-TR diagnoses and Global Assessment of Functioning (GAF), as measured by the Daily Living Activities Questionnaire-20 (DLA-20), to help control for confounding variables, such as diagnosis, and offer an objective view of symptom difficulties outside of self-reports and across multiple data collectors. Exercise perception was measured by the Exercise Benefits and Barriers Scale (EBBS) and participation in exercise, as well as, intensity of activity, was measured using the Godin Leisure Time Exercise Questionnaire (GLTEQ).

Participants (n=167) were recruited from a community mental health clinic in rural southwestern Colorado. They were approached by service providers (therapists and case managers), offered participation in the study during therapy settings, and notified of the study through flyers placed around the clinic buildings. Participation was voluntary and participants could withdraw prior to completion of the analysis entry into the spreadsheet for SPSS. At that time data packets became completely anonymous. A total of 16 withdrew from participation and two volunteered who did not meet screening criteria, leaving 149 participants who successfully completed the study. Participants took the TSC-40 in the presence of a clinician in order to provide support in the event of adverse reactions to any of the questions and then gave the remaining completed measures to their provider. Providers checked for completion and

submitted completed packets through the process outlined above. Clinicians collecting data provided a GAF score using the DLA-20 and a DSM diagnosis for each participant. Completed packets were stored in a locked cabinet within the agency's records department. Upon completion of data collection, this researcher scored the measures and entered data into the statistical software. All statistical calculations were determined using SPSS 20.

Descriptive Statistics

The sample (*N*=149) was 61.7% female, 38.3% male, with a mean GAF score of 53.2. At the time data was being collected the DSM-IV-TR was in circulation and GAF scores were still being used. However since completing data collection and prior to publication the DSM V was released and GAF scores were no longer used as part of diagnosis. They are included here based on DSM-IV-TR definitions and terms. Although diagnoses were not the main focus of this study, due to the collection site, a rural community mental health center, and this researcher's interest in how this complexity may impact one's ability to participate in physical exercise, even when benefits are known, diagnoses were collected to help provide more information about the complexity of participants completing the study. A majority had more than one diagnosis (*N*=101) with 31.5% (*N*=47) of the sample having posttraumatic stress disorder (PTSD) as their primary diagnosis. Most had a substance use disorder diagnosis (63.1%), again data was collected under the DSM-IV-TR and substance use was categorized based on dependence or abuse, DSM V equivalent would be a substance use disorder with a qualifier for severity. Common diagnoses included Alcohol Dependence (*N*=37), Alcohol Abuse (*N*=26), Major Depression - moderate (*N*=19), and Generalized Anxiety Disorder (*N*=18).

Participants were 18-71 years of age with the average age 40.4 years. 47% had some college education, 25.5% had a bachelor's degree or higher, 21.9% graduated high school/GED,

and 5.4% had not completed high school. The majority (81.2%) of participants had an annual household income under $40,000. Overall, participants felt their current health was good (49.7%) or fair (37.6%). Many reported some understanding of exercise benefits: 88.6% had participated in regular exercise before, 74.5% felt exercise had helped their psychological trauma symptoms, and 63.8% reported they knew about different effects psychological trauma had on the body.

Measurement Tools

Trauma Symptom Checklist–40

The TSC-40 was used to help understand how trauma symptoms were impacting participants over the last two months. All participants were in outpatient treatment and trauma was an expressed area of focus for treatment even if they did not have PTSD as a current diagnosis. As noted above most understood that trauma impacts their body (63.8%) and had received some relief from trauma symptoms using physical exercise (74.5%). The mean score on the TSC-40 in this study was 37.88, which is on the low end of trauma symptom manifestation. Possible scores range from 0-120 with higher scores representing more distress.

Patient Health Questionnaire

The PHQ has 11 subscales and used in this study to help understand how mental and somatic symptoms may impact participants; 71.8% of participants were not bothered or bothered a little by somatic symptoms, 44.3% had mild to moderate depressive symptoms, and close to half (42.3%) had a panic attack within four weeks of participating. Of those who had a panic attack in the last month (prior to completing the questionnaire) most had physical symptoms such as, chest pain, sweating, shortness of breath, or numbness in parts of the body. Many (84.6%) endorsed feeling worried over the last four weeks and being bothered by symptoms related to feeling restless or struggling with sleep and/or fatigue. Just over a quarter of the participants

endorsed struggling with binge eating behaviors (28.9%), however most did not report symptoms associated with bulimia nervosa (93.3%). Those who reported using alcohol (41%) stated they had not had adverse effects (e.g. struggling with daily activities, legal trouble, or interpersonal problems) as a result of drinking behaviors and 54.4% stated they did not drink alcohol at this time. Overall, 75.1% of participants stated their symptom presentations made taking care of work, home, or getting along with people not difficult at all (38.9%) or somewhat difficult (36.2%). A minority of study participants reported symptoms were very difficult to deal with (15.4%) or extremely difficult (9.4%) for them.

Daily Living Activities Scale–20

The DLA-20 is a clinical measure to objectively assess the global assessment of functioning, Axis V diagnosis in the DSM-IV-TR. This measure was filled out by the clinicians collecting data to help control for self-report symptom presentation and symptom difficulty across multiple data collectors. The range of GAF scores was 38-69 and the average score 53.26, meaning most people were dealing with moderate symptoms that moderately impact daily life. (4th ed., text rev.; DSM-IV-TR; American Psychiatric Association, 2000).

Exercise Benefits Barriers Scale

This measure offered a variety of statements about physical exercise. Participants were asked to rate their feelings (strongly disagree to strongly agree) regarding exercise benefits and barriers. Hypothesis three focused on the link between symptom severity and barriers to physical exercise. The EBBS is scored using the whole measure and/or two subscales. Subscale one measures the perception of benefits to exercise and subscale two barriers perceived to participating in exercise. Higher scores indicate greater endorsement of the scale being measured. The total scale mean was 129.02 out of a possible 172, benefits mean was 89.38 out of

116, and barriers mean 39.28 out of 56. Overall, most participants endorsed benefits and barriers to exercise, with higher benefits and overall scale scores compared to the barriers subscale in the sample.

Godin Leisure Time Exercise Questionnaire

Using the GLTEQ allowed participants to account for the amount of physical activity they performed throughout a week and intensity of physical exercise performed. Hypotheses one and two predicted higher mental and physical health symptoms would lower intensity of exercise performed and less time would be spent exercising in a seven day period. Just under half the sample performed no strenuous (49%) or moderately strenuous weekly exercise (35.6%), however most did perform mild exercise over a seven day period (81.2%). Over half the sample (63.8%) performed some form of exercise at least seven days each week. Most participants reported participation in regular activity long and intense enough to work up a sweat either *sometimes* during a seven day period (40.9%) or *often* (29.5%) during a seven day period

Testing Normality and Parametric Assumptions

Following the computation of descriptive statistics for sample demographics, exploratory descriptives were used to determine normality of the data. Histograms, box plots, and Kolmogorov-Smirnov and Shapiro-Wilk tests of normality were performed. The Kolmogorov-Smirnov and Shapiro-Wilk tests returned significant results for a number of variables and upon visual examination of histograms it was determined that further mathematical calculations would be needed to determine the parametric status of the sample. The skewness and kurtosis values were examined and calculated against the standard of error statistic. According to Coolican (2009), the skewness value should be less than two times the standard of error. Using the mathematical calculation it was determined a number of the variables were two times greater

than the standard error statistic. Transformation calculations were performed to determine if the data could be transformed into a normal distribution for parametric testing. Upon the completion of SPSS transformation arithmetic (LN, Log10, and Sqrt functions) variables were still outside normal distribution parameters. Therefore the originally planned MANOVA and Pearson's *r* statistical calculations were abandoned for nonparametric equivalents (Lin, 2010; McLaughlin, 2009; Statsoft, 2013). The substance abuse diagnosis category was also transformed using the SPSS Sqrt function to create ordinal data to complete the Spearman Rho (r_S) calculations for additional findings.

Mann Whitney U Test Results

After attempting to transform the data of high versus low scores to a normal distribution without success, the Mann-Whitney *U* test was used to consider the first three hypotheses:

Hypothesis 1 : Those with more symptom severity will exercise less intensely than those with less symptom severity.

Hypothesis 2: Those with more symptom severity will exercise less hours per week than those with less symptom severity.

Hypothesis 3: Those with more symptom severity will perceive more barriers to exercise than those with less symptom severity.

Each measure was split into two groups, high and low values of each independent variable (mental health symptom severity as measured by the TSC-40, GAF, PHQ), and then the Mann-Whitney *U* was performed using dependent variables (intensity of exercise performed and perception of barriers to exercise). A Mann-Whitney *U* test is often used when the data is nonparametric and transforming the data does not return a normal distribution (Morgan et al., 2011). To complete a Mann-Whitney *U* test one must calculate the *U*-value (N1N2 = *U*1 + *U*2)

(Coolican, 2009). This was done using a computerized Mann Whitney *U* statistical calculator. According to Social Science Statistics (2014), the value of *U* between the two groups of high GAF scores (50-100) and Low GAF scores (0-49) is 0 for a two-tailed test with a significance level of $p \leq 0.05$. The Z-score is 9.3122, *p* value is 0, and the result is significant at $p \leq 0.05$ (Social Science Statistics, 2014). Since the *U* value is 0 the distribution is approximately normal and the Z value can be used for the GAF variable. The calculation for the TSC-40 groups of high (60-120) and low (0-59) scores was also 0, with a Z-score of -8.1142, *p* value of 0, and the result significant at $p \leq 0.05$. In regard to the PHQ high (79-158) and PHQ low (0-78) scores, the *U* calculation was 33, Z-score of -10.3679, *p* value of 0, and significant at $p \leq 0.05$. Again, this distribution is approximately normal and the Z-value can be used (Social Science Statistics, 2014).

The results of the Mann-Whitney *U* test supported hypothesis one, higher symptom severity would result in less exercise intensity, in regards to only one symptom measure, the PHQ. The rank average for those with higher symptom presentations was 67.01 and 82.67 for those with less symptoms. The results indicated those with higher co-occurring mental and somatic symptoms exercised less strenuously than those with less co-occurring mental and somatic issues. This difference was significant, $U = 2191.0$, $p = .018$. The GAF and TSC-40 symptom severity measures did not return significant results $U = 2029$, $p = .401$ and $U = 1479$, $p = .377$ respectively.

For hypotheses two, two dependent variables were used to consider the amount of time spent exercising. Both variables were based on the GLTEQ measure where participants ranked the amount of time they spent exercising in a seven day period and how often, on average, they exercise regularly in seven days. The total time spent exercising over seven days was significant

in relation to the PHQ according to the Mann Whitney *U* test results, rank average of those with higher symptoms was 62.94, those with lower symptoms 86.59, $U = 1893$, $p = .001$. However as with hypothesis one, the TSC-40 and GAF measures did not return a significant finding $U = 1823$, $p = .096$ and $U = 1529$, $p = .560$ respectively. When considering frequency of regular exercise in an average seven day period no measure of symptoms returned a significant result, GAF $U = 2056$, $p = .475$, TSC-40 $U = 1542$, $p = .581$, and PHQ $U = 2564$, $p = .395$.

Hypothesis three was supported only by the PHQ as well. This hypothesis predicted that those with more symptom severity would perceive more barriers to exercise. The GAF and TSC-40 results supported the null hypothesis GAF $U = 1985$, $p = .330$ and TSC-40 $U = 1432.5$, $p = .290$. The PHQ rank averages were 62.86 for those with higher symptoms and 86.66 for those with less. This result indicated that higher symptom presentation resulted in more perceived barriers to physical exercise. The difference was significant, $U = 1888$, $p = .001$.

Multiple Regression

Multiple regression was conducted to help better understand the data set and how dependent variables may interact with each other. Regression helps explain the relationship of dependent variables (perception of and participation in physical exercise) to the independent variable (mental health symptom severity). According to SigmaPlot (2010) "The dependent variable in the regression equation are modeled as a function of the independent variables". When using regression one is able to look at how dependent variables may change when one or more of the independent variables are held steady. This allows for further exploration of the relationship between symptom severity and physical exercise participation and perception.

After checking assumptions for regression (e.g. normality of the data, linearity, and colinearity of variables) a standard multiple regression was performed to consider how

perception of exercise benefits may be impacted by other factors not included in the above hypotheses testing. Overall perception of exercise benefits was the dependent variable and age, education, current health, exercise has helped trauma symptoms, and prior knowledge about trauma effects on the body were independent variables. Table 4 displays the coefficients between variables, the unstandardized regression coefficients (B), and intercept, the standardized regression coefficients (beta), the semipartial correlations, and R (.327), R^2 (.107), and R^2 adjusted (.076). R for regression was significantly different from zero, $F_{5, 143} = 3.427$, $p = .006$. Two variables contributed significantly to perception of exercise benefits: current health (beta = -5.181) and exercise has helped my trauma symptoms (beta = -8.117).

Table 3

Factors Impacting Positive Perception of Exercise

Coefficients [a]

	Unstandardized Coefficients		Standardized Coefficients			Colinearity Statistics	
Model	B	Std. Error	Beta	t	Sig	Tolerance	VIF
(Constant)	1	8		1			
Age	51.082	.849	-.057	7.073	000	.09	
Education	-	.	.023	-	2		.108
Current	.076	110	-.216	.689	492	.92	

Health		.3	1	-.215		.	3	.083
Exercise	99	.423		281		779	.89	
Helped Trauma		-	1	.028		-	7	.115
Symptoms	5.181	.998		2.593		010	.83	
Knew		-	3			-	0	.205
Effects of Trauma	8.117	.268		2.484		014		
on the Body							.81	
		.9	2			.	7	.224
	27	.908		319		750		

Dependent Variable: Perception of Exercise

Correlations

Correlations were used to determine hypothesis four and hypothesis five:

Hypothesis 4: There will be a positive correlation between education level and perceived benefits to exercise.

Hypothesis 5: There will be a positive correlation between income level and perceived benefits to exercise.

Other studies have shown interaction between education and income levels on exercise and it is known that higher education and income levels have a positive effect on exercise behavior (Center for Disease Control, 2008; Simon et al., 2006). Correlations help explain how two random variables covary with each other and provide some understanding of how differences in the population manifest (Coolican, 2009). Due to data violation of parametric

assumptions for a Pearson Correlation and failed transformation attempts, the Spearman Rho (r_S) was used to consider hypotheses four and five. With respect to hypotheses four there was not a significant finding between education level and perceived benefits to exercise (Spearman rho r_S (149) = .115, p = .161 two tailed). Income as a predictor of perceived benefits to exercise also returned a non significant result (Spearman rho r_S (149) = -.044, p = .594 two-tailed) and supported the null hypothesis.

Income as a predictor of more strenuous exercise and more time spent exercising did not show significance, however income was correlated with mild exercise, r_S (149) = .176, p = .031 and mild exercise had a moderate correlation with regular exercise in seven days, r_S (149) = -.309, p = .000. Income was positively correlated with mild exercise suggesting as incomes went up so did mild exercise participation. Cohen's (1988) effect size accounted for only 3%. Interestingly, the moderate correlation between mild and regular exercise is negative suggesting as regular exercise went up, mild intensity went down. Cohen's (1988) effect size for this correlation accounted for 10% of the variance.

Additional Findings

After correlations regarding hypotheses four and five were completed, a number of other variables were correlated using Spearman's rho (r_S). This researcher's aim was to better understand the complex nature of clients presenting in a rural community mental health center. The additional correlations allowed the larger picture of this complexity to arise. Again, Spearman's rho (r_S) was used because many of the variables did not meet parametric assumptions and were skewed.

Age of the participant was a factor in exercise behaviors. A small correlation was found

between moderate exercise and total time spent exercising over seven days. Spearman rho $r_S(149) = -.278$, $p = .001$, and $r_S(149) = -.198$, $p = .04$. All are negative correlations suggesting that younger participants of this study did more exercise per week. Cohen's (1988) effect size was again small accounting for 8% and 3% of variance respectively.

Current Health also played a small role in perception of and participation in exercise. A number of correlations were negative suggesting that as current health went up participants were exercising less in seven days, $r_S(149) = -.334$, $p = .000$. Cohen's (1988) effect size was moderate accounting for 11% of the variance between current health and exercising less in seven days. The perception of barriers, $r_S(149) = -.242$, $p = .003$, and benefits, $r_S(149) = -.264$, $p = .001$ both went down as current health rose. Cohen's (1988) effect size was small for both and accounted for 5% and 7% of variance respectively. This might be considered contradictory or just speak to the complexity of the client participating in this study. In either case this is an area for further research. However they also reported more frequent exercise in an average seven day period, $r_S(149) = .287$, $p = .000$. Cohen's (1988) effect size was small accounting for 8% of variance between current health and regular exercise in an average seven day period. Taken together these correlations suggest that people may not have performed much exercise over seven days but do regular activity with enough intensity to raise heart rate and break a sweat on an average seven day period.

In addition, although a majority (74.5%) knew exercise could help their psychological trauma symptoms based on the negative correlation below it appears they are not embracing the perception of benefits exercise may offer. A moderate negative correlation exists between benefits of exercise and those who reported that exercise helped trauma symptoms, $r_S(149) = -$

.324, $p = .000$. Cohen's (1988) effect size is moderate accounting for 10% of the variance in knowing exercise can help trauma symptoms and the perception of exercise benefits. This is backed by the small correlation in the overall score on the Exercise Benefits / Barriers Scale which measures the perception of both the benefits and the barriers of performing physical exercise.

Although current health and knowing about physical exercise helping trauma symptoms created some confusing correlations, current exercise behaviors were negatively correlated with barriers, $r_S(149) = -.223$, $p = .006$ as to be expected with the sample demographics showing that 88.6% had participated in regular exercise, 74.5% felt it had helped their psychological trauma symptoms, and 63.8% reported they knew about effects psychological trauma had on the body. Cohen's (1988) effect size was small and accounted for 5% of the variance between current exercise behaviors and knowing exercise helps symptoms. This may point to, not only the complexity of the presenting client, but also the difficultly those with a variety of mental health symptoms have in participating in regular exercise.

Substance abuse diagnosis was shown to have an impact on perception of barriers to exercise, $r_S(149) = -.2.67$ $p = .001$. This negative correlation means that as perceived barriers to exercise went down the person was likely to have more substance use diagnoses. Using Cohen's (1988) guidelines, the effect size is small. The r_S indicates that approximately 7% of the variance in the percent of barriers to exercise was explained by substance use diagnosis. This negative correlation is further supported by the correlation between substance use and time spent exercising.

Substance use was also found to have a small effect on the amount of time spent

exercising and the intensity of that exercise performed, moderate exercise, $r_S(149) = -.262$, $p = .001$, mild exercise $r_S(149) = -.197$, $p = .016$, total time spent exercising $r_S(149)$, $= -.271$, $p = .001$, and regular exercise in seven days $r_S(149) = .199$, $p=.015$. It would appear that those with multiple substance use diagnoses exercise less based on the above negative correlations, however the amount of exercise in a seven day period is a positive correlation, suggesting that exercise performed in a seven day period increased as substance use diagnoses did. Cohen's (1988) value suggests that 7% of the variance between moderate exercise is explained by substance use diagnoses, 4% for mild exercise, 7% total time spent exercising in seven days, and 4% regular exercise over a seven day average.

The perception of exercise benefits was negatively correlated with a number of PHQ scales. These negative correlations suggest that as perception of exercise benefits went up, symptoms went down. PHQ scales included in this analysis were scale one, somatoform disorder symptoms, $r_S(149) = -.292$, $p = .000$, Cohen's (1988) value 8% of the variance; scale two, depression symptoms, $r_S(149) = -.292$, $p = .000$, Cohen's (1988) value ; scale three and four, symptoms of panic disorder, $r_S(149) = -.229$, $p = .005$ and $r_S(149) = -.249$, $p = .002$ respectively; scale five, anxiety disorder symptoms, $r_S(149) = -.292$, $p = .000$. According to Cohen's (1988) value 8% of the variance for somatoform, depressive, and anxiety symptoms can be explained by the perception of exercise benefits. In regards to panic disorder symptoms 5% and 6% (scale 3 and 4) of variance can be explained by perception of exercise benefits.

In addition perception of exercise benefits, exercise intensity levels, and total time spent exercising in seven days was also correlated negatively with scales one-five on the PHQ. PHQ scale one, $r_S(149) = -.243$, $p = .003$; scale two, $r_S(149) = -.254$, $p = .00s$; scale five, $r_S(149) = -$

.204, p = .013. Cohen's (1988) accounted for 6% and 4% of the variance between the PHQ scales and strenuous exercise. Moderate exercise also showed small correlations with the PHQ scales. Again scale one, $r_S(149) = -.243$, p = .004, Cohen's (1988) value accounts for 6% of the variance; scale two, $r_S(149) = -.224$, p = .006, Cohen's (1988) value accounts for 5% of the variance; scale three, $r_S(149) = -.177$, p = .030, Cohen's (1988) value account for 3% of the variance; scale five, $r_S(149) = -.204$, p = .013, Cohen's (1988) value accounts for 4% of the variance. In regards to total time spent exercising in seven days scales one, two, and five returned a small but significant correlation. Spearman rho (r_s) values were: scale one, $r_S(149) = -.286$, p = .000, Cohen's (1988) value accounts for 8% of the variance between total time spent exercising in the last week and somatoform disorder symptoms, scale two, $r_S(149) = -.234$, p = .004, Cohen's (1988) value accounts for 5% of the variance between total time spent exercising and depression symptoms, and scale five, $r_S(149) = -.223$, p = .006, Cohen's (1988) value again, accounting for 5% of the variance between total time spent exercising over the last week and anxiety symptoms. It is interesting to note the correlations between panic disorder symptoms did not show significant results with total time spent exercising but did have very small negative correlations with strenuous and moderate intensity levels. The physical symptoms of panic and anxiety disorders did not show significance with strenuous, moderate, or total time spent exercising.

Chapter 5: Discussion

After years of working with people who struggled to follow through on exercise recommendations, often citing physiological reasons for quitting that looked similar to a trauma response, I began to question clients about experiences. Anecdotally stories of body responses to psychological trauma and physical exercise were similar. It is well known in mental and physical health fields that exercise helps decrease negative mental health symptoms and increase positive ones (Martinsen et al., 1989; McGale et al., 2011; Weinstock et al., 1998). According to van Dijke and colleagues (2011) many who participate in community mental health services have experienced psychological trauma. In addition, those with mental health issues die at younger ages (Colton & Manderscheid, 2006) and utilize more health care (Jones et al., 2004) than those without mental health problems. This study aimed to better understand possible links between psychological trauma and symptoms (mental health and somatic) in regards to physical exercise perception and participation.

Further exploration of difficulties clients presenting with psychological trauma, multiple mental health diagnoses, and somatic symptoms is needed to help guide practical strategies for clinicians working with this diverse group. This was the rationale for looking closer at somatic symptoms, a wide variety of diagnoses, and the presence of psychological trauma as an identified treatment goal even without diagnosed PTSD. In this study there was a significant finding between co-occurring mental and somatic symptoms and the number of barriers to physical exercise.

Although, the hypotheses were found to be significant with only one independent variable, it is of consideration that the PHQ measurement tool did have significant results for hypotheses one - three. In addition, the multiple regression showed significance even when the

correlation hypotheses did not, as did the supplemental correlations, albeit small effect sizes in many cases. These points speak to the design's ability to show some connection between mental and somatic symptoms and participation in and perception of physical exercise.

Summary of Results

It would appear from the data that those presenting for mental health treatment at a community mental health center in rural Colorado do have a lot of complexity. Many had more than one diagnosis, most had a substance abuse or dependence (or both) diagnosis, and a third of the data set had PTSD as their primary diagnosis. A majority had participated in regular exercise in the past and many knew it had helped their psychological trauma symptoms. However, the mean TSC-40 score suggests that most were not experiencing acute trauma symptoms at the time of participating in this study. Yet, those with higher co-occurring mental and somatic symptoms (PHQ) exercised less (often/intensely) and perceived more barriers to physical exercise. There were negative correlations between the PHQ scales one-five and perception of benefits, strenuous and moderate exercise intensity, and total time spent exercising in the last seven days. Participants who engaged in higher intensity and more time exercising over the last seven days had less symptoms. Although most participants recognized benefits of exercise they were not actively participating in physical exercise (regularly) as a means to help themselves decrease symptom severity. This suggests that exercise as an effective treatment for mental health issues (Daumit et al., 2013; Dubose, 2011; Noble, 2013) is known, however clients are not following through in practice. In addition, based on the data above it appears the relationship between perception of exercise benefits and barriers is complex and many factors contribute, sometimes in competing fashion, to the motivation to actually complete the effort needed to exercise as prescribed. As noted in a variety of literature reviewed above those with mental health symptoms

do experience more physical health complications (Simon, et al., 1999; Simon, et al., 2006), yet struggle to complete exercise programs successfully (Murcia et al., 2007). This suggests therapy techniques that focus on behavioral and motivational interventions may be more successful by providing a bridge between talking about and practically applying exercise as a mental health treatment.

Overview of Results

Although, hypotheses one thru three in this study were significant with only one measure of co-occurring mental and physical health symptoms, a number of variables (age, income, current health, knowing exercise helped trauma symptoms) correlated with the perception and participation in physical exercise.

Hypothesis one asked will those with more symptom severity exercise less intensely than those with less symptom severity. The result was significant in regards to the complex nature of mental and somatic symptoms, however not significant for mental health symptom presentation (GAF scores) or trauma symptom manifestation (past two months) specifically. Hypothesis two stated not only would they exercise less intensely (hypothesis one) but would also exercise less hours per week. Again, mental health alone (GAF and TSC-40) was not found to be a significant factor in weekly exercise behavior. However, co-occurring mental and somatic symptoms (PHQ) were. Hypothesis three explored the perception of exercise barriers as a possible reason for not exercising as intensely or as often. As predicted those with more symptoms did perceive more barriers but again this finding was only significant with the PHQ measure. Taken together these results support the complex nature of clients who presented at this rural community mental health center. The PHQ measurement tool looks at both somatic and mental health symptoms and showed significance for all three hypotheses when exclusive mental health symptom

measures supported the null hypotheses regarding exercise intensity, time, and perceived barriers. It may be overall level of functioning based on mental health symptoms (GAF) or psychological trauma (TSC-40) themselves are not the moderator of exercise behaviors, but rather the complexity of dealing with multiple somatic and mental health issues. Due to the low mean on the TSC-40 in this study, it may be those in treatment are finding relief for trauma symptoms, yet still experiencing symptoms from other issues (e.g. substance use, physical health, difficulties during the behavior change process, etc.) that impact one's ability to engage in regular exercise. The mean GAF score also reflects possible symptom relief at 53.26. This suggests clients are still presenting with difficulties in the moderate but not severe ranges and could be finding relief in outpatient therapy participation.

Hypotheses four and five explored possible confounding variables in exercise participation. Income and education have been shown in previous research to correlate with positive exercise behaviors (Center for Disease Control, 2008; Simon et al., 2006) and this researcher wanted to attempt to control for these extraneous factors. Hypothesis four stated those with higher education would perceive more benefits to exercise and hypothesis five, that income would moderate perception of exercise benefits. In this study results Spearman rho (r_S) results supported the null hypotheses in both cases. However, income was found to correlate with mild intensity exercise performed each week. As income went up so did participation in mild weekly exercise, however with higher income levels less time was spent exercising overall. Based on written comments made by participants, some were working long hours and considered their work to be physical exercise but not leisure time activity as asked by the questionnaire, thus they did not rate work (e.g. housework, taking care of animals/property, commuting (biking/walking) to and from work) as an activity as measured by the GLTEQ. This finding may also suggest

income is a positive factor in ability to participate in regular exercise or that those with higher incomes see the value of exercise and make time for it each week. Perception of what high intensity activity is may have also played a role in this confounding finding. In the rural communities studied physical exercise levels are high (CDC, 2008) and activity is often focused on extreme sports such as ultra running, long biking events (road or trail), back country skiing, hiking, or climbing. Anecdotally, I have heard client concerns that "they do not fit into the extreme outdoor culture" these mountainous towns in southwestern Colorado exude. It could be that those in this study do not consider the exercise they are currently doing to be high intensity based on local perceptions of what high intensity activity is. This delineation was not made in this study and caution should be taken when considering these possibilities.

Additional correlations offered insight into a number of variables that may be contributing to perception and participation in physical exercise. Younger participants in this study exercised at moderate intensities more often than older participants. Current health and average regular exercise was positively correlated as well, however over seven days was negatively correlated, suggesting participants do not endorse exercise as much in a seven day period as they do regular activity. In addition a number of participants reported exercise helped decrease trauma symptoms but were not engaging in exercise regularly suggesting this knowledge has not translated into embracing the benefits of exercise. A majority of this study's participants had a substance use diagnosis (63.1%) and interestingly substance use played into the findings. Correlations showed as substance use diagnoses went up so did average seven day exercise behaviors and the perceived barriers to exercise decreased. Those with more substance abuse diagnoses may have more barriers, but are also forced into exercise (e.g. walking or biking instead of driving) than those with less substance abuse issues, thus perceiving fewer barriers as

a matter of life circumstance and need, or ability to perform regular daily exercise during times of incarceration (participant anecdotal reports). Although substance use showed a surprising correlation with average exercise behaviors, those with more substance abuse diagnoses reported less moderate and mild exercise and less time spent exercising over seven days than those with fewer substance abuse diagnoses. Again, this suggests on average people may be performing more activity than exercise in the previous week to participation in this study. This is an area for more research as it is unclear in this study if the perception of exercise and time spent is influenced by how far into recovery and sobriety the participant was.

Interestingly, scales one to five on the PHQ were negatively correlated with perception of exercise benefits, total amount of time spent exercising over seven days, and intensity level of exercise performed (strenuous and moderate levels). This suggests that as people perceived more benefits and performed exercise at higher intensities they had less symptoms related to somatoform disorder, depression, panic disorder, and anxiety. According to Dubose (2011) those with higher PTSD hyperarousal symptoms performed less exercise and Noble (2013) reported that higher intensities of exercise correlated with less psychological flourishing in those with more trauma symptoms. In this study sample, correlations for physical symptoms related to anxiety and panic did not return significant results in relation to higher intensity exercise. This data may reflect similar processes for those experiencing the physical symptoms of hyperarousal, however specific questions regarding symptoms related to hyperarousal were not asked so caution must be used when drawing inferences. This is an area for further research. As noted above most participants had performed regular exercise in the past and the correlations related to symptoms on the PHQ show regular exercise participation may have the ability to decrease mental health symptoms for those engaging in physical exercise with a variety of intensities. It

would be helpful to better understand if symptoms of hyper or hypo arousal are a contributing factor to participation in exercise.

Practical Considerations for Clinicians

As shown above, clients at this rural community mental health center knew exercise could help decrease symptoms however were not following through, even though a majority had participated in regular exercise in the past. This suggests practitioners, public service announcements, and other sources are disseminating information regarding physical exercise benefits on mental health but clients struggle to put these concepts into practice. The consideration that the more complex symptom measure showed significance between exercise participation and perception speaks to the complexity of issues and life struggles clients in community mental health may face. These insights suggest that talking about benefits of physical exercise is not enough, clients need a bridge to actual practice. This difficultly is not limited to mental health clients and may be a reflection of society at large, however based on the above literature those with mental health issues face many more obstacles and may have more physical health symptoms (Jackson et al., 2001; Noll et al., 2007; Spitzer et al., 1999). Practitioners in both mental and physical health may benefit by building alliances with those who can help clients apply practical strategies to obtain more physical exercise to meet physical and mental health care objectives (e.g. personal trainers). It may also benefit clients and clinics to build programs that allow clients to begin participation in physical exercise within the safety of mental and physical health care treatment rather than referring out (e.g. to a fitness center; Dunn & Jewell, 2010). In these environments clients with complex presentations would have more access to behavioral and/or motivational supports while working with clinicians around barriers. Again, this speaks to the need for broader programs to address the outcomes of better mental and

physical health care while not separating one from the other.

Limitations

This study has a number of limitations. First, it was done in a rural community mental health center that covered five counties in southwestern Colorado. Due to the rural nature of mental health center offices, a variety of clients present for a variety of programs. The variety both within the clinic and within clinician caseloads led to a broad range of symptom manifestation. This study offered support and better understanding to the complex nature that exists between exercise beliefs, knowledge, and desire while offering some understanding to reasons clients do not engage in physical exercise. On the other hand this study created more questions and some results (such as those regarding current health correlations, average seven day exercise vs. seven day activity levels) appear contradictory at first glance. In addition, to being a rural area of the United States, the communities involved in the study have a low rate of physical inactivity for the population (Center for Disease Control, 2008). This was supported by the high number of participants who endorsed being regular exercisers in the past. Many also reported relief from trauma symptoms as a result of exercise behaviors. These considerations add to this study's confounding data set.

Another consideration is a majority had a substance use or dependence diagnosis and correlations showed that those with more substance abuse diagnoses perceived less barriers to exercise even with more symptom presentations. Interestingly, PTSD diagnosis was not a significant predictor of participation in or perception of physical exercise. This is similar to Noble's (2013) finding that "childhood maltreatment was consistently associated with lower flourishing scores, regardless of exercise participation" and those with those with "greater trauma exposure … [had] lower flourishing scores at high levels of exercise" (p. ii). The PHQ on

the other hand asked questions regarding a variety of domains, symptoms, and time frames. It could be that this measure was able to capture the complexity of participant symptoms without the constraint of current and ongoing mental health treatment targets; making it a more effective tool to measure the questions of the hypotheses.

The measurement tools used may not have captured data in regards to hypotheses questions given above. Although complex trauma presentation was a focus of this study, all participants were in treatment with psychological trauma as a stated treatment focus. The TSC-40 asked about trauma symptoms, including physiological, based on the last two months of experience. One possibility is that the measure did not capture the manifestation of the arousal states which has implications for severity of trauma symptom presentation. For example, a person presenting with symptoms of hypoarousal (as outlined by the polyvagal theory above) would have a more severe biological cost than the client presenting still able to utilize social engagement and the mylineated ventral vagus. It is possible that a number of the arousal symptoms impacting ability to participate in physical exercise were not captured due to being in treatment and finding some symptom relief. A number of participants commented that they had experienced symptoms in the past but were not currently suffering from them. One client commented on symptom manifestation depending on life stress. She stated answering the TSC-40 was difficult because she knew some answers to be problematic in the past but not at the time of participation. Clients were not screened based on length of time in treatment and it is possible that many had found relief from current and previous therapy. This may account for the low mean of the TSC-40 in this data set. Another interesting finding was the amount of people who had already found relief from trauma symptoms using physical exercise (74.5%) and had known about the effects trauma has on the body (63.8%). This prior knowledge may also have created a

situation where the TSC-40 measurement tool was not accurate at capturing the level of trauma symptoms and trauma symptom impacts on physical exercise. Although the questions of the TSC-40 asked a number of questions about physical symptoms a better measure may have addressed the physiological issues associated with trauma that also overlap with intense exercise.

The GLTEQ may also have missed the mark in addressing actual intensity levels for this population. The majority of people reported regular exercise at least 'sometimes' each week with enough intensity to raise heart rates and create sweat production, however a number wrote comments stating they didn't have time to exercise outside of a physically demanding job and did not consider this to be 'leisure time' activity, that they used to exercise more than they do now, or that they had recently suffered an injury preventing them from current exercise but planned on returning to the practice in the future. It may also be that those in the sample who have been recently incarcerated were able to exercise more often (anecdotal responses) or those who have a circumstantial need to be active (e.g. biking/walking as a result of losing a driver's license or low income) may have skewed the number for participation in mild exercise and lack of barriers due to the need to be physically active to accomplish daily life tasks (e.g. walking to bus stop, biking children to school, performing errands on foot). The pattern of answering question four around regular exercise each week, but not endorsing strenuous or moderate levels of intensity in question one and two points to lack of congruence in the measurement tool for this population, especially when considering the written comments and explanations given. Unfortunately, there were not enough written comments to make conclusive inferences, however greater understanding of the relationship here is an area for future research. This would allow one to consider the complexity of symptoms and what gets in the way for clients who recognize the benefits of regular exercise but are not participating in an ongoing fashion.

Previous exercise participation creates another confounding variable. It is also suspected that due to self-selecting, those in the exercise group had enough body awareness to be at least somewhat comfortable with physical exertion. There is a complex interaction between trauma and physiology and it is known that some individuals avoid exercise due to being triggered by physical sensations (Ogden, Pain et al., 2006). This has implications for physical health consequences and obesity in those who have experienced mental health symptoms (Daumit et al., 2013; Simon et al., 2006).

Another confounding factor for interpretation of the results is the DSM. This study was begun while the DSM-IV-TR was in circulation, however prior to publication the DSM V was released. Due to updates and changes regarding diagnosis criteria generalizations to clinical diagnosis and treatments may be difficult. As noted in the results chapter the GAF score is no longer used as a diagnosis so interpretation of the GAF score in this study must be related to the more descriptive explanations of each category as outlined by the DSM-IV-TR rather than via number alone.

Methodologically this study was limited by quantitative data assumptions. A review of the literature showed numerous studies involving physical exercise benefits for mental health symptom presentations however lacked data relating to the complexity of psychological trauma and physical exercise. As a first step toward understanding this complexity, the measures in this study were chosen to gather a variety of data. This wide net was a tradeoff away from more specific and narrow foci. In answering self-report surveys rather than interviews client responses were limited to the short likert scale type questions. This allowed for quantitative analysis however did not allow for individual responses a qualitative design may have offered. As is the nature of self-reports it is hard to ascertain if clients were exaggerating or under-reporting

symptoms and/or exercise behaviors. For example many clients reported outside knowledge of benefits to physical activity. This knowledge may have skewed the EBBS in favor of benefits and away from barriers one may truly face. Although, methods employed in this study did address questions regarding links between mental health symptoms and physical exercise participation and perception it is a weaker method than using a true experimental design or a pre and post test intervention to gather data. These limitations offer opportunities for future research to expand data presented here.

Future Research

Areas for further research include; what prevents the client who knows exercise can help, who has been a regular exerciser in the past, and who understands that psychological trauma does impact their body from following through on physical exercise activities and what decreases the belief in the benefits exercise can provide? Future research needs to focus on mental versus physical symptom presentation to determine which has the larger impact on ability to participate in physical exercise regularly. Many in this study did not report high levels of psychological trauma symptoms however significant findings noted many were struggling with co-occurring mental and somatic issues. Other studies have noted complex trauma experiences create increased difficulties for clients in multiple domains of life (Briere & Spinazzola, 2005; Cloitre et al., 2009; van der Kolk, 1994). As noted by a number of authors above, many struggle to participate in physical exercise for a variety of reasons (Carless & Douglas, 2008; Dubose, 2011; Murcia et al., 2007; Noble, 2013; Wadden et al., 1997). Many in this study reported exercise on average, but not in a seven day period despite knowing physical exercise was helpful. Future research may be able to provide better understanding regarding methods that might be employed to help clients embrace exercise as a way to decrease psychological trauma

symptoms. The data showed talking and/or teaching clients about benefits of physical exercise may be well meaning but these lessons were not followed through on in practice. Exploration of reasons those with mental health symptoms struggle to implement regular exercise would allow for better program planning and implementation. A comparison of mental health clients to those without a clinical diagnosis may offer insight into where commonalities lie and where those with mental health symptoms struggle more than those not in treatment. Future research may help guide useful exercise interventions that translate from the fitness center to the therapy office effectively.

As noted above there were a number of confounding variables that could be explored as future research. Exploration using a more narrow focus may provide insight into individual difficulties clients face. It was of particular interest that those with substance use diagnoses stated they exercised more regularly but did not endorse regular weekly intensity levels. Plus appeared to perceive less barriers despite struggling with substance use. Lack of regular exercise despite reportedly high levels of current health, previous regular exercise, and experience of previous trauma symptom reduction is also curious. Future research should explore the differences between internal and external motivation in mental health center clients. As noted above internal motivation is a better predictor of exercise adherence and understanding the complexity of internal motivation in relation to mental health will offer another way to effectively program physical exercise for mental health symptom relief.

References

Ainsworth, M. D. S. (1969). Object relations, dependency, and attachment: A theoretical review of the infant-mother relationship. *Child Development, 40,* 969-1025.

Allen, J. P., & Land, D. (1999). Attachment in adolescence. In J. Cassidy & P. R. Shaver (Eds.), *Handbook of Attachment. Theory, research, and clinical applications* (pp.319-332). New York, NY: Guildford Press.

Allen, N. B., Chambers, R., Knight, W., Blahski, G., Ciechomski, L., Hassed, C., . . . Meadows, G. (2006). Mindfulness-based psychotherapist: A review of conceptual foundations, empirical evidence and practical considerations. *Australian and New Zealand Journal of Psychiatry*, *40,* 285-294.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th., text rev.). Washington DC: American Psychiatric Association.

American Psychological Association. (2010). *Publication manual of the American Psychological Association* (6th ed.). Washington, D.C: American Psychological Association.

Atlantis, E., Chow, C-M., Kirby, A., & Singh, M. (2004). An effective exercise-based intervention for improving mental health and quality of life measures: A randomized controlled trial. *Preventive Medicine, 39*(2), 424-434. doi: 10.1016/j.ypmed.2004.02.007

Avasthi, A.,Varma, S. C., Kulhara, P., Nehra, R., Grover, S., & Sharma, S. (2008). Diagnosis of common mental disorders by using the PRIME-MD patient health questionnaire. *Indian Journal Medical Research, 127*, 159-164.

Bakan, P. (1969). Hypnotizability, laterality of eye-movements and functional brain asymmetry. *Perceptual and Motor Skills, 28*, 927-932.

Bandura, A. (1971). *Social learning theory.* New York, NY: General Learning Press.

Beckham, J. C., Moore, S. D., Fledman, M. E., Hertzberg, M. A., Kirby, A. C., & Fairbank, J. A. (1998). Health status, somatization, and severity of posttraumatic stress disorder in Vietnam combat veterans with posttraumatic stress disorder. *American Journal of Psychiatry, 155,* 1565-1569.

Bergmann, U. (2010). EMDR's neurobiological mechanisms of action: A survey of 20 years of searching. *Journal of EMDR Practice and Research, 4*(1), 22-42. doi: 10.1891/1933-3196.4.1.22

Bloomgarden, A., & Calogero, R. M. (2008). A randomized experimental test of the efficacy of EMDR treatment on negative body image in eating disorder inpatients. *Eating Disorders*, *16*, 418-427. doi: 10.1080/10640260802370598

Bowlby, J. (1958). The nature of the child's tie to his mother. *International Journal of Psycho-Analysis, 39*, 350-373.

Bretherton, I. (1992). The origins of attachment theory: John Bowlby and Mary Anisworth. *Developmental Psychology, 28*, 759-775.

Briere, J., Elliott, D. M., Harris, K., & Cotman, A. (1995). Trauma symptom inventory. Psychometrics and association with childhood and adult victimization in clinical samples. *Journal of Interpersonal Violence*, *10*(4), 387-401. doi: 10.1177/088626095010004001

Briere J., & Runtz, M. (1989). Trauma Symptom Checklist - 40 (TSC-40). Retrieved from www.JohnBriere.com

Briere J. & Runtz, M. (1996). Trauma Symptom Checklist – 40 (TSC-40) guidelines and scoring. Retrieved from www.JohnBriere.com

Briere, J., & Spinazzola, J. (2005). Phenomenology and psychological assessment of complex posttraumatic states. *Journal of Traumatic Stress, 18*(5), 401-412. doi: 10.1002/jts.20048

Cahill, S.P., Carrigan, M. H., & Frueh, C. B. (1999). Does EMDR work? And if so why? A critical review of controlled outcome and dismantling research. [Abstract]. *Journal of Anxiety Disorders, 13*(1-2), 5-33. doi: 10.1016/S0887-6185(98)00039-5

Carless, D., & Douglas, K. (2008). The contribution of exercise and sport to mental health promotion in serious mental illness: An interpretive project. *International Journal of Mental Health Promotion, 10*(4), 5-12.

Carr, L., Iacoboni, M., Dubeau, M-C., Mazziotta, J. C., & Lenzi, G. L. (2003). Neural mechanisms of empathy in humans: A relay from neural systems for imitation to limbic areas. *Proceedings of the National Academy of Sciences, 100*(9), 5497-5502. doi: 10.1073/pnas.0935845100

Center for Disease Control. (2008). Facts about physical activity. Retrieved from http://www.cdc.gov/physicalactivity/data/facts.html

Classen, C. C., Cavanaugh, C. E., Kaupp, J. W., Aggarwal, R., Palesh, O. G., Koopman, C. . . . Spiegel, D. (2011). A comparison of trauma-focused and present-focused group therapy for survivors of childhood sexual abuse: A randomized controlled trial. *Psychological Trauma: Theory, Research, Practice, and Policy, 3*(1), 84-93. doi: 10.1037/a0020096

Cloitre, M., Stolbach, B. C., Herman, J. L., van der Kolk, B., Pynoos, R., Wang, J., & Petkova, E. (2009). A developmental approach to complex PTSD: Childhood and adult cumulative trauma as predictors of symptom complexity. *Journal of Traumatic Stress, 22*(5), 399-408.

Coates, D. (2010). Impact of childhood abuse: Biopsyhosocial pathways through which adult mental health is compromised. *Australian Social Work, 63*(4), 391-403. doi:10.1080/0312407X.2010.508533

Coker, A. L., Smith, P. H., Bethea, L., King, M. R., McKeown, R. E. (2000). Physical health consequences of physical and psychological intimate partner violence. *Archives of Family Medicine, 9*, 451-457.

Colton, C. W., & Manderscheid, R. W. (2006). Congruencies in increased mortality rates, years of potential life lost, and causes of death among public mental health clients in eight states. Retrieved from: http://www.cdc.gov/pcd/issues/2006/apr/05_0180.htm

Conrad, C. D. (2008). Chronic stress-induced hippocampal vulnerability: The glucocorticoid vulnerability hypothesis. *Annual Review of Neuroscience, 19*(6), 395-411.

Coolican, H. (2009). Research methods and statistics in psychology (5th ed.). London: Hodder Education.

Creswell, J. D., Way, B. M., Eisenberger, N. I., & Lieberman, M. D. (2007). Neural correlates of dispositional mindfulness during affect labeling. *Psychosomatic Medicine, 69,* 560-565. doi: 10.1097/PSY.0b013e3180f6171f

Creswell, J. W. (2009). Research design. *Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage Publications.

Crowell, J. A., & Treboux, D. (1995). A review of adult attachment measures: Implications for theory and research. *Social Development, 4*, 294-327.

Dallman, M. F., Pecoraro, N., Akana, S. F., la Fleur, S. E., Gomez, F., Houshyar, H. . . . Manalo, S. (2003). Chronic stress and obesity: A new view of "comfort food". *Proceedings of the National Academy of Sciences, 100*(20), 11696-11701. doi: 10.1073/pnas.1934666100

Daumit, G. L., Dickerson, F. B., Wang, N-Y., Dalcin, A., Jerome, G. J., Anderson, C. A. M., ... Appel, L. J. (2013). A behavioral weight-loss intervention in persons with serious mental illness. *The New England Journal of Medicine,* 1-9. doi:10.1056/NEJMoa1214530

Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S. F. . . . Sheridan, J. F. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine, 65*, 564-570. doi: 10.1097/01.PYS.0000077505.67574.E3

Dietrich. A., & McDaniel, W. F. (2004). Endocannabinoids and exercise. *British Journal of Sports Medicine, 38*, 536-541. doi: 10.1136/bjsm.2004.011718

Ding, Q., Vaynman, S., Akhavan, M., Ying, Z., & Gomez-Pinilla, F. (2006). Insulin-like growth factor I interfaces with brain-derived neurotrophic factor-mediated synaptic plasticity to modulate aspects of exercise-induced cognitive function. *Neuroscience, 140*, 823-833. doi: 10.1016/j.neuroscience.2006.02.084

DiPietro, J. A., Hilton, S. C., Hawkins, M., Costigan, K. A., & Pressman, E. K. (2002). Maternal stress and affect influence on fetal neurobehavioral development. *Developmental Psychology, 38*(5), 659-668. doi: 10.1037///0012-1649.38.5.659

Dishman, R. K., Berthoud, H-R., Booth, R. W., Cotman, C. W., Edgerton, V. R., Fleshner, M. R., … Zigmond, M. J. (2006). Neurobiology of exercise. *Obesity, 14(*3), 345-356.

Donnelly, J. E., Blair, S. N., Jakicic, J. M., Manore, M. M., Rankin, J. W., & Smith, B. K. (2009). Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. *Medicine and Science in Sports and Exercise*, 459-471. doi: 10.1249/MSS.0b013e3181949333

Doyne, E. J., Ossip-Klein, D. J., Bowman, E. D., Osborn, K. M., McDougall-Wilson, I. B., & Neimeyer, R. A. (1987). Running versus weight lifting in the treatment of depression. *Journal of Consulting and Clinical Psychology, 55*(5), 748-754.

Dranovsky, A., & Leonardo, E. D. (2012). Is there a role for young hippocampal neurons in

adaptation to stress. *Behavioral Brain Research, 227*(2), 371-375. doi: 10.1016/j.bbr.2011.05.007

Droste S. K., Gesing, A., Ulbricht, S., Müller, M. B., Linthorst, A. C. E., & Reul, J. M. H. M. (2003). Effects of long-term voluntary exercise on the mouse hypothalamic-pituitary-adrenocortical axis. *Endocrinology, 144*(7), 3012-3023. doi: 10.1210/en2003-0097

Dubose, W. R. (2011). *Relationship between exercise and persistent hyperarousal symptoms of PTSD.* (Unpublished master's thesis). Humboldt State University, California.

Duclos, M., Gouarne, C., & Bonnemaison, D. (2002). Acute and chronic effects of exercise on tissue sensitivity to glucocorticoids. *Journal of Applied Physiology, 94*(3), 869-875. doi: 10.1152/japplphysiol.00108.2002

Dunlop, W. L., & Beauchamp, M. R. (2012). The relationship between intra-group age similarity and exercise adherence. *American Journal of Preventive Medicine, 42*(1), 53-55. doi: 10.1016/j.amepre.2011.08.018

Dunn, A. L., & Jewell, J. S. (2010). The effect of exercise on mental health. *Current Sports Medicine Reports, 9*(4), 202-207.

Dunn, A. L., Trivedi, M. H., and O'Neal, H. A. (2001). Physical activity dose-response effects on outcomes of depression and anxiety. *Medicine and Science in Sports & Exercise, 33*(6), suppl., 2001, S587-S597.

Edmunds, J., Ntoumanis, N., Duda, J. L. (2006). A test of self-determination theory in the exercise domain. *Journal of Applied Social Psychology, 36*, 2240-2265. doi: 10.1111/j.0021-9029.2006,00102.x

Elbert, T., Flor, H., Birbaumer, N., Knecht, S., Hampson, S., Larbig, W., & Taub, E. (1994). Extensive reorganization of the somatosensory cortex in adult humans after nervous

system injury. *Neuroreport, 20*(5), 2593-2597.

Elliott, D. M., & Briere, J. (1992). Sexual abuse trauma among professional women: Validating the trauma symptom checklist-40 (TSC-40). *Child Abuse and Neglect, 16,* 391-398.

Elzinga, Schmahl, Vemetten, van Dyck, Bremner (2003). Higher cortisol levels following exposure to traumatic reminders in abuse-related PTSD. *Neuropsychopharmacology, 28*(9), 1656-1665.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149-1160.

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.

Felitti, V. J. (1993). Childhood sexual abuse, depression, and family dysfunction in adult obese patients: A case control study. *Southern Medical Journal, 86*(7), 732-736.

Fong, M. S., Brown, T. L., Wolcott, K. R., Lin, J., Fisher, B. E., & Wu, A. (2005). Evidence for activity-dependent neuroplasticity in an individual with parkinson's disease: A transcranial magnetic stimulation study. *Journal of Neurologic Physical Therapy, 29*(4), 189-193. doi: 10.1097/01.NPT.0000282329.80133.de

Ford, J. D., & Smith, S. F. (2007). Complex postraumatic stress disorder in trauma-exposed adults receiving public sector outpatient substance abuse disorder treatment. *Addiction Research and Theory, 16*(2), 193-203. doi: 10.1080/16066350701615078

Fraser, S. N, & Spink, K. S. (2002). Examining the role of social support in group cohesion in exercise compliance. *Journal of Behavioral Medicine, 25*(3), 233-249.

Frustaci, A., Lanza, G. A., Fernandez, I., Giannantonio, M. di, & Pozzi, G. (2010). Changes in psychological symptoms and heart rate variability during EMDR treatment: A case series of subthreshold PTSD. *Journal of EMDR practice and research, 4*(1), 3-11. doi: 10.1891/1933-3196.4.1.3

Georgiades, A., Sherwood, A., Gullette, E. C. D., Babyak, M. A., Hinderliter, A., Waugh, R., … Blumenthal, J. (2000). Effects of exercise and weight loss on mental stressed-induced cardiovascular responses in individual with high blood pressure. *Hypertension, 36*, 171-176. doi: 10.1161/01.HYP.36.2.171

Ghee, A. C., Johnson, C. S., & Burlew, A. K. (2010). Measurement equivalence of the trauma symptom checklist-40 for chemically dependent African American and Caucasian women. A preliminary study. *Journal of Aggression, Maltreatment, & Trauma, 19*(8), 820-838. doi: 10.1080/10926771.2010.522949

Gillespie C. F., & Nemeroff, C. B. (2007). Corticotropin-releasing factor and the psychobiology of early-life stress. *Association for Psychological Science, 16*(2), 85-89.

Gingrich, H. D. (2009). Complex traumatic stress disorders in adults. J*ournal of Psychology and Christianity, 28*(3), 269-274.

Ginot, E. (2007). Intersubjectivity and neuroscience: Understanding enactments and their therapeutic significance within emerging paradigms. *Psychoanalytic Psychology, 24*(2), 317-332. doi: 10.103/0736-9735.24.2.317

Glover, C. M., Ferron, J. C., & Whitley, R. (2013). Barriers to exercise among people with severe mental illnesses. *Psychiatric Rehabilitation Journal, 36*(1), 45-47. doi: 10.1037/h0094747

Godin, G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the

community. *Canadian Journal of Applied Sport Sciences, 10*(3), 141-146.

Green, B. L., Frank, L., Glennie, M., Subramanian, A., Fritts-Wilson, M., Neptune, D., & Chung, J. (2011). Primary care providers' experiences with trauma patients: A qualitative study. *Psychological Trauma: Theory, Research, Practice, and Policy, 3*(1), 37-41. doi: 10.1037/a0020097

Green, S. B., & Salkind, N. J. (2003). *Using SPSS for windows and macintosh. Analyzing and understanding data* (*3rd ed*.). Upper Saddle River, NJ: Pearson Education, Inc.

Greenough, W. T., Black, J. E., & Wallace, C. S. (1987). Experience and brain development. *Child Development, 58*, 539-559.

Gustafson, T. B., & Sarwer, D. B. (2004). Childhood sexual abuse and obesity. *Obesity Reviews, 5*, 129-135.

Gutnik, B., & Hyland, B. (1997). Spatial coordination in a bimanual task related to regular switching of movement vectors. *Perceptual and Motor Skills, 84*, 371-384.

Hadley, R. G., & Mitchell, L. K. (1995). *Counseling research and program evaluation.* Pacific Grove, CA: Brooks/Cole Publishing Company.

Hanson, R. (2010, May 12). Authors@Google: Rick Hanson. [Video file]. Retrieved from http://www.youtube.com/watch?v=0EM45CpeQb4

Haskell, S. G., Gordon, K. S., Mattoks, K., Duggal, M., Erdos, J., Justice, A., & Brandt, C. A. (2010). Gender differences in rates of depression, PTSD, pain, obesity, and military sexual trauma among Connecticut war veterans of Iraq and Afghanistan. *Journal of Women's Health, 19*(2), 267-271. doi: 10.1089/jwh.2008.1262

Herkt, D., Tumani, B., Grön, G., Kammer, T., Hofmann, A., & Abler, B. (2014). Facilitating access to emotions: Neural signature of EMDR stimulation. *PLoS ONE 9*(8):e106350.

doi:10.1371/journal.pone.0106350

Hunter, C. L., & Goddie, J. L. (2010). Operational and clinical components for integrated-collaborative behavioral healthcare in the patient-centered medical home. *Families, Systems, and Health, 28*(4), 308-321. doi: 10.1037/a0021761

Husain, S., Kuzminski, S., Shat, M. U., Gabrielson, B., Bret, M. E., Osuji, I. J., Brown, S. (2010). Cognition and dorsolateral prefrontal cortex volume in corticosteroid-treated patients given Lamotrigine. *Stress and Health, 27*, 18-22. doi: 10.1002/smi.1308

Isaacs, K. R., Anderson, B. J., Alcantara, A. A., Black, J. E., & Greenough, W. (1992). Exercise and the brain: Angiogenesis in the adult rat cerebellum after vigorous physical activity and motor skill learning. *Journal of Cerebral Blood Flow and Metabolism, 12*, 110-119.

Jackson, J. L., Houston, J. S., Hanling, S. R., Terhaar, K. A., & Yun, J. S. (2001). Clinical predictors of mental disorders among medical outpatients. *Archives of Internal Medicine, 161*, 875-879. Retrieved from http://archinte.jamanetwork.com

Jacobs, D. R., Ainsworth, B. E., Hartman, T. J., & Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine and Science in Sports and Exercise*, 81-91.

Jakicic, J. M., Marcus, B. H., Gallagher, K. I., Napolitano, M., & Lang, W. (2003). Effect of exercise duration and intensity on weight loss in overweight, sedentary women. *Journal of the American Medical Association, 290*(10), 1323-1330.

Jones, D. R., Macias, C., Barreira, P. J., Fisher, W., H., Hargreaves, W. A., & Harding, C. M. (2004). Prevalence, severity, and co-occurrence of chronic physical health problems of persons with serious mental illness. *Psychiatric Services, 55*(11), 1250-1257. doi: 10.1176/appi.ps.55.11.1250

Jula, A., Salminen, J. K., Saarijärvum, S. (1999). Alexithymia: A facet of essential hypertension. *Hypertension, 33*, 1057-1061. doi: 10.1161/01.HYP.33.4.1057

Kaehler, L. A., & Freyd, J. J. (2011). Betrayal trauma and borderline personality characteristics: Gender differences. *Psychological Trauma: Theory, Research, Practice, and Policy,* 1-7. doi:10.1037/a0024928.

Keller, R., & Kurtz, R. (2001). Hakomi simplified. Online version. Retrieved from http://hakomi.com/wp-content/uploads/2010/02/Comments.pdf

Kendell-Tacket, K. (2009). Psychological trauma and physical health: A psychoneuroimmunology approach to etiology of negative health effects and possible interventions. *Psychological Trauma: Theory, Research, Practice, Policy, 1*(1), 35-48. doi: 10.1037/a0015128

Klaassens, E. R., (2010). Bouncing back trauma and the HPA-axis in healthy adults. *European Journal of Psychotraumatology Supplement, 1*, Online version, 5844. doi:10.3402/ejpt.v1i0.5844

Kremen, W. S., Prom-Wormley, E., Panizzon, M. S., Eyler, L. T., Fischi, B., Neale, M. C., … Fennema-Notestine, C. (2010). Genetic and environmental influences on the size of specific brain regions in midlife: The VETSA MRI study. *Neuroimage, 49*(2), 1213-1223. doi: 10.1016/j.neuroimage.2009.09.043

Kroenke, K., Spitzer, R. L., & Williams. J. B. W. (2001). The PHQ-9. Validity of a brief depression severity measure. *Journal of General Internal Medicine, 16,* 606-613.

Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2002). The PHQ-15: Validity of a new measure for evaluating the severity of somatic symptoms. *Psychosomatic Medicine, 64,* 250-266.

Kucyi, A., Alsuwaidan, M. T., Liauw, S. S., & McIntyre, R. S. (2010). Aerobic physical exercise as a possible treatment for neurocognitive dysfunction in bipolar disorder. *Postgraduate Medicine, 122*(6), 107-116.

Kurtz, R. (1985). The organization of experience in hakomi therapy. *Hakomi Forum, 3*. Retrieved from http://www.hakomiinstitute.com

Kurtz, R. (1990). *Body-centered psychotherapy.* Mendocino, CA: LifeRhythm.

Larsen, P. D., Tzeng, Y. C., Sin, P. Y. W., & Galletly, D. C. (2010). Respiratory sinus arrhythmia in conscious humans during spontaneous respiration. *Respiratory Physiology & Neurobology, 174*, 111-118. doi: 10.1016/j.resp.2010.04.021

Lazar, S. W., Kerr, C. E., Wasserman, R. H., Gray, J. R., Greve, D. N., Treadway, M. T., … Fischl, B. (2005). Meditation experience is associated with increased cortical thickness. *Neuroreport, 16(*17), 1893-1897.

Levine, P. A., & Frederick, A. (1997). *Waking the tiger.* Berkeley, CA: North Atlantic Books.

Lewis, T., Amini, F., & Lannon, R. (2001). *A General Theory of Love,* Vintage press, New York.

Liebenberg, H., & Papaikonomou, M. (2010). "Complex-trauma": Reflections on the effect of early childhood abuse among a small adult group of bariatric patients. *South African Journal of Psychology, 40*(3), 327-337.

Lin, C-D. J. (2010). *Planned contrasts and post hoc tests in MANOVA made easy*. Retrieved from http://www.wuss.org/proceedings10/analy/2981_3_ANL-LIN.pdf

Linehan, M. M. (1993). Skills training manual for treating borderline personality disorder New York, NY: Guliford Publications, Inc.

Löwe, B., Spitzer, R. L., Gräfe, K., Kroenke, K., Quenter, A., Zipfel, S., ... Herzog, W. (2004). Comparative validity of three screening questionnaires for DSM-IV depressive disorders

and physicians' diagnoses. *Journal of Affective Disorders, 78,* 131-140.

Lucassen, P. J., Meerlo, P., Naylor, A. S., van Dam, A. M., Dayer, A. G., Fuchs, E. . . . . Czéh, B. (2010). Regulation of adult neurogenesis by stress, sleep disruption, exercise and inflammation: Implications for depression and antidepressant action. *European Neuropsychopharmacology, 20*, 1-17. doi: 10.1016/j.euroneuro.2009.08.003

Maret, S. (2009). *Introduction to prenatal psychology*. New Providence, NJ: Churchgate Books.

Martinsen, E. W., Hoffart, A., & Solberg, O. (1989). Comparing aerobic with nonaerobic forms of exercise in the treatment of clinical depression: A randomized trial. *Comprehensive Psychiatry, 30*(4), 324-331.

McCarty, W. A. (2009). Welcoming consciousness: Supporting babies' wholeness from the beginning of life–An integrated model of early development. Santa Barbara, CA: Wondrous Beginnings Publishing.

McEwen, B. S. (2001). Plasticity of the hippocampus: Adaptation to chronic stress and allostatic load. *Annals of the New York Academy of Sciences, 933*, 265-277.

McEwen, B. S. (2007). Physiology and neurobiology of stress and adaptation: Central role of the brain. *Physiological Reviews, 87*, 873-904. doi: 10.1152/physrev.0041.2006.

McGale, N., McArdle, S., & Gaffney, P. (2011). Exploring the effectiveness of an integrated exercise/CBT intervention for young men's mental health. *British Journal of Health Psychology*, *16*, 457-471. doi: 10.1348/135910710X522734

McLaughlin, M. (2009). *MANOVA: Multivariate Analysis of Variance - Usc.* Retrieved from www-bcf.usc.edu/~mmclaugh/550x/PPTslides/.../MANOVA.ppt

Meaney, M. J., Diorio, J., Francis, D., Widdowson, J., LaPlante, P., Caldji, C., … Plotsky, P. M. (1996). Early environmental regulation of forebrain glucocorticoid receptor gene

expression: Implications for adrenocortical responses to stress. *Developmental Neuroscience, 18*(1-2), 49-72.

Meltzoff, J. (1998). *Critical thinking about research. Psychology and related fields.* Washington D.C: American Psychological Association.

Miller, W. C., Koceja, D. M., Hamilton, E. J. (1997). A meta-analysis of the past 25 years of weight loss research using diet, exercise or diet plus exercise intervention. *International Journal of Obesity, 21*, 941-947.

Morgan, G. A., Leech, N. L., Gloeckner, G. W., & Barrett, K. C. (2011). *IBM SPSS for introductory statistics. Use and interpretation. (4th ed.).* New York, NY: Taylor & Francis Group.

Morgan, P. (2010). Get up. Stand up. Riding to resilience on a surfboard. *Child and Family Social Work*, *15*, 56-65. doi: 10.1111/j.365-2206.2009.00637.x

Murcia, J. A. M., Gimeno, E. C., Camcaho, A. M. (2007). Measuring self-determination motivation in a physical fitness setting: Validation of the behavioural regulation in exercise questionnaire-2 (BREQ-2) in a Spanish sample. *The Journal of Sport Medicine and Physical Fitness, 47*(3), 366-378.

Mutrie, N., Campbell, A. M., Whyte, F., McConnachie, A., Emslie, C., Lee, L. . . . Richie, D. (2007). Benefits of supervised group exercise programme for women being treated for early stage breast cancer: Pragmatic randomized controlled trial. *British Medical Journal*, 1-7. doi: 10.1136/bmj.39094.648553.AE

Newcomer, S. R., Steiner, J. F., & Bayliss, E. A. (2011). Identifying subgroups of complex patients with cluster analysis. *The American Journal of Managed Care, 17*(8), e324-e332.

Netz, Y., & Lidor, R. (2003). Mood alterations in mindful versus aerobic exercise modes. *The*

Journal of Psychology, 137(5), 405-419.

Nicols, D. S., & Glenn, T. M. (1994). Effects of aerobic exercise on pain perception, affect, and level of disability in individuals with fibromyalgia. *Journal of the American Physical Therapy Association, 74*(4), 327-332.

Nieuwenhuis, S., Elzinga, B. M., Ras, P. H., Berends, F., Duijs, P., Samara, Z., & Slagter, H. A. (2013). Bilateral saccadic eye movements and tactile stimulation, but not auditory stimulation, enhance memory retrieval. *Brain and Cognition, 81*, 52-56. doi:10.1016/j.bandc.2012.10.003

Noble, J. P. (2013). *The role of physical activity in resilience to psychological trauma.* (Master's thesis). Available form ProQuest Dissertations and Theses database (UMI No. 1544827)

Noll, J. G., Zeller, M. H., Trickett, P. K., & Putnam, F. W. (2007). Obesity risk for female victims of childhood sexual abuse: A prospective study. *Pediatrics,120*, e61-e68. doi:10.1542/peds.2006-3058

Ogden, P. (2009). Modulation, mindfulness, and movement. In Kerman, W. W. (Ed.), *Clinical pearls of wisdom: 21 leading therapists share their key insights* (pp. 1-13). New York, NY: W.W. Norton &Company, Inc. Retrieved from: http://lifespanlearn.info/articles/OgdenClinicalPearlsLosAngeles.pdf

Ogden, P., Minton, K, & Pain, C. (2006). *Trauma and the body.* New York, NY: W.W. Norton & Company, Inc.

Ogden, P., Pain, C., & Fisher, J. (2006). A sensorimotor approach to the treatment of trauma and dissociation. *Psychiatric Clinics of North America, 20*, 263-279.

Ohkawara, K., Tanaka, S., Miyachi, M., Ishikawa-Takata, K., & Tabata, I. (2007). A dose-response relation between aerobic exercise and visceral fat reduction: Systematic review

of clinical trials. *International Journal of Obesity, 31*, 1786-1797. doi:10.1038/sj.ijo.0803683

Pagani, M., Giorgio, D. L., Verardo, A. R., Nicolais, G., Monaco, L., Lauretti, G., … Siracusano, A. (2012). Neurobiological correlates of EMDR monitoring – An EEG study. *PLoS ONE, 7*(9): e45753. doi: 10.1371/journal.pone.0045753

Pajonk, F-G., Wobrock, T., Gruber, O., Scherk, H., Berner, D., Kaizl, I., ... Falkai, P. (2010). Hippocampal plasticity in response to exercise in schizophrenia. *Archives of General Psychiatry, 67*(2), 133-143.

Pate, R. R., & Durstine, J. L. (2004). Exercise physiology and its role in clinical sports medicine. *Southern Medical Journal, 97*(9), 881-885. doi: 0038-4348/04/9709-0881

Peluso M. A. M., & Guerra de Andrade, L. H. S. (2005). Physical activity and mental health: The association between exercise and mood. *Clinics, 60*(1), 61-70.

Perkonigg, A., Owashi, T., Stein, M. B., Kirschbaum, C., & Wittchen, H-U. (2009). Posttraumatic stress disorder and obesity. Evidence for a risk association. *American Journal of Preventive Medicine, 36*(1), 1-8. doi: 10.1016/j.amepre.2008.09.026

Porges, S. W. (1998). Love: An emergent property of the mammalian autonomic nervous system. *Psychoneuroendocrinology, 23*(8), 837-861.

Porges, S. W. (2001). The polyvagal theory: Phylogenetic substrates of a social nervous system. *International Journal of Psychophysiology, 42*, 123-146.

Porges, S. W. (2007). The polyvagal perspective. *Biological Psychology, 74*(2), 116-143.

Posavac, E. J., & Carey, R. G. (2007). *Program evaluation. Methods and case studies (7th ed.).* Upper Saddle River, NJ: Pearson, Prentice, Hall.

Purcell, R. H., Sun, B., Pass, L. L., Power, M. L., Moran, T. H., & Tamashiro, L. K. (2011).

Maternal stress and high-fat diet effect on maternal behavior, milk composition, and pup ingestive behavior. *Physiology and Behavior, 104*, 474-479. doi:10.1016/j.physbeh.2011.05.012

Raichlen, D. A., & Gordan, A. D. (2011). Relationship between exercise capacity and brain size in mammals. *PlosOne, 6*(6), e20601, 1-8. doi: 10.1371/journal.pone.0020601.

Reilly, J. J., & Kelly, J. (2011). Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: Systematic review. *International Journal of Obesity, 35*, 891-898. doi: 10.1038/ijo.2010.222

Rognmo, O., Hetland, E., Helgerud, J., Hoff, J., & Slørdahl, S. A. (2004). High intensity aerobic interval exercise is superior to moderate intensity exercise for increasing aerobic capacity in patients with coronary artery disease. *European Journal of Cardiovascular Prevention and Rehabilitation, 11*, 216-222. doi: 10.1097/01.hjr.0000131677.96762.Oc

Ross, R., Janssen, I., Dawson, J., Kungl, A-M., Kuk, J. L., Wong, S. L., Nguyen-Duy, T-B. . . . Hudson, R. (2004). Exercise-induced reduction in obesity and insulin resistance in women: A randomized controlled trial. *Obesity Research, 12*(5), 789-798.

Sandberg, D. A. (2010). Adult attachment as a predictor of posttraumatic stress and dissociation. *Journal of Trauma and Dissociation, 11*, 293-307. doi: 10.1080/15299731003780937

Sarin, S., & Nolen-Hoeksema, S. (2010). The dangers of dwelling: An examination of the relationship between rumination and consumptive coping in survivors of childhood sexual abuse. *Cognition and Emotion, 24*(1), 71-85. doi: 10.1080/02699930802563668

Sayar, K., & Ak, I. (2001). The predictors of somatization: A review. *Bulletin of Clinical Psychopharacology, 11*(4), 266-271.

Scott, K.M., Burffaerts, R., Simon, G. E., Alonso, J., Angermeyer, M., de Girolamo, D., … Von

Korff, M. (2008). Obesity and mental disorders in the general population: results from the world mental health surveys. *International Journal of Obesity, 32,* 192-200. doi: 10.1038/sj.iho.0803701.

Scott, R. L., Presmanes, W. S. (2001). Reliability and validity of the daily living activities scale: A functional assessment measure for severe mental disorders. *Research on Social Work Practice, 11*(3), 373-389. doi: 10.1177/104973150101100306

Schechter, D. S., Zeanah, C. H., Myers, M. M, Brunelli, S. A., Liebowitz, M. R., Marshall, R. D., … Hofer, M. A. (2004). Psychobiological dysregulation in violence-exposed mothers: Salivary cortisol of mothers with very young children pre – and post-separation stress. *Bulletin of the Menninger Clinic, 68*(4), 319-336.

Schnurr, P. P., & Spiro, A. (1999). Combat exposure, posttraumatic stress disorder symptoms, and health behaviors as predictors of self-reported physical health in older veterans. *The Journal of Nervous and Mental Disease, 187*(6), 353-356.

Schore, A. (2001). The effects of early relation trauma on right brain development, affect regulation, and infant mental health. *Infant Mental Health Journal, 22*(1-2), 201-269.

Schore, A. (2010a). Relational trauma and the developing right brain: The neurobiology of broken attachment bonds. In Baradon, T. (Ed.), *Relational Trauma in Infancy: Psychoanalytic, attachment, and neuropsychological contributions to parent-infant psychotherapy* (pp. 19-47). New York, NY: Routledge.

Schore, A. (2010b). Allen Schore – Human nature and early experience, Bowlby's 'environment of evolutionary adaptedness': Recent studies on the interpersonal neurobiology of attachment and emotional development. [Video File]. Retrieved from http://www.vimeo.com/17822733

Schwartz, G. E., Davidson, R. J., & Goleman, D. J. (1978). Patterning of cognitive and somatic processes in the self-regulation of anxiety: Effects of meditation versus exercise. *Psychosomatic Medicine, 40*(4), 321-328.

Schwartz, G. E., Davidson, R. J.,& Maer, F. (1975). Right hemisphere lateralization for emotion in the human brain: Interactions with cognition. *Science, 190*(4211), 286-288.

Sechrist, K, Walker, S., & Pender, N. (1985). Exercise Benefits/Barriers Scale. Retrieved from: http://deepblue.lib.umich.edu/handle/2027.42/85354

Sechrist, K. R., Walker, S. N., & Pender, N. J. (1987). Development and psychometric evaluation of the exercise benefits/barriers scale. *Research in Nursing & Health, 10*, 357-365.

Sesso, H. D., Paffenbarger, R. S., & Lee, I-M. (2000). Physical activity and coronary heart disease in men. The Harvard alumni study. *Circulation, 102*, 975-980.

Shapiro, F., & Forrest, M. S. (2004).*The breakthrough therapy for overcoming anxiety, stress, and trauma.* New York City, NY: Basic Books.

Schunk, D. H., (2012). *Learning theories. A educational perspective* (pp. 3-70). (6th ed.). Boston, MA: Pearson Education, Inc.

Siegel, D. (2009a). Dan Siegel: The brain and the developing mind. Chautauqua Institution. [Video File]. Retrieved from http://fora.tv/2009/06/30/Dan_Siegel_The_Brain_and_the_Developing_Mind

Siegel, D. (2009b). Google personal growth series: Mindsight the new science of personal transformation. [Video File]. Retrieved from http://www.youtube.com/watch?v=Gr4Od7kqDT8

Siegel, D. (2010a). Mindsight. The new science of personal transformation. New York, NY:

Bantam Books.

Siegel, D. (2010b). *The Mindful Therapist.* New York, NY: W.W. Norton & Company, Inc.

Sifft, J. M, & Khalsa, G. C. K. (1991). Effect of educational kinesiology upon simple response times and choice response times. *Perceptual and Motor Skills, 73*, 1011-1015.

SigmaPlot. (2010). SigmaPlot exact graphs and data analysis. Statistical analysis using sigmaPlot. Retrieved from http://www.sigmaplot.com/webinars/statistics_ppt.pdf

Simon, G. E., VonKorff, M., Piccinelli, M., Fullerton, C., & Ormel, J. (1999). An international study of the relation between somatic symptoms and depression. *The New England Journal of Medicine, 341*(18), 1329-1335.

Simon, G. E., VonKorff, M., Saunders, K., Miglioretti, D. L., Crane, P. K., van Belle, G., & Kessler, R., C. (2006). Association between obesity and psychiatric disorders in the US adult population. *Archives of General Psychiatry, 63*, 824-830.

Social Science Statistics. (2014). Mann-Whitney *U* test calculator. Retrieved from http://www.socscistatistics.com/tests/mannwhitney/Default2.aspx

Solmon, P. (2001). Effects of physical exercise on anxiety, depression, and sensitivity to stress: A unifying theory. *Clinical Psychology Review, 21*(1), 33-61.

Soper, D. (2012). A-priori sample size calculator for a student t-test. http://www.danielsoper.com/statcalc3/calc.aspx?id=47#

Spitzer, C., Barnow, S., Volzke, H., John, U., Freyberger, J., & Grabe, H. J. (2009). Trauma, posttraumatic stress disorder, and physical illness: Findings from the general population. *Psychosomatic Medicine, 71*, 1012-1017. doi: 10.1097/PSY.0b013e181bc76b5

Spitzer, R. L., Kroenke, K., & Williams, J. B. W. (1999). Validation and utility of a self-report version of PRIME-MD. The PHQ primary care study. *Journal of the American Medical*

Association, 282(18), 1737-1744.

Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder. *Archives of Internal Medicine, 166,* 1092-1097.

Stathopoulou, G., Powers, M. B., Berry, A. C., Smits, J. A. J., & Otto, M. W. (2006). Exercise interventions for mental health: A quantitative and qualitative review. *Clinical Psychology: Science & Practice, 13*, 179-193.

StatSoft, Inc. (2013). *Introduction to ANOVA/MANOVA. Electronic Statistics Textbook.* Tulsa, OK: StatSoft. WEB: http://www.statsoft.com/textbook/ Retrieved from www.statsoft.com/textbook/anova-manova/#contrast

Stickgold, R. (2002). EMDR: A putative neurobiological mechanism of action. *Journal of Clinical Psychology, 58*(1), 61-75.

Stokes, K. A., Gilbert, K. L., Hall, G. M., Andrews, R. C., & Thompson, D. (2012). Different responses of selected hormones to three types of exercise in young men. *European Journal of Applied Physiology.* Online version. doi: 10.1007/s00421-012-2487-5

Sugarman, A. (2006). Attention deficit hyperactivity disorder and trauma. *International Journal of Psycho-Analysis, 87*(1), 237-241.

Tagay, S., Schlegl, S., & Wolfgang, S. (2010). Traumatic events, posttraumatic stress, symptomatology, and somatoform symptoms in eating disorder patients. *European Eating Disorders Review, 18*, 124-132. doi: 10.1002/erv.972

Tharp, G. D. (1975). The role of glucocorticoids in exercise. *Medicine and Science in Sports, 7*(1), 6-11.

Thrivikraman, K. V., Nemeroff, C. B., & Plotsky, P. M. (2000). Sensitivity to glucocorticoid-mediated fast-feedback regulation of the hypothalamic – pituitary – adrenal axis is

dependent upon stressor specific neurocircuitry. *Brain Research, 870*, 87-100.

Thomas, E., Flor, H., Birbaumer, N., Knecht, S., Hampson, S., Larbig, W., Taub E. (1994) Extensive reorganization of the somatosensory cortex in adult humans after nervous system injury. *NeuroReport*, 2593-2597.

Tjønna, A. E., Lee, S. J., Rognomo, Ø., Stølen, T. O., Bye, A., Haram, P. M, ... Wisløff, U. (2008). Aerobic interval training versus continuous moderate exercise as a treatment for the metabolic syndrome. A pilot study. *Journal of the American Heart Association, 118,* 346-354. doi: 10.1161/CIRCULATIONAHA.108.772822

Tummala-Narra, P., Kallivayalil, D., Singer, R., & Andreini, R. (2011). Relational experiences of complex trauma survivors in treatment: Preliminary findings from a naturalistic study. *Psychological Trauma: Theory, Research, Practice, and Policy.* Advance online publication, 1-9. doi: 10.1037/a0024929

Urry, H. L., van Reekum, C. M., Johnstone, T., Kalin, N. H., Thurow, M. E., Schaefer, H. S., ... Davidson, R. J. (2006). Amygdala and ventromedial prefrontal cortex are inversely coupled during regulation of negative affect and predict the diurnal pattern of cortisol secretion among older adults. *The Journal of Neuroscience, 26*(16), 4415-4425.

Van den Bergh, B. H., Mulder, E. H., Mennes, M., & Glover, V. (2005). Antenatal maternal anxiety and stress and the neurobehavioural development of the fetus and child: Links and possible mechanisms. A review. *Neuroscience And Biobehavioral Reviews, 29*(2), 237-258. doi:10.1016/j.neubiorev.2004.10.007

Van den Bergh, B. R. H., Mulder, E. J. H., Visser, G. H. A., Poelmann-Weesjes, G., Bekedam, D. J., & Prechtl, H. F. R. (1989). The effect of (induced) maternal emotions on fetal behavior: A controlled study. *Early Human Development, 19*, 9-19.

van Dijke, A., Ford, J. D., van der Hart, O., van Son, M., van der Heijden, P., & Buhring, M. (2011). Complex posttraumatic stress disorder in patients with borderline personality disorder and somatoform disorders. *Psychological Trauma: Theory, Research, Practice, and Policy.* Advance online publication, 1-7, doi:10.1037/a0025732

van der Hart, O., & Horst, R. (1989). The dissociation theory of Pierre Janet. *Journal of Traumatic Stress, 2*(4), 11.

van der Hart, O., Nijenhuis, E. R. S., & Steele, K. (2005). Dissociation: An insufficiently recognized major feature of complex posttraumatic stress disorder. *Journal of Traumatic Stress, 18*(5), 413-423. doi:10.1002/jts.20049

van der Kolk, B., A. (1994). The body keeps the score: Memory and the evolving psychobiology of post traumatic stress. *Trauma Information Pages*, 1-21. Retrieved from: http://www.trauma-pages.com

van der Kolk B. A., & Courtois, C. A. (2005). Editorial comments: Complex developmental trauma. *Journal of Traumatic Stress, 18*(5), 385-388. doi:10.1002/jts/20046

van der Kolk, B. A., Roth, S., Pelcovitz, D., Sunday, S., & Spinazzola, J. (2005). Disorders of extreme stress: The empirical foundation of a complex adaptation to trauma. *Journal of Traumatic Stress, 18*(5), 389-399. doi:10.1002/jts.20047

Vassilakopoulos, T., Zakynthinos, S., Roussos, C., Economou, M. (1999). Strenuous resistive breathing induces proinflammatory cytokines and stimulates the HPA axis in humans. *American Journal of Physiology – Regulatory, Integrative, and Comparative Phsyiology, 277*, R10103-R1019.

Vieweg, W. V. R., Julius, D. A., Bates, J., Quinn III, J. F., Fernandez, A., Hasnain, M., & Pandurangi, A. K. (2007). Posttraumatic stress disorder as a risk factor for obesity among

male military veterans. *Acta Psychiatrica Scandinavica, 116,* 483-487. doi: 10.1111/j.1600-0047.2007.01071.x

Wadden, T. A., Vogt, R. A., Andersen, R. E., Bartlett, S. J., Foster, G. D., Kuehnel, R. H., . . . Steen, S. N. (1997). Exercise in the treatment of obesity effects of four interventions on body composition, resting energy expenditure, appetite, and mood. *Journal of Consulting and Clinical Psychology, 65*(2), 269-277.

Wang, Y. T., Taylor, L., Pearl, M., & Chang, L-S. (2004). Effects of tai chi exercise on physical and mental health of college students. T*he American Journal of Chinese Medicine, 32(*3), 453-459.

Warburton, D. E. R., Nicol, C. W., Bredin, S. S. D. (2006). Health benefits of physical activity: The evidence. *Canadian Medical Association Journal, 174*(6), 801-809.

Weinstock, R. S., Dai, H., Wadden, T. A. (1998). Diet and exercise in the treatment of obesity. Effects of 3 interventions on insulin resistance. *Archives of Internal Medicine, 158*, 2477-2483.

Weissbecker, I., Floyd, A., Dedert, E., Salmon, P., & Sephton, S. (2006). Childhood trauma and diurnal cortisol disruption in fibromyalgia syndrome. *Psychoneuroendocrinology, 31*, 312-324.doi: 10.1016/j.psyneuen.2005.08.009

Wing, R. R., & Jeffery, R. W. (1999). Benefits of recruiting participants with friends and increasing social support for weight loss and maintenance. *Journal of Consulting and Clinical Pscyhology, 67(1), 132-138.*

Wilkinson, M. (2010). Changing minds in therapy. Emotion, attachment, trauma & neurobiology. New York, NY: Norton & Company, Inc.

Wipfli, B. M. (2008). *Serotonin and psychological variables in the relationship between exercise*

and mental health. (Doctoral dissertation). Available from Pro Quest Dissertations and Theses database. (UMI no. 3318440)

Wipfli, B., Landers, D., Nagoshi C., & Ringenbach, S. (2011). An examination of serotonin and psychological variables in the relationship between exercise and mental health. *Scandinavian Journal of Medicine and Science in Sports, 21,* 474-481. doi: 10.1111/j.1600-0838.2009.01049.x

Wittert, G. A., Livesey, J. H., Espiner, E. A., & Donald, R. A. (1996). Adaptation of the hypothalamopituitary adrenal axis to chronic exercise stress in humans. *Medicine and Science in Sports and Exercise,* p. 1015-1019.

Wolf, G. K., Reinhard, M., Cozolino, L. J., Caldwell, A., & Asamen, J. K. (2009). Neuropsychiatric symptoms of complex posttraumatic stress disorder: A preliminary Minnesota Multiphasic Personality Inventory scale to identify adult survivors of childhood abuse. *Psychological Trauma: Theory, Research, Practice, and Policy, 1*(1), 49-64. doi: 10.1037/a0015162

Yoke, M. (Ed.). (2010). *Personal fitness training: Theory & practice textbook* (2nd Ed.). Sherman Oaks, CA: Aerobics and Fitness Association of America.

Zlotnick, C., Shea, M. T., Begin, A., Pearlstein, T., Simpson, E., & Costello, E. (1996). The validation of the trauma symptom checklist-40 (TSC-40) in a sample of inpatients. *Child Abuse and Neglect, 20*(6), 503-510.

Appendix A: Measurement Tools and Permissions

TSC-40 – Approved without written permission for research use.

John Briere Ph.D.

Home | Publications | Books | Published Tests | Unpublished Tests | ITCT-A | Trauma Links | Conferences | Contact

Trauma Symptom Check-list 33 and 40 (TSC-33 and TSC-40)

John Briere, Ph.D. and Marsha Runtz, Ph.D.

Please note: Use of this scale is limited to professional researchers. The TSC-40 is a research measure, not a clinical test. It is not intended as, nor should it be used as, a self-test under any circumstances.

This page contains a psychometric review of the TSC 33/40, with references up to mid-1998, **followed by a free copy of the TSC-40 (at the end of this page)** for use by researchers. Cut and paste to your word processor as needed (formatting will require adjustment).

This summary is substantially adapted from Briere, J. (1996), Psychometric review of the Trauma Symptom Checklist-40, in B.H. Stamm (Ed.). Measurement of stress, trauma, and adaptation. Lutherville, MD: Sidran Press.

TYPE OF POPULATION: Adults

COST: None

COPYRIGHT: John Briere, Ph.D. and Marsha Runtz, Ph.D.

WHAT IT MEASURES: The TSC-40 is a research measure that evaluates symptomatology in adults associated with childhood or adult traumatic experiences. It measures aspects of posttraumatic stress and other symptom clusters found in some traumatized individuals. It does not measure all 17 criteria of PTSD, and should not be used as a complete measure of that construct. The TSC-40 is a revision of the earlier TSC-33 (Briere & Runtz, 1989). Those requiring a validated psychological test of posttraumatic response, using a similar format, should consider the Trauma Symptom Inventory (TSI) or (for evaluation of a specific trauma) the Detailed Assessment of Posttraumatic Stress (DAPS).

MEASURE PROCEDURE AND CONTENT: The TSC-40 is a 40-item self- report instrument consisting of six subscales: Anxiety, Depression, Dissociation, Sexual Abuse Trauma Index (SATI), Sexual Problems,, and Sleep Disturbance, as well as a total score. Each symptom item is rated according to its frequency of occurrence over the prior two months, using a four point scale ranging from 0 ("never") to 3 ("often"). The TSC-40 requires approximately 10-15 minutes to complete, and can be scored in approximately 5-10 minutes.

PSYCHOMETRIC PROPERTIES SUMMARY: Studies using the TSC-40 indicate that it is a relatively reliable measure (subscale alphas typically range from .66 to .77, with alphas for the full scale averaging between .89 and .91). The TSC-40 and its predecessor, the TSC-33, have predictive validity with reference to a wide variety of traumatic experiences (see reference section). The TSC-40 also appears to predict perpetration of intimate violence (e.g., Dutton, 1995) and vicarious traumatization in psychotherapists (e.g., Chrestman, 1995).

GENERAL COMMENTS: *The TSC-40 is a research instrument only.* It is freely available to researchers. No additional permission is required for use or reproduction of this measure, although Briere and Runtz (1989) should be cited.

MEASURE AUTHORS: John Briere, Ph.D. (USC) and Marsha Runtz, Ph.D. (Associate Professor, Department of Psychology, P.O. Box 3050, University of Victoria, Victoria, British Columbia, Canada, V8W 3P5)

Top of Page

Top of Page

Trauma Symptom Checklist - 40 (TSC-40)

Subscale composition and scoring for the TSC-40 The score for each subscale is the sum of the relevant items, listed below:

Dissociation: 7,14,16,25,31,38
Anxiety: 1,4,10,16,21,27,32,34,39
Depression: 2,3,9,15,19,20,26,33,37
SATI (Sexual Abuse Trauma Index): 5,7,13,21,25,29,31
Sleep Disturbance 2,8,13,19,22,28
Sexual Problems 5,9,11,17,23,29,35,40
TSC-40 total score: 1-40

Top of Page

TSC-40

How often have you experienced each of the following in the last two months?

0 = Never 3 = Often

1. Headaches	0 1 2 3
2. Insomnia (trouble getting to sleep)	0 1 2 3
3. Weight loss (without dieting)	0 1 2 3
4. Stomach problems	0 1 2 3
5. Sexual problems	0 1 2 3
6. Feeling isolated from others	0 1 2 3
7. "Flashbacks" (sudden, vivid, distracting memories)	0 1 2 3
8. Restless sleep	0 1 2 3
9. Low sex drive	0 1 2 3
10. Anxiety attacks	0 1 2 3
11. Sexual overactivity	0 1 2 3
12. Loneliness	0 1 2 3
13. Nightmares	0 1 2 3
14. "Spacing out" (going away in your mind)	0 1 2 3
15. Sadness	0 1 2 3
16. Dizziness	0 1 2 3
17. Not feeling satisfied with your sex life	0 1 2 3
18. Trouble controlling your temper	0 1 2 3
19. Waking up early in the morning and can't get back to sleep	0 1 2 3
20. Uncontrollable crying	0 1 2 3
21. Fear of men	0 1 2 3
22. Not feeling rested in the morning	0 1 2 3
23. Having sex that you didn't enjoy	0 1 2 3
24. Trouble getting along with others	0 1 2 3
25. Memory problems	0 1 2 3
26. Desire to physically hurt yourself	0 1 2 3

27. Fear of women	0 1 2 3
28. Waking up in the middle of the night	0 1 2 3
29. Bad thoughts or feelings during sex	0 1 2 3
30. Passing out	0 1 2 3
31. Feeling that things are "unreal"	0 1 2 3
32. Unnecessary or over-frequent washing	0 1 2 3
33. Feelings of inferiority	0 1 2 3
34. Feeling tense all the time	0 1 2 3
35. Being confused about your sexual feelings	0 1 2 3
36. Desire to physically hurt others	0 1 2 3
37. Feelings of guilt	0 1 2 3
38. Feelings that you are not always in your body	0 1 2 3
39. Having trouble breathing	0 1 2 3
40. Sexual feelings when you shouldn't have them	0 1 2 3

Top of Page

PHQ – Approved for use without written permission

PATIENT HEALTH QUESTIONNAIRE (PHQ)

This questionnaire is an important part of providing you with the best health care possible. Your answers will help in understanding problems that you may have. Please answer every question to the best of your ability unless you are requested to skip over a question.

Name_____ Age____ Sex: ☐ Female ☐ Male Today's Date_____

1. During the last 4 weeks, how much have you been bothered by any of the following problems?	Not bothered	Bothered a little	Bothered a lot
a. Stomach pain	☐	☐	☐
b. Back pain	☐	☐	☐
c. Pain in your arms, legs, or joints (knees, hips, etc.)	☐	☐	☐
d. Menstrual cramps or other problems with your periods	☐	☐	☐
e. Pain or problems during sexual intercourse	☐	☐	☐
f. Headaches	☐	☐	☐
g. Chest pain	☐	☐	☐
h. Dizziness	☐	☐	☐
i. Fainting spells	☐	☐	☐
j. Feeling your heart pound or race	☐	☐	☐
k. Shortness of breath	☐	☐	☐
l. Constipation, loose bowels, or diarrhea	☐	☐	☐
m. Nausea, gas, or indigestion	☐	☐	☐

2. Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at all	Several days	More than half the days	Nearly every day
a. Little interest or pleasure in doing things	☐	☐	☐	☐
b. Feeling down, depressed, or hopeless	☐	☐	☐	☐
c. Trouble falling or staying asleep, or sleeping too much	☐	☐	☐	☐
d. Feeling tired or having little energy	☐	☐	☐	☐
e. Poor appetite or overeating	☐	☐	☐	☐
f. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	☐	☐	☐	☐
g. Trouble concentrating on things, such as reading the newspaper or watching television	☐	☐	☐	☐
h. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	☐	☐	☐	☐
i. Thoughts that you would be better off dead or of hurting yourself in some way	☐	☐	☐	☐

FOR OFFICE CODING: Som Dis if at least 3 of #1a-m are "a lot" and lack an adequate biol explanation.
Maj Dep Syn if answers to #2a or b and five or more of #2a-i are at least "More than half the days" (count #2i if present at all).
Other Dep Syn if #2a or b and two, three, or four of #2a-i are at least "More than half the days" (count #2i if present at all).

		NO	YES
6. Questions about eating.			
a.	Do you often feel that you can't control what or how much you eat?	☐	☐
b.	Do you often eat, within any 2-hour period, what most people would regard as an unusually large amount of food?	☐	☐
If you checked "NO" to either #a or #b, go to question #9.			
c.	Has this been as often, on average, as twice a week for the last 3 months?	☐	☐

7. In the last 3 months have you often done any of the following in order to avoid gaining weight?		NO	YES
a.	Made yourself vomit?	☐	☐
b.	Took more than twice the recommended dose of laxatives?	☐	☐
c.	Fasted — not eaten anything at all for at least 24 hours?	☐	☐
d.	Exercised for more than an hour specifically to avoid gaining weight after binge eating?	☐	☐

	NO	YES
8. If you checked "YES" to any of these ways of avoiding gaining weight, were any as often, on average, as twice a week?	☐	☐

	NO	YES
9. Do you ever drink alcohol (including beer or wine)?	☐	☐
If you checked "NO" go to question #11.		

10. Have any of the following happened to you more than once in the last 6 months?		NO	YES
a.	You drank alcohol even though a doctor suggested that you stop drinking because of a problem with your health.	☐	☐
b.	You drank alcohol, were high from alcohol, or hung over while you were working, going to school, or taking care of children or other responsibilities.	☐	☐
c.	You missed or were late for work, school, or other activities because you were drinking or hung over.	☐	☐
d.	You had a problem getting along with other people while you were drinking.	☐	☐
e.	You drove a car after having several drinks or after drinking too much.	☐	☐

11. If you checked off any problems on this questionnaire, 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
☐	☐	☐	☐

FOR OFFICE CODING: But Not if #6a,b, and c and #8 are all 'YES'; Bin Eat Dis the same but #8 either 'NO' or left blank.
Alc Abu if any of #10a-e is 'YES'.

3. Questions about anxiety.		NO	YES
a.	In the last 4 weeks, have you had an anxiety attack — suddenly feeling fear or panic?	☐	☐
If you checked "NO", go to question #5.			
b.	Has this ever happened before?	☐	☐
c.	Do some of these attacks come suddenly out of the blue — that is, in situations where you don't expect to be nervous or uncomfortable?	☐	☐
d.	Do these attacks bother you a lot or are you worried about having another attack?	☐	☐

4. Think about your last bad anxiety attack.		NO	YES
a.	Were you short of breath?	☐	☐
b.	Did your heart race, pound, or skip?	☐	☐
c.	Did you have chest pain or pressure?	☐	☐
d.	Did you sweat?	☐	☐
e.	Did you feel as if you were choking?	☐	☐
f.	Did you have hot flashes or chills?	☐	☐
g.	Did you have nausea or an upset stomach, or the feeling that you were going to have diarrhea?	☐	☐
h.	Did you feel dizzy, unsteady, or faint?	☐	☐
i.	Did you have tingling or numbness in parts of your body?...	☐	☐
j.	Did you tremble or shake?	☐	☐
k.	Were you afraid you were dying?	☐	☐

5. Over the last 4 weeks, how often have you been bothered by any of the following problems?		Not at all	Several days	More than half the days
a.	Feeling nervous, anxious, on edge, or worrying a lot about different things.	☐	☐	☐
If you checked "Not at all", go to question #6.				
b.	Feeling restless so that it is hard to sit still.	☐	☐	☐
c.	Getting tired very easily.	☐	☐	☐
d.	Muscle tension, aches, or soreness.	☐	☐	☐
e.	Trouble falling asleep or staying asleep.	☐	☐	☐
f.	Trouble concentrating on things, such as reading a book or watching TV.	☐	☐	☐
g.	Becoming easily annoyed or irritable.	☐	☐	☐

FOR OFFICE CODING: Pan Syn if all of #3a-d are 'YES' and four or more of #4a-k are 'YES'. Other Anx Syn if #5a and answers to three or more of #5b-g are "More than half the days".

Exercise Benefit/Barriers Scale – My Letter for permission, response email, and scale

Stacy Reuille-Dupont, LPC, C-PFT
98 Ute Pass West Rd
Durango, CO 81301

06/13/2013

Dr. Sechrist
18 Morningstar
Irvine, CA 92603-3745
krsech@pacbell.net

Dr. Sechrist,

I am writing to request permission to use the measurement tool: **Exercise Benefits/Barriers Scale** in my research titled Impact of Psychological Trauma Symptoms on Comorbid Physical and Mental Health Problems, Exercise Behavior, and Perceived Benefits and Barriers to Physical Exercise.

I am a PhD candidate at the Chicago School of Professional Psychology, a certified personal trainer, and group exercise instructor. My dissertation research aims to bridge these areas of study to better understand how those with psychological trauma perceive and participate in physical exercise. It is well documented that those with mental health issues often have physical health complications and die at younger ages. Many have difficulty following through with health provider recommendations to exercise at intensity levels high enough to impact physiological change.

My hypothesis is that those with psychological trauma may have difficulty participating in physical exercise due to somatic experiences such as hyper-arousal, hyper-vigilance, numbing, or dissociating from stressful experience in addition to cognitive distortions. This study aims to better understand the interface between these areas in efforts to create more successful interventions for those who suffer from psychological trauma symptoms.

Participants will not be compensated for participation and data will be collected from a variety of master's level psychotherapists.

If you have any questions please contact me: 218-522-0636 or stacy@superiorworkout.com

Sincerely,

Stacy Reuille-Dupont, LPC, C-PFT

From: "Karen Sechrist" <krsech@pacbell.net>
Subject: Repeat Message
Date: June 18, 2013 9:41:14 AM MDT
To: "Stacy Reuille-Dupont" <stacy@superiorworkout.com>

Stacy:

The Exercise Benefits/Barrier Scale (EBBS) is located at http://deepblue.lib.umich.edu/handle/2027.42/85354 . You will also find a letter of permission to use the EBBS at that location in the "EBBS Information" PDF file.

The EBBS was originally developed to evaluate behavior for the Health Promotion Model (HPM). If you want additional information on the HPM, please go to:
http://deepblue.lib.umich.edu/browse?type=author&order=ASC&rpp=20&value=Pender%2C+Nola+J.

Please note that the HPM link does not work correctly from the e-mail. Please copy and paste the link into your browser address bar to include the "period" at the end.

Best wishes with your research,

K. Sechrist for Sechrist/Walker/Pender
krsech@pacbell.net

Health Promotion Model Instrumentation Group

Nola J. Pender, PhD, RN, FAAN • Susan Noble Walker, EdD, RN, FAAN • Karen R. Sechrist, PhD, RN, FAAN

Dear Colleague:

Thank you for your interest in the Exercise Benefits/Barriers Scale (EBBS). The EBBS was developed in response to a need for an instrument designed to determine perceptions of individuals concerning the benefits of and barriers to participating in exercise. Items for the scale were obtained inductively from interviews and from the literature.

The EBBS is a 43-item summated rating scale consisting of two subscales, Benefits and Barriers. Ratings are obtained using a four-point response system. The EBBS has been tested for internal consistency, validity of its constructs, and test-retest reliability. A sample of 650 individuals over 18 years of age, primarily from northern Illinois, participated in the initial testing of the EBBS. Calculation of Cronbach's alpha for the 43-item instrument yielded a standardized alpha of .954. The 29-item Benefits Scale has a standardized alpha of .954 and the 14-item Barriers Scale has a standardized alpha of .866. Factor analysis yielded a nine-factor solution initially with an explained variance of 65.2%. Second order factor analysis yielded a two-factor solution, one a benefits factor and the other a barriers factor. Test-retest reliability was accomplished with a sample of 66 healthy adults at a two-week interval. Test-retest reliability was found to be .89 on the total instrument, .89 on the Benefits Scale and .77 on the Barriers Scale. Additional information on the development and initial testing of the EBBS can be found at in the following article:

> Sechrist, KR, Walker, SN, and Pender, NJ. (1987). Development and psychometric evaluation of the Exercise Benefits/Barriers Scale. *Research in Nursing & Health, 10*, 357-365.

You have our permission to download and use the EBBS for non-commercial data collection purposes such as research or evaluation projects as long as the following conditions are met:

- The EBBS will be used without any modifications other than translation into a language other than English (see information on translation, if required);
- The copyright statement will appear on the bottom of all copies of the EBBS; and
- All study participants will be over 18 years of age since the EBBS was not validated in younger populations.

A copy of the EBBS with scoring information is available for download. A Spanish translation of the EBBS is also available. If you need additional information, you may contact Dr. Karen Sechrist by e-mail (krsech@pacbell.net).

Best wishes with your research,

Karen R. Sechrist, PhD, RN, FAAN
for Pender/Walker/Sechrist

EXERCISE BENEFITS/BARRIERS SCALE

DIRECTIONS: Below are statements that relate to ideas about exercise. Please indicate the degree to which you agree or disagree with the statements by circling SA for strongly agree, A for agree, D for disagree, or SD for strongly disagree.

1. I enjoy exercise.	SA A D SD
2. Exercise decreases feelings of stress and tension for me.	SA A D SD
3. Exercise improves my mental health.	SA A D SD
4. Exercising takes too much of my time.	SA A D SD
5. I will prevent heart attacks by exercising.	SA A D SD
6. Exercise tires me.	SA A D SD
7. Exercise increases my muscle strength.	SA A D SD
8. Exercise gives me a sense of personal accomplishment.	SA A D SD
9. Places for me to exercise are too far away.	SA A D SD
10. Exercising makes me feel relaxed.	SA A D SD
11. Exercising lets me have contact with friends and persons I enjoy.	SA A D SD
12. I am too embarrassed to exercise.	SA A D SD
13. Exercising will keep me from having high blood pressure.	SA A D SD
14. It costs too much to exercise.	SA A D SD
15. Exercising increases my level of physical fitness.	SA A D SD
16. Exercise facilities do not have convenient schedules for me.	SA A D SD
17. My muscle tone is improved with exercise.	SA A D SD
18. Exercising improves functioning of my cardiovascular system.	SA A D SD
19. I am fatigued by exercise.	SA A D SD
20. I have improved feelings of well being from exercise.	SA A D SD
21. My spouse (or significant other) does not encourage exercising.	SA A D SD

(Continued on reverse side)

22. Exercise increases my stamina.	SA A D SD
23. Exercise improves my flexibility.	SA A D SD
24. Exercise takes too much time from family relationships.	SA A D SD
25. My disposition is improved with exercise.	SA A D SD
26. Exercising helps me sleep better at night.	SA A D SD
27. I will live longer if I exercise.	SA A D SD
28. I think people in exercise clothes look funny.	SA A D SD
29. Exercise helps me decrease fatigue.	SA A D SD
30. Exercising is a good way for me to meet new people.	SA A D SD
31. My physical endurance is improved by exercising.	SA A D SD
32. Exercising improves my self-concept.	SA A D SD
33. My family members do not encourage me to exercise.	SA A D SD
34. Exercising increases my mental alertness.	SA A D SD
35. Exercise allows me to carry out normal activities without becoming tired.	SA A D SD
36. Exercise improves the quality of my work.	SA A D SD
37. Exercise takes too much time from my family responsibilities.	SA A D SD
38. Exercise is good entertainment for me.	SA A D SD
39. Exercising increases my acceptance by others.	SA A D SD
40. Exercise is hard work for me.	SA A D SD
41. Exercise improves overall body functioning for me.	SA A D SD
42. There are too few places for me to exercise.	SA A D SD
43. Exercise improves the way my body looks.	SA A D SD

EXERCISE BENEFITS/BARRIERS SCALE

Instrument Development and Scoring Information

Instrument Development. The Exercise Benefits/Barriers Scale (EBBS) was developed in response to a need for an instrument to determine perceptions of individuals concerning the benefits of and barriers to participating in exercise. Items for the scale were obtained inductively from interviews and from the literature. The resulting instrument has been tested for internal consistency, validity of its constructs, and test-retest reliability.

A sample of 650 individuals, primarily from northern Illinois, responded to the instrument. Calculation of Cronbach's alpha for the 43-item instrument yielded a standardized alpha of .954. The 29-item Benefits Scale has a standardized alpha of .954 and the 14-item Barriers Scale has a standardized alpha of .866. Factor analysis yielded a nine-factor solution initially which an explained variance of 65.2%. Second order factor analysis yielded a two-factor solution, one a *benefits* factor and the other a *barriers* factor. Test-retest reliability was accomplished with a sample of 66 healthy adults at a two-week interval. Test-retest reliability was found to be .89 on the total instrument, .89 on the Benefits Scale and .77 on the Barriers Scale.

Instrument Scoring. The instrument may be scored and used in its entirety or as two separate scales. The instrument has a four-response, forced-choice Likert-type format with responses ranging from 4 (strongly agree) to 1 (strongly disagree). Barrier Scale items are reverse-scored. Items on the Barrier Scale are numbers 4, 6, 9, 12, 14, 16, 19, 21, 24, 28, 33, 37, 40 and 42. Missing data may be handled in one of two ways. If more than five percent of the items are unanswered, it is recommended that the response be discarded. If the missing item response rate is less than five percent, median substitution prevents falsely low scores.

Scores on the total instrument can range from 43 to 172. The higher the score, the more positively the individual perceives exercise. When the Benefits Scale is used alone, the score range is between 29 and 116. When the Barriers Scale is used alone, scores range between 14 and 56. If used alone, the Barriers Scale does not need to be reverse-scored. In this instance, the higher the score on the Barriers Scale, the greater the perception of barriers to exercise.

Additional Information. Information about the instrument can be found in the following reference:

Sechrist, KR, Walker, SN, & Pender, NJ. (1987). Development and psychometric evaluation of the Exercise Benefits/Barriers Scale. *Research in Nursing & Health*, 10, 357-365. Further information may be obtained by contacting: Dr. Karen Sechrist, 18 Morningstar, Irvine, CA 92603-3745; e-mail krsech@pacbell.net

Godin Leisure Time Exercise Questionnaire – My letter for permission, email response, and scale

Stacy Reuille-Dupont, LPC, C-PFT
98 Ute Pass West Rd
Durango, CO 81301

06/13/2013

Dr. Shephard
PO Box 521
Brackendale, BC V0N 1H0 Canada
royjshep@mountain-inter.net
Dr. Godin
Pavillon Paul-Comtois
Université Laval
Québec (Qc)
G1K 7P4
gaston.godin@fsi.ulaval.ca

Dr. Godin and Dr. Shephard,
I am writing to request permission to use the measurement tool: **Godin Leisure-Time Exercise Questionnaire** in my research titled Impact of Psychological Trauma Symptoms on Comorbid Physical and Mental Health Problems, Exercise Behavior, and Perceived Benefits and Barriers to Physical Exercise.

I am a PhD candidate at the Chicago School of Professional Psychology, a certified personal trainer, and group exercise instructor. My dissertation research aims to bridge these areas of study to better understand how those with psychological trauma perceive and participate in physical exercise. It is well documented that those with mental health issues often have physical health complications and die at younger ages. Many have difficulty following through with health provider recommendations to exercise at intensity levels high enough to impact physiological change.

My hypothesis is that those with psychological trauma may have difficulty participating in physical exercise due to somatic experiences such as hyper-arousal, hyper-vigilance, numbing, or dissociating from stressful experience in addition to cognitive distortions. This study aims to better understand the interface between these areas in efforts to create more successful interventions for those who suffer from psychological trauma symptoms.

Participants will not be compensated for participation and data will be collected from a variety of master's level psychotherapists. If you have any questions please contact me: 218-522-0636 or stacy@superiorworkout.com

Sincerely,
Stacy Reuille-Dupont, LPC, C-PFT

From: Gaston Godin <Gaston.Godin@fsi.ulaval.ca>
Subject: RE : Permission to use the GLTEQ
Date: June 14, 2013 1:07:14 PM MDT
To: Stacy Reuille-Dupont <stacy@superiorworkout.com>

Dear Ms. Reuille-Dupont:

Please find attached the requested letter as well as a related recent publication.

Sincerely,

Pr. Gaston Godin, Ph.D., FEHPS
Emeritus professor
Laval University
Quebec City, Canada

UNIVERSITÉ LAVAL
Faculté des sciences infirmières

June 14, 2013

Stacy Reuille-Dupont, LPC, C-PFT
98 Ute Pass West Rd
Durango, CO 81301
USA

Dear Mrs Reuille-Dupont:

Our questionnaire is in the public domain and free for use. There is no need to ask permission for its use. Nonetheless, if you wish to feel safe about this, I am pleased to grant you permission to use our questionnaire (Godin-Shephard Leisure-Time Exercise Questionnaire) for your research project aimed at better understanding how those with psychological trauma perceive and participate in physical exercise.

Best wishes of success in your research project.

Gaston Godin, Ph.D., FEHPS
Professor

Groupe de recherche sur les comportements et la santé
Pavillon Vandry, rue de la médecine, 3e étage
Québec (Québec) G1V 0A6
CANADA

(418) 656-2131, poste 7900
Télécopieur : (418) 656-3920
Gaston.Godin@fsi.ulaval.ca
Site Web: http://www.godin.fsi.ulaval.ca

Godin Leisure-time Exercise Questionnaire

Considering a **7-day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your **free time** (write on each line the appropriate number).

TIMES PER WEEK

STRENUOUS EXERCISE _____
(HEART BEATS RAPIDLY - i.e. running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

MODERATE EXERCISE _____
(NOT EXHAUSTING - i.e. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

MILD EXERCISE _____
(MINIMAL EFFORT - i.e. yoga, archery, fishing from river bend, bowling, horseshoes, golf, snow-mobiling, easy walking)

Considering a 7-day period (a week), during your leisure-time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

OFTEN	SOMETIMES	NEVER/RARELY
☐	☐	☐

DLA -20 – My letter for permission, email response, and scale

Stacy Reuille-Dupont, LPC, C-PFT
98 Ute Pass West Rd
Durango, CO 81301

06/13/2013

Willa Presmanes
MTM Services, LLC
PO Box 1027
Holly Springs, NC 27540
Willa.Presmanes@mtmservices.org
MTMWilla@aol.com

Ms. Presmanes,

I am writing to request permission to use the measurement tool: **Daily Living Activities – 20 Functional Assessment** in my research titled *Impact of Psychological Trauma Symptoms on Comorbid Physical and Mental Health Problems, Exercise Behavior, and Perceived Benefits and Barriers to Physical Exercise.*

I took a training from you on the DLA-20 through my employer Axis Health System (formerly Southwest Colorado Mental Health Center) in Durango, CO and currently use it in my daily work. I am a PhD candidate at the Chicago School of Professional Psychology, a certified personal trainer, and group exercise instructor. My dissertation research aims to bridge these areas of study to better understand how those with psychological trauma perceive and participate in physical exercise. It is well documented that those with mental health issues often have physical health complications and die at younger ages. Many have difficulty following through with health provider recommendations to exercise at intensity levels high enough to impact physiological change.

My hypothesis is that those with psychological trauma may have difficulty participating in physical exercise due to somatic experiences such as hyper-arousal, hyper-vigilance, numbing, or dissociating from stressful experience in addition to cognitive distortions. This study aims to better understand the interface between these areas in efforts to create more successful interventions for those who suffer from psychological trauma symptoms.

Participants will not be compensated for participation and data will be collected from a variety of master's level psychotherapists.

If you have any questions please contact me: 218-522-0636 or stacy@superiorworkout.com

Sincerely,

Stacy Reuille-Dupont, LPC, C-PFT
From: Willa Presmanes <willa.presmanes@mtmservices.org>
Subject: Re: PhD candidate research_Permission to use the DLA20
Date: June 14, 2013 3:40:47 PM MDT
To: Stacy Reuille-Dupont <stacy@superiorworkout.com>
Cc: "Bradley, Marian" <Marian.Bradley@mtmservices.org>

Stacy, I AM SO PROUD OF YOU!! And I am excited to have any/all data about the use of the research with DLAs – and boy, does this study sound interesting! I haven't reviewed scores for your group in a while and I would like to offer you free review and I would greatly appreciate helping you make sure your master's level providers are using the tool correctly – invite them to attend a go to meeting from home or any location. I feel like if you know, by review AND pre-post test that all of your scores are reliable that it will make your research so much more valuable. We could block off 1.5 hour online to do this work but it might not take but one-hour. I just would like to make myself available to ensure the validity of your results- and I would love access to your report and permission to disseminate – it's fine if people have to pay for journal access. I personally think you are on a good track – I remember there is a site in Michigan that has successful experience with SMI and exercise and I hope I can locate the facility name. The article was published in a NCCBH journal, not widely distributed, so I will try to do a search. What do you think about this suggestion and when are you starting data entry – let's try to work before baseline measures are collected. This really could be important information as the Affordable Care Act kicks in in Jan, 2014. Thanks for staying touch.

Marian can set up that appointment if your providers can make themselves available.

--
Willa Presmanes, M.Ed., M.A.
Outcomes Research Behavioral Healthcare

1580 Misty Oaks Drive
Sandy Springs, Georgia 30350
Office Phone/Fax: (919) 387-9892
Cell: (770) 851-2972
Website: http://www.mtmservices.org/DLA20-FAQ.html
http://www.thenationalcouncil.org/consulting-best-practices/mtm-services/
http://www.thenationalcouncil.org/cs/schizophrenia_advancing_care
http://www.thenationalcouncil.org/areas-of-expertise/dla-20-mental-health-outcomes-measurement/
http://rsw.sagepub.com/content/11/3/373.short
E-mail: willa.presmanes@mtmservices.org

1=Schizophrenia, 2=Schizoaffective 3=Maj. Depressive 4=Bipolar 5=Psychotic Dis 6=Delusional Dis 7=Dual Alcohol/Drug & Any SPMI above

Daily Living Activities - Adult MH
DLA20© WS Pressmanes M.A./M.ED & RL Scott Ph.D

Instructions: Using the following scale, code (1-7) how often or how well each of the 20 activities of daily living were independently completed during the last 30 days. Scores of 5 to 7 indicate functioning "within normal limits"(WNL). Areas not assessed = NA (all applicable).

1	2	3	4	5 (WNL)	6(WNL)	7(WNL)
...ame of the time. Persistent, continuous intervention required-Dysfunctional. Disabling impairment	Almost never; Not functional; Dependent; Severe impairments	Occasionally; functioning depends on continuous support; Substantial impairments	Some of the time; marginal independence-low level of continuous support, serious impairments	A good bit of time; Independent with moderate, routine support; moderate problems @ job	Most of the time, Independent with intermittent support or follow-up, intermittent problem	All of the time; Optimal & independent strength, no problem for TX

DAILY ACTIVITIES	EXAMPLES OF SCORING WNL BEHAVIORS (Scores 5-7) How often or how well does the consumer do the following ...?	Date 1	Date 2	Date 3	Date 4	Date 5	Date 6
1. Healthcare (Physical & Mental Health) Practices	Takes care of health issues, manages moods, infections or other diagnosed problems; takes medication as prescribed; follows up on medical appointments.						
2. Household Stability and Residence Maintenance	Maintains stable housing; organizes possessions, cleans. Contributes to stability in home respect others & property, share chores						
3.Communication	Listens, expresses opinions, feelings, anger and makes wishes known effectively.						
4. Safety within home and environment	Safely moves about community – Avoids dangerous people or places where there is likely trouble or abuse potential; adequate vision, hearing, makes safe decisions. Safely uses small appliances, ovens/burners, matches, knives, razors, other tools.						
5. Managing Time	Follows regular schedule for bedtime, wake-up, mealtimes, rarely tardy or absent for work, day programs, appointments, scheduled activities.						
6. Managing Money	Manages money wisely (independent source of funds); controls spending habits. Abstains from overspending personal limits, betting, stealing?						
7. Nutrition	Eat at least 2 basically nutritious meals daily; observed with healthy snacks. Optimal independence (score 7) includes meal planning, preparation.						
8. Problem Solving	Understands reasons for seeking services, potential choices to resolves basic problems of daily living, asks questions for clarity and setting expectations.						
9. Family Relationships	Gets along with family, positive relationships as parent, sibling, child, significant other family member.						
...Alcohol, Drug Use	Avoids abuse or abstains from alcohol/drugs, cigarettes; understands signs and symptoms of dependency; avoids misuse or combining alcohol, drugs, medication						
11. Leisure Entertainment	Relaxes with a variety of activities: e.g., attends/participates in sports, music, arts, crafts, reads newspapers, magazines, books; recreational games with others; goes to movies						
12. Community Resources	Uses community services, self-help groups, telephone, public transportation, religious organizations, shopping.						
13. Peers/Social	Gets along with friends, neighbors, coworkers, other peers						
14. Sexual Behavior	Sexually appropriate behavior toward others; comfortable with gender, respects privacy and personal rights, practices safe sex or abstains.						
15. Work & Productivity	Independently working, volunteering, housemaking, or learning skills for financial self-support.						
16. Coping Skills	Knows about nature of disability/illness, probable limitations, symptoms of relapse, behaviors that make problem worse. Uses options for coping, improving, preventing relapse, restoring feelings of self-worth, competence, being in control.						
17. Behavior Norms	Complies with community norms, nuisance behaviors; respects rights of others. No contact with police; total release from probation/parole, court requirements, if applicable; controls dangerous, violent, aggressive, bizarre behaviors						
18. Personal Hygiene Care	Help or manage general cleanliness: daily bath, shower, brush teeth						
19. Grooming	Cares for hair, hands, general appearance, shaves.						
20. Dress	Dresses self; wears clean clothes that are appropriate for weather, job, and other activities; clothing is generally neat and intact.						

Scoring: Step 1. Sum a minimum of 15 ratings from applicable column.
p 2. Average (Step 1 total divided by # activities rated); compare to 7 pt. scale.
Step 3. (a) To estimate GAF: multiply avg. DLA by 10 for Tot.DLA or
(b) Total DLA for all 20 (Take ½ of Sum in Step 1) averages +-3 pts from GAF.
Step 4. Reassess GAF 1-100 where 51-60 is moderate problems, 5 on DLA.
Step 5. +/- Change score: subtract prior DLA from most recent rating.

1. Sum	0.0					0.0
2.Average	0.0					0.0
Tot. DLA	0.0					0.0
Est. GAF	0.0					0.0
Change						0.0
MGAF (+/-3)						

Demographic Sheet

Please provide the following information. All information requested will help this researcher better understand the complex nature between psychological trauma and physical exercise.

The information you provide will be kept confidential and you do not need to give any identifying information unless you would like this researcher to contact you.

Please circle the answers that best describe you. One per answer unless noted.

Sex:

Male Female

Current Age:

The Education Level That Best Describes Me Is:

I didn't go to high school

I went to high school but didn't graduate

I have a GED or High School Diploma

I have some college experience

I have a Bachelor's Degree

I have a Master's Degree

I have a PhD, MD, or JD

My Annual Household Income Range Is:

Under 20,000

20,000-40,000

40,000 - 60,000

60,000 - 80,000

80,000 - 100,000

Over 100,000

I would describe my current health as:

Excellent Good Fair Poor

I have participated in regular exercise before:

Yes No

I feel physical exercise has helped my psychological trauma symptoms:

Yes No

I know about the different effects trauma has on the physical body:

Yes No

Anything Else You Would Like This Researcher To Know About Your Experience with Psychological Trauma and Participating in Physical Exercise:

If you would like to see results of this research study or have questions for this researcher and would like to be contacted please add your name and contact information, this information will be kept confidential and will be disposed of according to APA guidelines.

Appendix B: Participant Recruitment

Are You Physically Active?

Does Exercise seem to help you?

Do You Have a Mental Health Diagnosis?

Do You Feel Your Mental Health Impacts Your Weight?

Does Exercise Seem Harder To You Than Other People?

Would you like to be more active but it seems overwhelming to start?

Have you been told to exercise but can't seem to follow through and feel your mental health is part of the problem?

Psychological Health & Exercise

A Study To Understand How Those With Trauma Participate in Physical Exercise

THIS IS AN ADVERTISMENT FOR PARTICIPATION IN A RESEARCH STUDY.

If ANY of these statements sound familiar to you, consider participating in this study

Participation will help create better Exercise Based Therapy Interventions for clients who suffer from mental and physical health issues.

Research Project:

Impact of Psychological Trauma Symptoms on Exercise Behavior and Perceived Benefits and Barriers to Physical Exercise

Reason for study:

This study aims to better understand how those who have suffered from psychological trauma perceive and participate in physical exercise.

As a result of this study it is hoped to better understand what keeps or helps those with psychological trauma from participating in exercise so better mental health and exercise science interventions may be designed.

There is no financial compensation for participation in this study.

Risks to participation are expected to be minimal and similar to participating in outpatient therapy for psychological trauma symptoms.

Participation Criteria:

In order to participate in this research study you must:

- Currently be in outpatient treatment with a psychotherapist
- Between 18-85 years of age with no orthopedic or age related reasons that keep you from exercising.
- Not under the immediate influence of drugs or alcohol
- Be able to read and write in English
- Have the ability to complete all written forms / measurement tools

Ask Your Therapist about Participating Today

Time Requirement Expected: 20 minutes.
You will be asked to fill out 4 questionnaires and a demographic sheet. Your name will not be linked to completed answer sheets.

Location of Study Participation: Your therapist's office

Contact for Further Information:
Stacy Reuille-Dupont, LPC ~ sdupont@axishealthsystem.org ~ 970-335-2214
Axis Health System ~ 281 Sawyer Dr. ~ Durango, CO 81301

Appendix C: Informed Consent

Title: Impact of Psychological Trauma Symptoms on Co-Morbid Physical and Mental Health Problems, Exercise Behavior, and Perceived Benefits and Barriers to Physical Exercise

Investigators: Stacy Reuille-Dupont, LPC

We are asking you to participate in a research study. Please take your time to read the information below and feel free to ask any questions before signing this document.

Purpose: The purpose of this study is to better understand how psychological trauma symptoms impact one's physical health, physical exercise behaviors, and perception of ability to participate in physical activity.

Procedures: Participation in this study will require approximately 20 minutes of your time. You will be asked to complete a series of measurement tools regarding psychological trauma symptoms (Trauma Symptom Checklist - 40), perception of the benefits and barriers to participating in physical exercise (Exercise Benefits/Barriers Scale), your current amount and intensity of exercise participation (Godin Leisure Time Activities Scale), a measurement tool to identify possible co-occurring mental and physical health problems (Patient Health Questionnaire), and a basic demographic form. Your therapist will be asked to provide your current mental health diagnosis and global assessment of functioning score (Daily Life Activities Scale - 20). Your completed measurement tools will be collected by your therapist and held until the investigator collects them. Your completed forms will remain confidential and this form, with your name, won't be attached to the completed data forms. All completed informed consent forms will be separated from the surveys so no identifying information will link you to your answers.

Risks to Participation: Risks of participating in this study are expected to be minimal if any. However, due to asking about trauma symptoms it is possible you may experience distress. Distress is not expected to be any greater than that of participating in outpatient therapy for psychological trauma symptoms. Questions about trauma are within the scope of what is talked about in therapy.

Some examples of questions included on the Trauma Symptom Checklist–40 are:

How often have you experienced each of the following in the last two months:

- Trouble getting along with others
- Sexual problems
- Anxiety attacks
- Feelings of guilt

The Trauma Symptom Checklist-40 will be taken in your therapist's office. In the event that you feel activated (increased fear, anxiety, heart rate, tense muscles, etc) after taking, you

will be able to discuss your experience with your therapist immediately. In the event you have a delayed reaction, you will be provided with a calming strategies handout that outlines simple activities you can do at home or work and includes the number to the local mental health crisis line for extra help calming yourself.

Benefits to Participants: There are no direct benefits to participation.

Although you may not directly benefit from participation in this study, the benefits are expected to impact the psychotherapy community at large, allowing for better interventions to successfully support reaching physical health goals for those suffering from psychological trauma and physical health symptoms.

Alternatives to Participation: Participation in the study is voluntary and you can withdraw at anytime prior to the data analysis phase without penalty or loss of current mental health services.

Confidentiality: This study involves research, which will be conducted by Stacy Reuille-Dupont, LPC, a Clinical Psychology, with a Somatic Concentration PhD student at the Chicago School of Professional Psychology (TCSPP). Any personally identifying information you choose to give will be protected to the limits allowed by law and will be kept in a secure and locked location.

Participation in this study will be kept in strict confidence and no information that identifies participants will be released in any way without separate written approval with the exception of information disclosed that meets criteria outlined by the state for mandated reporters. This includes information regarding danger to self or others, abuse of a child or elder, or information requested through proper legal process according to mental health law. For more information please see: www.colorado.gov/cs/Satellite/CDHS-BehavioralHealth/CBON/1251581456073 for the Colorado Mental Health Statute governing psychotherapy confidentiality laws.

Axis Health System staff recruited to participate in data collection, transport, storage are: therapists, front desk staff, records department employees, and those who deliver confidential interoffice mail. All have been required to sign a confidentiality agreement and abide by HIPPA/AHS confidentiality policies and procedures. All data will be stored in locked confidential files and will be destroyed according to guidelines outlined by the American Psychological Association.

There is no financial compensation for participation in this study.

Stacy Reuille-Dupont and her dissertation committee members (Erica Ellis, PsyD, Marlon Sukal, PhD, and Gina Lasky, PhD) will have access to any data and/or identifying information after the collection period has ended. Data will be held for 5 years, as per The American Psychological Association (APA) guidelines and shredded prior to disposal.

Questions or Concerns: If you have any questions or concerns regarding this project or participation in it please contact Stacy Reuille-Dupont, LPC at: 970-335-2214 or Erica Ellis, PsyD (dissertation chair) at: Core Faculty, Somatic Psychology / The Chicago School of Professional Psychology, 617 West 7th Street, Los Angeles, CA 90017.

If you have questions concerning your rights in this research study you may contact the Institutional Review Board (IRB), which is concerned with the ethical protection of subjects in research projects. You may reach the IRB office Monday-Friday at 312-467-2343 or writing: Institutional Review Board, The Chicago School of Professional Psychology, 325 N. Wells, Chicago, Illinois, 60654.

Consent: The research project and the procedures have been explained to me. I agree to participate in this study. My participation is voluntary and I do not have to sign this form if I do not want to be part of this research project. I will receive a copy of this consent form for my records.

Participant Printed Name: _____

Participant Signature: _____ **Date:** _____

Printed Name of Person Obtaining Consent: _____

Signature of Person Obtaining Consent: _____
Date: _____