The Role of Self-Determination Theory in Physical Activity Interventions for Post-Traumatic Stress Disorder

by

Michelle Carchrae

City University of Seattle

A Capstone Research Project submitted in partial fulfillment

of the requirements for the degree of

Master of Counselling (MC)

March 2021

APPROVED BY:

Dr. Laura Farres, PhD, RCC, ChPC, MPC, Capstone advisor, Master of Counselling Faculty

Dr. Ron Manley, PhD, R. Psych., Faculty reader, Master of Counselling Faculty

Abstract

Standard treatments for trauma are often limited by the aversiveness of addressing traumatic memories in counselling. Physical activity is emerging as an effective adjunct treatment for post-traumatic stress disorder (PTSD) that does not require clients to engage with traumatic memories, however PTSD symptoms themselves can act as a barrier to participation in physical activity. Identifying ways that physical activity interventions for PTSD can be designed to promote motivation to participate can help lower the barriers to exercise that people with PTSD experience. By reviewing the literature on physical activity as a treatment for PTSD, it was found that studies that were oriented around self-determination theory (SDT) had better participation rates and fewer dropouts. By attending to participants' feelings of autonomy, competence and relatedness, interventions based on self-determination theory also help contribute to choice and safety, which are important considerations when designing interventions for people who have experienced trauma. Some gaps in the literature exist around the role of gender in physical activity interventions for PTSD, especially in understanding how gender may interact with self-determination theory or the need for perceived safety in people who have experienced trauma. A physical activity program that incorporates SDT elements is proposed as a way to put these findings into practice.

Keywords: physical activity, exercise, self-determination theory, post-traumatic stress disorder, trauma, motivation

Contents

Chapter 1 - Introduction and Rationale

In order for people to benefit from a mental health intervention or treatment program, they need to be willing to participate in it. This seems self-evident, and yet people dropping out of treatments for mental health challenges such as post-traumatic stress disorder (PTSD) is common. In this chapter, I will begin by describing PTSD and the challenges people face when attempting to seek relief from their PTSD symptoms. Understanding why it is so difficult for people with PTSD to engage in a mental health intervention or treatment program will help inform the research undertaken in this capstone, which focuses on how to better support and motivate people with PTSD to engage in physical activity. In this chapter, I will also provide some background information on my personal position and preconceptions about physical activity and trauma that I hold as I come to this project, and an acknowledgement of the ways they may bias my interpretation of the literature. I also name my theoretical orientations and the lenses I view the research through, and how these too colour my reading of the literature and identification of critical themes throughout. Finally, I will define some key terms and name my hopes for the significance of this work.

Background to the Problem

PTSD is defined by a characteristic cluster of symptoms that arise in response to traumatic experience. These symptoms include flashbacks or reexperiencing, avoidance of anything that reminds the person of the traumatic event, difficulty with sleeping and moderating arousal, among others (American Psychiatric Association, 2013). PTSD symptoms may be severe enough to interfere with a person's ability to engage in their life, and often co-occur with other

diagnoses such depression or substance use (Van Ameringen et al., 2008). Unfortunately, PTSD is relatively common, especially in populations such as combat veterans (Gradus, n.d.) and sexual abuse survivors (Van Ameringen et al., 2008). In Canada, lifetime rates of PTSD are estimated to be 9.2%, with current (1 month) rates estimated to be 2.4% (Van Ameringen et al., 2008).

PTSD symptoms themselves can create barriers to seeking treatment, especially avoidance symptoms. Avoidance symptoms make it particularly difficult for people to move towards experiences that are likely to reactivate their triggers, while difficulty sleeping and moderating arousal makes it challenging to navigate through the world and attend appointments (Zen et al., 2012).

Recommended treatments for PTSD, such as prolonged exposure, which aims to extinguish fear-based responses by exposing people to their traumatic memories and other content that triggers a trauma response, can be extremely unpleasant and even retraumatizing for people with PTSD (Van der Kolk, 2014). On top of the risk of retraumatization, exposure-based treatments may not actually resolve the physiological effects of the trauma despite desensitizing the client to the traumatic stimuli (Van Der Kolk, 2014). Even retelling one's trauma story can be extremely activating and potentially retraumatizing (Briere & Scott, 2015). Lewis et al. (2020) found that dropout rates in standard psychotherapeutic treatments for PTSD were higher for trauma-focused modalities that encouraged the confrontation and integration of traumatic memories. Modalities that were not trauma-focused were more acceptable for clients, but had lower success rates (Lewis et al., 2020).

PTSD symptoms can also be experienced by individuals as a barrier to engaging in other health-promoting behaviours. For example, people with PTSD are less likely to eat a healthy diet or engage in sufficient physical activity compared to healthy people (Zen et al., 2012). Also, when people with PTSD do engage in a physical activity program, the people with the highest

symptom burden are usually the first to drop out even though they can potentially benefit the most from engaging in physical activity (Knappe et al., 2019). Motivating people with PTSD to engage in health-promoting behaviours such as physical activity is important because physical activity can reduce PTSD symptoms and improve quality of life (Rosenbaum et al., 2015b).

Given that common treatments for PTSD are often potentially retraumatizing and many people with PTSD find it challenging to maintain participation in them, developing alternative treatments such as physical activity programs can lower the barriers to participation for this vulnerable population. A key element of an effective physical activity program for people with PTSD is maintaining people's motivation to participate because, as with any treatment, people cannot benefit from it if they do not participate.

Purpose Statement and Rationale

The intention of this capstone project is to understand how to support the motivation of people with PTSD to participate in physical activity interventions. This will be accomplished by reviewing the literature and identifying specific intervention features that support motivation in psychologically healthy ways, so that therapists, exercise physiologists and other professionals using physical activity as a treatment for PTSD can design effective and supportive interventions.

This work will be guided by the following research questions: What helps people with PTSD maintain motivation to participate in a physical activity intervention and how can these motivating factors be implemented effectively? What background knowledge does a clinician or researcher need to know in order to implement these motivating factors and design an effective intervention?

These research questions were chosen for several reasons. First, not all people with PTSD want to engage in regular talk therapy. This may be because they are experiencing avoidance

symptoms or fear the risk of retraumatization, as discussed above. Other potential reasons include the stigma of seeking mental health treatment, not being psychologically minded, not able to feel safe speaking with a therapist, or having a language, cultural or financial barrier. Second, physical activity is emerging as an effective adjunct treatment for many mental illnesses, such as depression (Knapen et al., 2015; Morres et al., 2019), anxiety (Gordon et al., 2017), and other serious mental illnesses such as bipolar disorder and schizophrenia (Vancampfort et al., 2015). Given the somatic perspective of trauma and the body, it makes sense to encourage and support people with PTSD to engage with their bodies in a safe environment (Van Der Kolk, 2014). It seems likely that physical activity could be an opportunity for people to experience safe embodiment and to develop a new relationship with their bodies based on joyful movement and skillful competence.

Given the barriers that people with PTSD and other serious mental illnesses experience in maintaining participation in both mental health treatment (Lewis et al., 2020) and physical activity (Vancampfort et al., 2015), it is important to identify ways to remove those barriers so that more people can access effective treatments. This capstone project is intended for anyone who wants to design or deliver an exercise intervention for PTSD, including clinicians and counsellors as well as researchers.

Personal Position and Preconceptions

Before proceeding further in this exploration, it is important to name my personal position in relation to the topic of physical activity for PTSD. I recognize that my own experiences and beliefs have the potential to bias my interpretation of the findings and influence my focus. Physical activity has been an important part of my life for many years, and has been my most consistent self-care practice across my lifespan so far. I discovered a love of running at age 11

when I joined the cross-country running club at my elementary school and ran laps around the big grass field early in the mornings. I was not very good at it, and always got a stitch in my side, yet there was something about showing up and noticing myself getting better each week that I liked. I also noticed that I felt better after running. In high school, I became a lifeguard and in University I discovered yoga, but running was still my activity of choice all through my teen and young adult years. I ran because running was the only thing I knew of that helped me regulate my emotions and energy levels.

As I grew older, and especially after my children were born, I discovered that running was no longer enough to keep myself regulated. I started learning about non-violent communication and empathy, began going to counselling and working on learning other skills for self-regulation. Around this time, I also had a foot injury and other symptoms of inflammation that prevented me from running. I had to stop running and focus on healing. I took up yoga when my foot healed and started meditating. I embarked on a very intense healing diet protocol. This experience, while difficult, taught me that healing occurred through multiple avenues simultaneously, including body, mind and emotions.

Since giving up running I have switched to doing strength and conditioning training. I have a home gym set up with free weights and taught myself proper lifting form. I have also begun learning some Olympic-style lifts. Especially early in the process, strength training was a surprisingly emotional experience for me. It felt like grief and collapse were stored in my tissues, and something about accessing my strength triggered their release. I was thankful that I was at home where it was acceptable to stop in the middle of a workout to cry, and that I had resources like a counsellor set up for myself, but I did wonder what was going on when these episodes would happen.

Running, swimming, yoga, dance, aerobics classes and using cardio machines all felt like normal exercises for a woman to do, but when I started strength training I noticed myself coming up against internalized cultural narratives about femininity. This was despite the fact that female weightlifting was experiencing a tremendous explosion in growth and interest, which began after 2012 (Huebner et al., 2020). This discomfort brought the issue of gender and physical activity into my awareness and is part of why I interpret studies of physical activity for PTSD through the lens of gender narratives. In my experience, developing my physical strength has helped me access psychological strength as well. I believe that improving access to both physical and psychological strength could benefit many other women, just as improving access to physical and psychological expressiveness and flexibility could benefit many men.

My relationship with trauma is a little bit more complex and difficult to name. I have never had a PTSD diagnosis, lived through significant “big T” traumas, or experienced severe abuse. However, there are trauma histories on both sides of my family tree, and I have had the experience of releasing and processing what seemed to be preverbal and/or intergenerational trauma. I am also interested in working with people who have experienced trauma in my future work as a counsellor.

Theoretical and Conceptual Framework

The main theoretical framework that will be used to analyse the research is the somatic approach to trauma. This approach is an emerging paradigm that focuses on the physiological changes that occur in the nervous system as a result of unresolved trauma. It is different from the mainstream medical model of trauma in several key ways, including defining trauma by the effect it has on a person’s nervous system (Payne et al., 2015), a focus on body sensations during treatment, and the goal of completing a movement that was blocked during the moment of trauma

(Fisher, 2019). This model of trauma uses animal models of traumatic response as a conceptual framework for understanding what happens for people when they face inescapable threat (Levine, 1997). The somatic model of trauma also incorporates research on the different vagal states and how they can be activated by traumatic experiences (Porges, 2011). The details of the somatic perspective on trauma will be discussed in further detail during the literature review.

I also view trauma through the lens of attachment theory and interpersonal neurobiology, acknowledging that for infants and young children, attachment and attunement are life or death needs that shape the developing brain and nervous system (Schore, 2001). From this perspective, attachment-disrupting events, which may seem normal or unremarkable in the lives of children from an adult perspective, may be experienced as traumatic by the child (Luyten & Fonagy, 2015).

I will also address the research through a lens that is informed by structures of power. This includes feminist and gender-informed theory, which acknowledges that male and female bodies tend to experience different types of trauma due to the effects of patriarchy (Herman, 2015). This also includes an awareness of systems of oppression, which acknowledges that entire groups of people will be more likely to experience trauma through racism, wealth inequality, physical size and ability, and age (Hernandez-Wolfe & Mcdowell, 2013). Another aspect of this lens is intersectionality, which is a term that describes how people who experience life at the intersection of two or more positions of disadvantage are uniquely affected by the particular effects of discrimination that occur at the intersection of those positions (Crenshaw & Dobson, 2016).

Finally, I acknowledge that I will also interpret the literature through my personal theoretical orientation and attraction to experiential forms of therapy, including gestalt, emotion-focused and internal family systems. While this may not show up explicitly in the literature

review, my belief that experiencing the here and now in a different way can be transformative does lead me to see exercise as one more way of facilitating clients having a transformative here-and-now experience of the world, their bodies and their PTSD symptoms.

Definition of Terms

Basic Psychological Needs

Basic psychological needs are a component of self-determination theory (SDT). SDT states that people must have their basic psychological needs met in order for intrinsic motivation to emerge or for externally motivated behaviours to become internalized or integrated (Deci & Ryan, 2000). These needs are autonomy, competence and relatedness. Autonomy is defined as the state of having self-directing freedom and the ability to act freely according to one's morals (Merriam-Webster, n.d.). When autonomy is met, people have a sense of being able to freely choose to engage in an activity, and when an activity is engaged in autonomously a person is in a state of autonomous regulation (Rodrigues et al., 2018). Competence is "the ability to do something well" (Cambridge Dictionary, n.d.). Relatedness is the presence of a securely attached relationship in a person's life, which acts as a foundation that allows people to engage in exploratory behaviour (Deci & Ryan, 2000).

Complex Post-Traumatic Stress Disorder

Complex post-traumatic stress disorder (cPTSD) was named by Judith Herman (2015) and refers to the effects of experiencing many traumatic events over time. This type of trauma is differentiated from PTSD due to the cumulative nature of the traumatic events and the absence of a singular traumatic event such as a war injury or a car crash. If cPTSD occurs during childhood, it is called developmental trauma, although this is not yet recognized as an official diagnosis

(Van Der Kolk et al., 2019). Both cPTSD and developmental trauma are often excluded from research on physical activity as a treatment for PTSD.

Exercise

Exercise is defined as "bodily exertion for the sake of developing and maintaining physical fitness" (Merriam-Webster, n.d.) Exercise includes traditional sports and games such as basketball, soccer and tennis, as well as aerobic and strength training. While exercise is a term that is commonly used in both everyday language and in research, it can be problematic due to the fact that the definition hinges on the intention of the person engaging in the activity. This may exclude activities that people engage in for pleasure rather than for fitness, such as dance, gardening, or outdoor exploration, which can provide the same benefits for mental health due to the physical activity involved. In this capstone, the term exercise will be used only when referring to activities specifically engaged in for the purposes of physical fitness, and the term physical activity will be used to refer to musculoskeletal movement in general.

Interoception

Interoception is a person's ability to sense internal body sensations and gain information about the inner state of their body (Payne et al., 2015). This ability is often disrupted in people who have experienced trauma, and learning how to engage in interoception is a common goal of trauma treatment (Van der Kolk, 2014). Interoception is part of the more general sense of a person's embodiment, or the degree to which they inhabit and feel connected with their body (Danielsson & Rosberg, 2015).

Internalized and Integrated Motivation

In SDT, motivation is understood to exist on a continuum between purely extrinsic and purely intrinsic, with degrees of external and internal motivation in between. Internalized motivation occurs when a person begins by being extrinsically motivated to engage in an activity,

and this external force becomes internalized to motivate the person from within (Deci & Ryan, 2000). The person still does not engage in the activity for the sense of pleasure and inner desire that characterizes intrinsic motivation, but the extrinsic force of motivation is no longer present externally. Integrated motivation is when this internalized force has become integrated into a part of the person's own values and belief system (Deci & Ryan, 2000). The person may still not engage in the activity for the pleasure of it, but does so because they value good health or whatever other values they have associated with the activity.

Mindfulness

Mindfulness is a state of nonjudgmental awareness (Kabat-Zinn, 2005). The concept of mindfulness originates in eastern spiritual traditions such as Buddhism and has been integrated into western psychotherapy and counselling through various approaches such as mindfulness-based stress reduction (MBSR) and acceptance and commitment therapy (ACT). Mindfulness is often used as a way of increasing a person's interoceptive ability, emotion regulation and stress tolerance.

Physical Activity

Physical activity is defined as any type of musculoskeletal movement. While this may seem like a definition that is too broad to be useful, there are several benefits to orienting to physical activity rather than exercise. The first is that physical activity reflects more accurately the benefits that can be gained by having a more active lifestyle. Choi et al. (2019) found that even one hour per week of physical activity was associated with improvements in mental health. These improvements occurred as a result of the increase in physical activity, not because people were engaging in that activity in order to improve their physical fitness.

Focusing on physical activity rather than exercise is more inclusive and less subjective and helps to avoid some of the psychological barriers many people have towards fitness-oriented

exercise goals (Teixeira et al., 2012). In addition, the definition of physical activity includes activities engaged in for the purpose of improving fitness, but the definition of exercise does not include activities engaged in for the purpose of being social, having fun or working on a project. For example, a person who plays soccer to get stronger and faster or to lose weight is engaging in exercise, while another person who plays soccer to spend time having fun with their friends is engaging in physical activity. Both people will experience mental and physical benefits as a result of playing soccer, regardless of their intended goals and desires for engaging in that activity.

Self-Determination Theory (SDT)

SDT is a theory of human motivation that focuses on the different ways that people can be motivated and the qualities that are necessary to facilitate the emergence of intrinsic motivation (Deci & Ryan, 2000). SDT is one of the most influential theories of motivation used in exercise and physical activity research.

Significance

For clinicians who work with people experiencing PTSD symptoms, such as counsellors and exercise physiologists, this capstone project will hopefully contribute an evidence-based framework for supporting clients' motivation to engage with a physical activity program as part of their treatment for PTSD. This may occur in a formal group treatment program or as an individual counsellor supporting a person with PTSD. This project will also hopefully support and inform future research and the development of suitable programs for physical activity as a treatment for PTSD, shining a light on the important interpersonal elements that create therapeutic change in these interventions in addition to the physiological elements involved in physical activity.

Developing more effective physical activity interventions for PTSD is significant for clinicians, counsellors and researchers as well as every person out there who struggles with PTSD symptoms. Any way mental health professionals can make treatment more accessible has the potential to help more people who are currently suffering from trauma symptoms. Many of the current assumptions about counselling and trauma treatment is that it is expensive, time consuming and that it always involves talking in an office. Developing effective physical activity interventions for PTSD has the potential to bring bottom-up trauma interventions into the mainstream and offers a potentially more appealing alternative or adjunct treatment to cognitive and exposure-based treatments for trauma.

Conclusion

Effective treatments for PTSD can be difficult for clients to tolerate, and adjunct treatments such as physical activity may open up more avenues for potential healing and relief from symptoms. By outlining the background to the problem of finding effective and tolerable treatments for trauma, and the background I bring in from my personal experience and theoretical orientation, I hope to have named the unique intersection and perspective that I bring to this issue and provided information on the specific context that this research is taking place within. In the next chapter, I will review the literature and begin to identify themes and specific elements in interventions that can begin to answer the question of how physical activity interventions can be designed to support participants' motivation to participate in them.

Chapter 2 - Literature Review

Trauma, physical activity, and motivation are all broad topic areas that contain a great deal of complexity. In this chapter, I will briefly review the literature in each area, focusing on information that is immediately relevant to the role of self-determination theory (SDT) in the use of physical activity as a treatment for PTSD. First, I will examine PTSD, including two different ways of diagnosing and defining trauma, rates of PTSD in Canada and the USA, recommended treatments, the role of gender in trauma and some of the limitations of current treatment approaches for PTSD. Next, I review the difference between physical activity and exercise, discuss the benefits of physical activity and current rates of activity in Canada. I will also examine the individual and systemic barriers to activity that exist for healthy individuals and some of the risks of physical activity. Then I will review the literature on the use of physical activity as a treatment for mental health conditions, including PTSD. The literature shows many promising benefits for people with mental health conditions when they engage in physical activity, in the areas of physical, mental and social health. However, the barriers to physical activity that exist at the individual and systemic levels still exist and are even more pronounced for people who are struggling with severe mental illness.

One of the main barriers that prevents people from engaging in physical activity is motivation, whether or not they are experiencing mental illness. SDT is an effective framework for understanding motivation to participate in a way that facilitates the emergence of greater psychological health at the same time. This health is built up through experiences of autonomy, competence, and relatedness. When these needs are fulfilled or thwarted in a physical activity context, different effects on motivation, participation, and symptom reduction may be seen. Some of these effects include differences in drop-out rates and meaningful changes in perspective that

occurred for study participants. I also discuss some specific ways that studies supported the fulfilment of those needs through variations in study design and implementation.

Lastly, I will discuss the gaps that emerged as I reviewed the literature, including the dominance of the medical model as a theoretical orientation, lack of discussion around the specific needs of trauma survivors, lack of inclusion or identification of participants who may be disabled or had negative past experiences of physical activity, and the interaction of gender with the elements of SDT, physical activity and PTSD.

Post-Traumatic Stress Disorder

Post-traumatic stress disorder (PTSD) arises in some individuals in response to traumatic events. PTSD is characterized by the presence of a cluster of symptoms that includes intrusive symptoms, such as recurrent memories, dreams or flashbacks, and avoidant symptoms, such as efforts to avoid distressing memories or external reminders of the traumatic event. The PTSD symptom cluster also includes negative cognitive and mood states, and changes in arousal and reactivity. For an official DSM-5 diagnosis, these symptoms must be present for more than one month, cause clinically significant distress or impairment in functioning, and not be attributable to the physiological effects of a substance (American Psychiatric Association, 2013).

While the DSM-5 definition of a traumatic event includes the criteria of "exposure to actual or threatened death, serious injury, or sexual violence" (American Psychiatric Association, 2013, p. 171), trauma experts and clinicians such as Peter Levine define trauma in a more nuanced way. Levine, working together with Payne and Crane-Godreau, focused on the effect that the event had on a person's nervous system, with trauma being defined as "an event that causes a long-term dysregulation in the autonomic and core extrapyramidal nervous system" (Payne et al., 2015, p. 5). Defining trauma in this way means that "an event that is very traumatic

to one person may not be traumatic to another" (Payne et al., 2015, p.5) and that clinicians need to look to the functioning of the person's nervous system in order to determine whether they are experiencing the effects of trauma rather than evaluating the seriousness of their injury or lived experience.

Nervous system dysregulation is the source of the characteristic system cluster that defines PTSD. According to Payne et al. (2015), the traumatic stress response first involves the extreme activation of the sympathetic nervous system, and then, if the extreme stress continues, the parasympathetic nervous system. The continued activation of these two systems through the reactivation of traumatic memories produces the intrusive symptoms of PTSD via the hyperarousal of the sympathetic nervous system, and the withdrawing symptoms via the hyperarousal of the parasympathetic nervous system (Fisher, 2019). The hyperarousal of these two systems at the same time is highly stressful on the body, interferes with the ability to be aware of the present moment (Fisher, 2019), and produces the heightened changes in reactivity as well as the negative mood and cognitions characteristic of PTSD.

The difference between defining trauma and PTSD as the presence of dysregulated nervous system functioning and the DSM-5 definition, which relies on a clinician's subjective judgment about what type of event may be traumatic, means that the DSM-5 definition of trauma likely excludes people who experience trauma that occurs at early stages of development and continues over time. Even with this likely under-diagnosis of PTSD and exclusion of cPTSD, rates show that PTSD is widespread, and especially common in certain populations. The actual rates of individuals living with dysregulated nervous system functioning is likely even higher.

Unfortunately, there is little data available on rates of PTSD in Canada. Van Ameringen et al. (2008) gathered data on the prevalence of PTSD in the Canadian general population, finding that "the prevalence rate of lifetime PTSD in Canada was estimated to be 9.2%, with a rate of

current (1-month) PTSD of 2.4%" (p. 171). However, the government of Canada has recognized that PTSD is a significant risk to public health in Canadians and that more data is needed. In June 2018 the Federal Framework on Post-Traumatic Stress Disorder Act was passed, and the Government of Canada held a National Conference on PTSD in April 2019 (Government of Canada, 2020). These changes are intended to improve our knowledge about PTSD in Canada and inform future public health practices to better support Canadian men and women who experience PTSD (Government of Canada, 2020).

Although the Canadian statistics are limited, the United States' National Institute of Mental Health (2017) reports that 3.6% of US adults had PTSD in 2016 and the lifetime prevalence at that time was 6.8%. Women are more than twice as likely than men to develop PTSD, with past year prevalence rates of 5.2% and 1.8% respectively. Among populations of combat veterans, rates of PTSD vary according to the military operation they were deployed in, from around 30% for Vietnam veterans to around 14% for veterans of Operation Enduring Freedom and Operation Iraqui Freedom (Gradus, n.d.).

Not only do rates of PTSD differ for men and women, but there is evidence to suggest that people may be traumatized in gender-specific ways. Judith Herman (2015) recognized that men are more often traumatized by participating in war and women by their subjugation in domestic and sexual life in the context of patriarchy. This subjugation of women results in higher rates of sexual abuse, which likely contributes to women's higher prevalence of PTSD rates overall (Guina et al., 2019). However, men are more likely to suffer traumatic experiences as a result of military service, with men constituting 84% of military personnel in the U.S. (CFR.org Editors, 2020).

Gender interacts with PTSD symptoms in complex ways. First, as noted above, women are more likely to experience sexual trauma, and sexual trauma is associated with more severe

PTSD symptoms than non-sexual trauma in both men and women (Guina et al., 2019). In addition, sexual trauma is more likely to be associated with dissociation at the time of the trauma and with cognitive symptoms such as ruminative thoughts in the PTSD symptom cluster (Shors et al., 2018). However, the relationship between gender, trauma type, and PTSD symptom severity is complex, and is potentially mediated by differences in female versus male biological differences in stress response. This includes more cortisol dysregulation in women (Yehuda, 1999, as cited in Guina et al., 2019), and more hypothalamic-pituitary-adrenal axis activation in women (Ogilvie & Rivier, 1997, as cited in Guina et al., 2019). Guina et al. (2019) write, "Based on our results, both gender and trauma type [sexual vs non-sexual] may influence suicide attempts and other outcomes to varying degrees" (p. 4731). However, Guina et al. (2019) did find that amnesia was significantly greater as a result of sexual trauma for both genders. Gender and trauma type is clearly relevant to the ways that people develop and experience PTSD, although there are no clear gender-specific guidelines for differential diagnosis or treatment based on these criteria.

According to the American Psychological Association (2020), recommended treatments for PTSD currently include cognitive behavioural therapy (CBT), cognitive processing therapy (CPT), cognitive therapy (CT) and exposure therapy (ET). These treatments reflect the dominance of the medical model and DSM-5 diagnosis criteria in current professional psychological approaches. Four additional treatments are also given conditional recommendations, including brief eclectic psychotherapy, eye movement desensitization and reprogramming (EMDR), narrative exposure therapy (NET) and certain medications (American Psychological Association, 2020). With the exception of EMDR and medications, which are somewhat body-based or physiological, these treatments all focus on either cognitive processes, exposure, creating a coherent narrative, or working with the therapeutic relationship. Canadian

clinical practice guidelines are similar, with prolonged exposure, CBT, dialectical behaviour therapy (DBT) and EMDR recommended as psychological treatments, and various types of antidepressants recommended as pharmacological treatments (Katzman et al., 2014).

Other approaches to trauma treatment include the body explicitly, such as sensorimotor psychotherapy (SP) (Ogden & Minton, 2000) or somatic experiencing (SE) (Payne et al., 2015), and reflect a significant paradigm shift in the treatment of trauma. These approaches are informed by the definition of trauma as persistent nervous system dysregulation, and work with the manifestations of that dysregulation as they occur in the felt experience of body gestures and sensation in the present moment during a session. This includes attending to body sensations as well as changes in arousal, gesture and posture. In addition, sensorimotor psychotherapy also attends to thoughts and beliefs, believing that "the integration of all three levels of processing--sensorimotor, emotional and cognitive -- is essential for recovery to occur" (Ogden & Minton, 2000, p. 150). When the therapist is able to help the client learn how to regulate their nervous system arousal and distinguish between thoughts, feelings, and beliefs that are linked to traumatic memory and those that are not, the client is better equipped to navigate and heal the symptoms of PTSD.

However, trauma treatments in both the medical and somatic models are limited by the aversiveness of the traumatic memories themselves and the difficulty in accessing the somatic source of nervous system dysregulation. In the medical model, prolonged exposure treatments can create high levels of anxiety in clients (Gaston, 2015), and for some clients, even the clinical setting itself can be a trauma trigger. This is especially true for indigenous clients who have been traumatized by their contact with healthcare or mental health professionals (Native Youth Sexual Health, 2016). In the somatic model, clients may have difficulty becoming aware of their internal body sensations or developing the ability to be mindfully aware of both somatic sensations and

awareness of where they are in the present moment, both of which are skills that are required for somatic trauma treatment approaches (Fisher, 2019). Alternative approaches to working with PTSD symptoms could benefit the people in this population who struggle with standard approaches to trauma treatment.

Exercise and Physical Activity

Exercise is defined as "bodily exertion for the sake of developing and maintaining physical fitness" (Merriam-Webster, n.d.). Exercise includes activities such as aerobics classes, using gym equipment, participating in sports, and many other activities. Physical activity is understood as any type of musculoskeletal movement, whether engaged in for the purpose of physical fitness or not (Choi et al., 2019). Physical activity includes any type of bodily movement, such as walking, doing housework or gardening, carrying groceries or playing tag, as well as activities traditionally seen as exercise. While physical activity is fairly objective and may vary in intensity, duration, and the number of muscles that are being engaged, exercise is more subjective and involves one's intention or goals for the movement.

Throughout this capstone, the term physical activity will be primarily used, reflecting Choi et al.'s (2019) findings that any kind of movement has benefits for mental health, and the fact that physical activity includes exercise, but the definition of exercise does not include physical activity. The choice to focus on physical activity rather than exercise also intentionally includes activities that may be inherently pleasurable but not always viewed as exercise, such as going dancing, which would otherwise be excluded when using only exercise as inclusion criteria (Teixeira et al., 2012). However, the literature predominantly uses the term exercise, reflecting social norms around engaging in movement primarily for fitness, and this term may be used when the specific definition of exercise is intended.

Also in line with social norms about physical activity for the purpose of fitness, most research focuses on exercise activities such as aerobic activity (Shors et al., 2018), resistance training (Ley et al., 2018; Nilsson et al., 2019), sports (Massey & Williams, 2020), dance (Bernstein, 2019; B. Levine & Land, 2016) and yoga (Mitchell et al., 2014; Van Der Kolk et al., 2014). Physical activity has been shown to provide many physical and mental benefits. Physical benefits include improved cardiovascular and muscular strength, metabolic health and the maintenance of a healthy body weight, better sleep quality, and indicators of overall health and longevity such as grip strength (Knappe et al., 2019; Oppizzi & Umberger, 2018). Physical activity also influences hormones and neurotransmitters such as dopamine and the endocannabinoid system (eCB) (Crombie et al., 2018). Psychological benefits of physical activity include stress reduction (Firth et al., 2016), present moment focus, and enjoyment and play if the activity is pleasurable to the participant (Ley et al., 2018). Benefits also include the development of mental strength if the activity is challenging, and a sense of belonging when a person is engaging in a physical activity with others (Caddick et al., 2015; Ley et al., 2018; Nilsson et al., 2019). People often experience both physical and mental health benefits when engaging in regular physical activity, including people with significant mental health challenges such as depression (Knapen et al., 2015).

Exercise is often recommended as an important part of a healthy lifestyle. Public health guidelines in Canada recommend that adults engage in 150 min of moderate to vigorous activity per week in bouts of 10 minutes or more (Canadian Society for Exercise Physiology, 2017a). The guidelines for children and youth are even more, at 60 minutes per day (Canadian Society for Exercise Physiology, 2017b). Unfortunately, very few people are actually meeting these guidelines. According to Statistics Canada, only 16.4% of adults were meeting physical activity guidelines in 2017, and only 39.2% of children met the guidelines (Statistics Canada, 2019).

Clearly, simply setting expectations and guidelines based on public health information is not enough to change people's behaviour and motivate an increase in movement or exercise.

If people know that exercise and physical activity are good for them, why do so many people remain sedentary? This is a complex question, but part of the answer involves recognizing the barriers that make it difficult for people to engage in sufficient physical activity. Barriers such as fat-phobia and body-shaming can discourage people from going to fitness centres if they have larger bodies (Hawryliw, 2017). Shame and perfectionism can also discourage people from participating in exercise or physical activity, especially in settings where they may feel judged on their performance or they are likely to judge themselves (Rogers & Ebbeck, 2016).

In studies of barriers to exercise in populations of people with depression and other serious mental health challenges, researchers found that people hold a wide variety of beliefs about the barriers they experience as preventing them from exercising. These include not having social support, not knowing how to exercise properly, not having enough time, experiencing transportation difficulties, being too tired and feeling unsafe or self-conscious (Firth et al., 2016; Glowacki et al., 2017). These barriers often exist for people in the general population as well. These beliefs about exercise and fitness may not exist in the same way when people think about engaging in physical activity because it does not have the same connection to the harmful attitudes found in popular exercise and diet culture.

Some barriers also exist at the cultural and systemic levels, such as capitalism informing cultural expectations that individuals should work 40+ hours per week and be constantly busy improving themselves and their lives. Sedentariness may be an attempt to engage in an act of resistance to the busyness of capitalism and its effects on our lives (Bell, 2011). Even if people do want to engage in physical activity, there is not much time available to do so when adults are working 40+ hours each week and students are busy all day with school, extra-curricular

activities and homework. Even though workplaces are beginning to recognize the importance of movement throughout the day, and some are working to reduce sedentary behaviour in the workplace (Olsen et al., 2018), in Canada we still live in an overwhelmingly sedentary and highly scheduled culture. Exercise and physical activity for leisure are often only available to those who can afford both the time and money involved in accessing it, which affects both the general population and those who are experiencing mental illness (Grzywacz & Marks, 2001).

Since physical activity is something that almost everyone knows they should be doing, even if they are not, it can be easy to forget about potential risks or side effects. However, there are some risks associated with beginning an exercise program or dramatically increasing the amount or intensity of physical activity, such as an increased risk of heart attacks and potential injury (Kim et al., 2012). These risks can be reduced significantly by working with an exercise physiologist or physical trainer who is able to design an appropriate movement program that takes into account an individual's baseline level of fitness. There are also some psychological risk factors, such as shame and perfectionism, which can contribute to negative experiences of exercise (Rogers & Ebbeck, 2016) or drive people to exercise excessively, especially when present alongside disordered eating (Kolnes, 2016).

Overall, when the risks of exercise and physical activity are compared to the risks and side effects of common pharmacological treatments for mental health disorders such as depression (Cipriani et al., 2018), it is clear that the risks of exercise are minimal. This makes exercise an appealing treatment or adjunct treatment for mental health disorders. Most people can safely incorporate exercise into their lives, including people experiencing significant mental and physical health challenges, and the benefits of doing so far outweigh the potential risks.

Physical Activity as a Treatment for Post-Traumatic Stress Disorder

Physical activity has been demonstrated to be effective in improving symptoms of a wide variety of mental health concerns, including PTSD. Physical activity influences many body systems and mental processes, and although it is unclear exactly how activity improves mental health, it is clear that it does provide benefit. However, there are specific barriers to engaging in exercise and physical activity that exist for people with mental health challenges including PTSD.

Research on the use of physical activity in the treatment of depression is fairly well established, showing that it is effective for low-moderate levels of depression (Knapen et al., 2015; Morres et al., 2019), and is comparable to the effect of both psychotherapy and antidepressant medications for depressive symptoms (Farris et al., 2019). Even a critical review of the literature on physical activity for depression showed that its effectiveness is likely under-represented in studies due to methodological issues (Schuch et al., 2017). Other studies have shown that physical activity is beneficial for anxiety (Gordon et al., 2017), bipolar disorder and schizophrenia (Vancampfort et al., 2015), Parkinson's disease (Oliveira de Carvalho et al., 2018), and stress reduction (Goldstein et al., 2020).

Given the benefits of physical activity for such a wide range of mental illnesses, it was likely that it would also be found to be beneficial for symptoms of PTSD. The specific symptom clusters of PTSD, such as avoidance and re-experiencing, mean that people with PTSD may be more likely to avoid physical activity due to its physiological activation, especially because uncontrollable high sympathetic nervous system activation followed by high parasympathetic nervous system activation is characteristic of a traumatic experience (Payne et al., 2015). However, this also means that re-engaging with physical activity in a supported environment may help people with PTSD learn to regain control of their physiological responses.

Some research focuses on identifying mechanisms of action that potentially mediate the ways that physical activity is therapeutic for PTSD (Crombie et al., 2018; Oppizzi & Umberger, 2018; Shors et al., 2018). Understanding these mechanisms more fully can help researchers pinpoint the specific elements of physical activity that are creating a therapeutic effect. While identifying mechanisms of action is beyond the scope of this capstone, some of the research included in this review does identify a few initial findings of interest related to physiological and psychological mechanisms of action. These include the identification of interoceptive exposure, emotional regulation, and increased brain-derived neurotrophic factor (BDNF) production as some possible mechanisms of action (Oppizzi & Umberger, 2019), along with increased endo-cannabinoid (eCB) production (Crombie et al., 2018), and extinction/exposure learning (Shors et al., 2018).

The literature on physical activity as a treatment for PTSD includes a fairly wide array of types of activity, including sports and games (Knappe et al., 2019; Ley et al., 2018; Massey & Williams, 2020), surfing (Caddick et al., 2015; Rogers et al., 2014), aerobics and resistance training (Crombie et al., 2018; Mehling et al., 2017; Pebole & Hall, 2019; Rosenbaum et al., 2015a; Shors et al., 2018), dance (Bernstein, 2019; B. Levine & Land, 2016) and yoga (Mitchell et al., 2014). Many of the studies reviewed invited participants to come together and engage in the same physical activity at the same time and place (Bernstein, 2019; Rogers et al., 2014; Caddick et al., 2015; Knappe et al., 2019; Ley et al., 2018; Mehling et al., 2017; Mitchell et al., 2014; Nilsson et al., 2019; Shors et al., 2018). One study had participants engage in individualised activity plans while present in the same place together (Pebole & Hall, 2019). A few studies did not specify whether physical activity or exercise occurred in the presence of a group or not (Crombie et al., 2018; Rosenbaum et al., 2015a).

Efficacy and Benefits

Even if it is not yet known exactly how physical activity works in the body and mind to help people with PTSD, it is still possible to identify the specific benefits that physical activity provides for this population. Across the various studies reviewed, physical activity has been shown to have positive effects on reducing PTSD symptom severity and improving participants' subjective quality of life (Bernstein, 2019; Caddick et al., 2015; Crombie et al., 2018; Knappe et al., 2019; Levine & Land, 2016; Ley et al., 2018; Massey & Williams, 2020; Mehling et al., 2017; Mitchell et al., 2014; Nilsson et al., 2019; Oppizzi & Umberger, 2018; Pebole & Hall, 2019; Rogers et al., 2014; Rosenbaum et al., 2015a; Rosenbaum et al., 2015b; Shors et al., 2018). While individual studies are often limited in statistical power due to small sample sizes, a meta-analysis by Rosenbaum et al. (2015b) evaluated four randomized controlled trials of physical activity for PTSD and found that physical activity is effective as a treatment. This was a landmark study in the field because it was the first meta-analysis of randomized controlled trials of physical activity for PTSD. Further evidence was found in later studies that focused on improvements in participants' physical health, mental health, and their social/emotional/subjective health when using physical activity as a treatment for PTSD.

Some of the indicators of improvements in physical health in studies of physical activity for PTSD included improved sleep quality and grip strength (Knappe et al., 2019; Oppizzi & Umberger, 2018), body composition and weight loss (Rosenbaum et al., 2015a), and increases in mobility and overall strength (Rosenbaum et al., 2015a). Participants also noted improvements in coordination and skilful task performance (Ley et al., 2018), feeling better able to control one's own body, and simply feeling stronger and healthier overall (Nilsson et al., 2019). Improvements in physical health may open the door to further improvements in other areas of participants' lives.

One participant in Nilsson et al.'s (2019) study explains, "when you feel better, physically, it is also much easier to get over some of the psychological issues" (p. 6).

Mental health indicators include decreases in PTSD symptoms (Knappe et al., 2019; Mitchell et al., 2014; Rogers et al., 2014; Rosenbaum et al., 2015a), decreases in depression symptoms (Knappe et al., 2019; Rogers et al., 2014; Rosenbaum et al., 2015a), reduction in anxiety sensitivity (Fetzner & Asmundson, 2015), and reduction in specific types of cognitive symptoms such as rumination (Shors et al., 2018). Other mental and cognitive benefits include improved attentional focus and interoceptive ability (Ley et al., 2018), learning about the effects of trauma (Nilsson et al., 2019), and having something to look forward to each week (Caddick et al., 2015). For many participants, physical activity was something they looked forward to, and this in itself can be used as a self-regulation tool in trauma work (Ogden & Fisher, 2015). A participant in Caddick et al.'s (2015) study describes it this way: "Even the thought of surfing can get you below that fight/flight line where you kind of go, 'Umm, actually yeah, what else do I like doing? Going for walks. Right, come on, go for a walk'" (p. 81).

Indicators of social, emotional and subjective health include the experience of respite and being in the present moment even temporarily (Caddick et al., 2015; Ley et al., 2018; Nilsson et al., 2019), measures of subjective and psychological well-being (Caddick et al., 2015), feelings of motivation, restoration, distraction and exposure (Ley et al., 2018), and improvements in non-reactivity and self-regulation (Mehling et al., 2017). Nilsson et al. (2019) noted:

> Some participants even highlighted their social experiences as the overall most important benefit of their treatment participation, e.g., feeling changed in one's social abilities, being able to trust in others, or to have found new friends and relationships within the treatment groups (p. 8).

These physical, mental, and emotional/social benefits were often observed to be interrelated with each other in complex ways. For example, "narratives about [a participant's] positive affective states were often linked to mastery experiences and accomplishments, positive group experiences (e.g., feedback from others, a sense of belonging), and an attentional focus on playing" (Ley et al., 2018, p. 498). These complex interrelationships appear to function together to create a rich, transformative experience that has therapeutic benefits for people in multiple areas of life simultaneously.

Barriers

Similar to the general population, the benefits of physical activity for people with PTSD are often the least accessible to the people who need them the most. Research shows that people with PTSD are less likely than healthy controls to engage in health-promoting behaviours, such as physical activity, and more likely to experience cardiovascular disease, to be smokers, and to not adhere to medication prescriptions (Zen et al., 2012). There are likely several factors that contribute to this effect, including an aversion to body awareness in women who have experienced sexual trauma (Smith-Marek et al., 2018), comorbid depression (Harada et al., 2013), and the psychological and physiological symptoms of PTSD themselves. Symptoms such as dissociation and avoidance may cause people to delay accessing needed medical care or attending to health-promoting behaviours, and prolonged sympathetic nervous system arousal and the disruption of the hypothalamic pituitary axis can create harmful conditions for many body systems, including the cardiovascular system (Zen et al., 2012).

Finding ways to help people with PTSD overcome the barriers to physical activity that they experience may be an important part of contributing to their willingness to be alive in the world. DeBeer et al. (2016) found that veterans with PTSD who participated in health promoting

behaviours such as exercise and healthy nutrition saw a reduction in their rates of suicidal ideation and suicide completion. Given the many barriers to exercise that people experience on both a societal level and as a result of PTSD symptoms, it is important to understand how to effectively help people be motivated to participate in physical activity.

Motivation and Physical Activity

Motivation can be defined as the desire to act in service of a goal (Psychology Today, n.d.), and the strength of that desire may vary depending on several factors. When people are motivated to engage in activities for the pleasure and internal rewards of doing so, this is called intrinsic motivation. Motivation that occurs as a result of being rewarded for meeting externally imposed goals is known as extrinsic motivation (Deci & Ryan, 2000). Intrinsically motivated goals tend to have stronger motivation associated with them, and the presence of extrinsic rewards may actually decrease people's intrinsic motivation to participate in the activity, especially if the reward is the primary reason for participating (Deci & Ryan, 2000; Kohn, 2018).

However, according to self-determination theory (SDT), intrinsic and extrinsic motivation are better understood as opposite ends of a continuum, with four types of motivation existing between purely intrinsic or purely extrinsic motivation (Deci & Ryan, 2000). Varying states of motivation along this continuum may also co-exist with other states, so both intrinsic and extrinsic motivation may play a part in someone's overall motivation to engage in a particular activity. These states in the middle of the continuum play a role in the adoption of new behaviours (Deci & Ryan, 2000).

Deci and Ryan (2000) found that the basic psychological needs of autonomy, competence and relatedness are necessary conditions for the emergence of intrinsic motivation. Intrinsic motivation may develop through a process of internalizing or integrating extrinsic goals into

intrinsic ones (Deci & Ryan, 2000). This means that when autonomy, competence, and relatedness are present, people can begin to internalize and integrate goals that started out as extrinsically motivated. This process happens in contexts such as parenting, education, and counselling as well as in coaching, physical activity, and exercise (Deci & Ryan, 2008). In order for this internalization process to occur, people need to feel able to engage in the activity, have a sense of ownership over their choice to engage, and have a secure relationship with others regardless of their performance. The absence of any of these three basic psychological needs of autonomy, competence, or relatedness can lead to feelings of alienation and lack of motivation (Deci & Ryan, 2000).

Autonomy, competence, and relatedness are the foundation of SDT, one of the primary theories supporting the development of motivation in physical activity (Teixeira et al., 2012). Each of these three basic psychological needs shows up in particular ways in an SDT-informed exercise program or intervention, and each of these needs are connected to conditions that are created when participants engage in the activity. If these conditions meet people's basic psychological needs for autonomy, competence, and relatedness, motivation may emerge naturally.

Autonomy

Autonomy is defined as the state of having self-directing freedom and the ability to act freely according to one's morals (Merriam-Webster, n.d.). A person with autonomy knows they have the right to choose for themselves what they want to do and whether they believe something is right or wrong. Autonomy, in general motivation and exercise, is reflected in the presence of autonomous motivation, in which a person is engaging of their own volition and their

participation is based on their own desire rather than a feeling of obligation (Teixeira et al., 2012).

Autonomous motivation is associated with an internal locus of causality and has been found to be correlated with higher rates of exercise engagement (Teixeira et al., 2012). Autonomous motivation includes intrinsic motivation, but also includes internalized and integrated forms of behavioural regulation, which motivate behaviour based on personal values rather than the pure enjoyment of the activity (Teixeira et al., 2012). In an exercise context, integrated motivation may look like exercising because one values physical or mental health, even if the exercise itself is not always enjoyable in the moment.

Studies of SDT and exercise found that autonomy is strongly associated with autonomous regulation, a type of self-directed external motivation that exists in the continuum between intrinsic and extrinsic motivation (Rodrigues et al., 2018; Teixeira et al., 2012). Rodrigues et al. (2018) also report that "autonomy satisfaction is a strong predictor of exercise intention" and that "individuals who perceive freedom of choice are more prone to maintain a long-term exercise practice" (p. 11). It is clear that meeting the need for autonomy in physical activity is key to developing and maintaining motivation to participate.

Competence

Competence is "the ability to do something well" and this can be an especially important element of SDT in physical activity (Cambridge Dictionary, n.d.). Facilitating people's need for competence helps them become motivated to develop their skills and take on new challenges. However, actual competence may differ from people's perceived competence. Low perceived competence can contribute to amotivation for exercise, especially when people are more motivated to engage in other activities (Teixeira et al., 2012). Low perceived competence may

overlap with low competence in people who are not in a regular habit of engaging in physical activity or who have physical limitations due to age, injury, or disability. When actual and perceived competence are low, people may be extremely reluctant to try increasing their activity or engaging in specific exercises due to the belief they will not be able to do it well (Teixeira et al., 2012).

Supporting an experience of competence in a physical activity intervention involves careful design of exercises that are appropriate for each individual's unique needs and abilities (Pebole & Hall, 2019). Tracking participants' changes in their level of perceived competence can also increase their likelihood of integrating exercise in their regular behaviour (Teixeira et al., 2012). Changes in actual competence can also contribute to exercise adherence, as "individuals who acquire new skills or improve existing ones tend to have greater predisposition to maintain exercise frequency" (Klain et al., 2015, as cited in Rodrigues et al., 2018, p. 11).

Relatedness

The final element of SDT, relatedness, is closely linked with attachment (Deci & Ryan, 2000). Relatedness in this context does not necessarily mean that people must have attachment figures present while engaging in their intrinsically motivated activity; rather the presence of a securely attached relationship in a person's life acts as a foundation that allows people to engage in exploratory behaviour (Deci & Ryan, 2000). However, other studies of SDT elements in exercise do consider relatedness as incorporating social connection that occurs during the exercise intervention itself (Teixeira et al., 2012).

Relatedness may be an especially important element in the emergence of intrinsic motivation. Baumeister and Leary (1995) describe the need to belong as the most important element in human motivation. In Baumeister and Leary's (1995) perspective, the need for

belonging is a fundamental motivator that drives behaviour and results in pathology when the need is unmet. This can be seen in attachment behaviour between infants and mothers, which is some of the very earliest goal-oriented behaviour in which humans engage (Beebe et al., 2016; Tronick, 1989). The importance of secure attachment can also be seen in the consequences of insecure attachment in children and adults, both at the individual level and in terms of cost to public healthcare (Bachmann et al., 2019; Read et al., 2018).

In the context of exercise, relatedness may be supported by the quality of the interpersonal interactions between the facilitators and participants, and between participants themselves. This includes elements such as empathic attunement and unconditional positive regard between facilitators and participants (Teixeira et al., 2012). When physical activity is performed as a group, people's sense of belonging and acceptance in the group can be a powerful support for the experience of relatedness, which helps motivate people to return and continue to engage in the activity (Nilsson et al., 2019).

In the literature on SDT and motivation to engage in physical activity or exercise, relatedness is often found to have fewer associations with exercise outcomes than autonomy or competence (Rodrigues et al., 2018). This may be true in populations of healthy participants, on which most SDT and exercise studies focus. If healthy people have strong attachment relationships outside of the intervention, their need for relatedness is already being met. However, for people with histories of traumatic experience, their relationships outside the intervention may be not meeting their needs for relatedness. In this case, relatedness may be a key element of SDT that facilitates motivation for people with PTSD to continue participating in a physical activity intervention.

The Transtheoretical Model of Change

While SDT is a popular theory of motivation in physical activity and other areas of life, another influential theory of motivation is the stages of change model, also known as the transtheoretical model (TTM) of change. The TTM model states that people may present for therapy or engage in behaviours from several different mindsets that characterize the various stages of change (Connors et al., 2013). These stages move from precontemplation through to contemplation, preparation, action, and maintenance. If people relapse or move out of motivation to engage in a certain behaviour, they may cycle back to an earlier stage and begin the process again (Connors et al., 2013).

The TTM is popular with clinicians who work with people who engage in substance use or other addictions, although it can be applied to any change. One of the strengths of this model is the way it acknowledges that the impetus for change needs to come from inside the person, and that people go through a process to become ready for change. It also allows for interventions to be tailored to the specific mindset that a person is in, according to their current stage of change, and provides a theoretical framework for understanding the process of relapse and re-engagement with change (Connors et al., 2013). The TTM also acknowledges the presence of ambivalence, which is common in people with PTSD, and which can affect motivation to engage and continue in treatment (Rooney et al., 2005).

Mehrtash and Ince (2018) studied the intersection of SDT and the TTM of change in a population of healthy women participating in a health-promotion program in their workplace. They found that “participants in the maintenance stage had significantly higher mean scores for basic psychological needs than those in the preparation stage” and that increases in autonomous motivation had the effect of advancing the stage of change that participants were in (Mehrtash &

Ince, 2018, p. 49). Similarly, the more advanced the stage of change, the more autonomous motivation a participant had. These findings reinforce the importance of using an SDT-informed program design, as it is likely to both increase participants' autonomous motivation and fulfilment of their basic psychological needs and also advance their stage of change in the TTM.

When evaluating the TTM for applicability in physical activity interventions for PTSD, it appears that even though it accounts for ambivalence, the TTM does not accurately represent motivation to change in people with PTSD (Rooney et al., 2005). According to Rooney et al. (2005), the reasons for this are unclear, but may relate to differences in the role of motivation in maintaining problematic behaviours in substance use compared to the origin of problematic behaviours and symptoms in PTSD. On the other hand, Bezyak et al. (2011) found that the five TTM predictors, "processes of change (cognitive and behavioral), self-efficacy, and decisional balance (pros and cons)" did accurately correlate with and predict physical activity in people with severe mental illness (p. 187), indicating that the TTM may still have some usefulness in thinking about motivation for people with PTSD. Even though the TTM may not fully represent the unique motivational needs of people with PTSD, it can be a useful framework for thinking about people's readiness for change, and it appears to overlap in constructive ways with SDT and the basic psychological needs.

Self-Determination Theory and Physical Activity Interventions for PTSD

As described above, when the basic psychological needs of autonomy, competence and relatedness are met, people are more likely to begin and continue with a physical activity program. These needs are present for both healthy individuals and those who have PTSD, although people with PTSD may be less likely to have these needs met in other areas of their lives. Rosenbaum et al. (2015b) highlighted the importance of SDT in PTSD studies by stating,

"clinicians should consider utilising motivational techniques such as those contained with the self-determination theory (SDT) which appear to be influential in promoting physical activity among other mental health populations" (p. 135).

Physical activity interventions for PTSD that incorporated SDT-informed elements (Bernstein, 2019; Ley et al., 2018; Pebole & Hall, 2019) often had lower participant dropout rates than other interventions. For example, Pebole and Hall (2019) included SDT-informed elements in their Warrior Wellness program and found that participant engagement was high, with an 84% attendance rate and an 88% completion rate. This means that only 12% of participants did not complete the program. These rates can be compared to an intervention such as Rosenbaum et al.'s (2015a), which had a 56% attendance rate and a 46% completion rate. Although there were limitations to Rosenbaum et al.'s (2015a) study which contributed to the low completion rate, the findings do support the hypothesis that studies that do not include many SDT-informed features may have lower rates of engagement.

However, low rates of engagement are considered normal in studies of physical activity interventions for PTSD, with an average drop-out rate of 18% (Imel et al., 2013, as cited in Rosenbaum et al., 2015b). Given the fact that high drop-out rates are common for treatments of PTSD, it becomes even more important to maximise motivation to engage with the intervention.

The importance of self-determination theory in supporting participants' motivation to engage in a physical activity intervention may be especially pertinent given the nature of trauma. Trauma, by definition, is something overwhelming, uncontrollable and unavoidable that happens to an individual, and often involves the betrayal of a relationship (Courtois, 2013). The process of healing from trauma, especially trauma that happened in the context of an interpersonal relationship, involves restoring choice, the ability to navigate through life's challenges, and a safe attachment relationship, in addition to regaining a sense of awareness and connection with the

body (Van Der Kolk, 2014). These key elements are the same as the key elements of autonomy, competence, and relatedness that are present in SDT (Deci & Ryan, 2000). It may be the case that people who have experienced trauma are attempting to regain their sense of choice and competence when dropping out of programs that do not honour their needs.

The literature on physical activity interventions for PTSD that are informed by SDT has many moving examples of the effect of SDT elements on participants. Caddick et al. (2015) wrote about how "surfing gave the veterans something concrete to look forward to" (p. 81). Ley et al. (2018) wrote about how "even after participation in the program, Rashid continued to exercise autonomously" despite chronic shin pain related to his traumatic history (p. 500). Comments like these from relevant qualitative studies demonstrate the meaningful change that is possible for participants who experienced joy and respite during the intervention itself, and who integrated the intervention into their own internally-motivated belief system. This internalization allowed the participants to carry it forward with them as a resource for their future life, and highlights that a shift from extrinsic to integrated motivation has occurred.

Examining each basic psychological need highlights a different aspect of the relationship between physical activity and the effects of PTSD. It also becomes possible to see the role of motivation in navigating a physical activity program and PTSD symptoms. The following sections will closely examine each basic psychological need, focusing on the ways the fulfilment of these needs were supported by the design and implementation of the physical activity intervention for PTSD. These sections will also discuss the effect that SDT-informed program design and implementation had on participants' experiences and the overall results of the study.

Autonomy

When autonomy is present in the context of an intervention or treatment for PTSD, participants will be able to engage in choice during the intervention. Autonomy is often supported in an exercise setting through the language used, specifically language that is client-focused, supportive of their choices and avoids pressuring the client (Teixeira et al., 2012). However, it is not only language that provides opportunities for the need for autonomy to be fulfilled; the opportunities available to participants in an intervention also contribute to a sense of autonomy.

SDT-informed interventions facilitated the fulfilment of autonomy by designing interventions so that participants have choice and control over the type of activities they engage in and the duration and intensity at which they engage (Ley et al., 2018; Nilsson et al., 2019; Pebole & Hall, 2019). These included tailoring physical activity programs to match participants' individual goals and desires, as well as inviting them to modify the movements they performed according to their body's abilities as they changed from day to day. Other studies focused on using invitational language (Mitchell et al., 2014), one of the hallmarks of trauma-informed yoga.

In addition to the autonomy-supportive stance of the researchers and facilitators, physical activity itself may also contribute to the development of a broader sense of autonomy for PTSD survivors. Physical activity interventions for PTSD may provide participants the opportunity to reclaim their body and, by extension, their bodily autonomy. Traumatic experiences, especially when the person dissociated during the trauma, often result in a decreased sense of embodiment and connection with one's body (Van Der Kolk, 2014). However, movement that occurs within a context of free choice and while directing attention to the bodily felt sense can help trauma survivors reclaim their embodiment and increase their sense of autonomy over their own body (Ogden & Fisher, 2015). This type of embodiment practice is often found in dance (Bernstein,

2019) and yoga (Mitchell et al., 2014), although some studies explicitly included interoceptive exercises in the context of aerobic and resistance training (Mehling et al., 2017; Shors et al., 2018).

One of the challenges of facilitating autonomy in a research setting is the tension between maintaining the autonomy of the participant and their right to choose how and when to participate and the needs or desires of the researcher to complete the study. This is especially relevant in quantitative studies where the researchers need participants to engage in specific assessments, exercises and activities in order to gather data. Different studies approached this tension in varying ways, guided by their theoretical orientation and integration of SDT concepts. Some studies focused on gathering qualitative data rather than quantitative (Caddick et al., 2015), while others gave participants the freedom to modify their movements as needed and asked them to record the movements performed so that the researchers could study the data related to the activities they actually performed (Pebole & Hall, 2019). This is in contrast to other studies which asked participants to engage in a certain level of exercise intensity or duration in order to test a specific hypothesis (Crombie et al., 2018). These types of studies may contribute more robust knowledge about the mechanisms of action behind the effectiveness of physical activity for PTSD, but may come at the cost of frustrating participants' need for autonomy.

Competence

Collaboratively designing a physical activity program is also an opportunity for participants to experience competence. Pebole and Hall (2019) worked with older adult veterans and engaged them in the process of creating an individualised physical activity program. Through collaborative interviews with an exercise physiologist, participants explored their expectations for themselves, and the reasons why they thought they might not attend sessions, along with setting

some SMART goals. From this interview, the exercise physiologist created individualized plans for each participant. When the participants arrived for each session, they received their plan for that day, however, they knew they had the flexibility to adjust the activities each day according to their changing abilities, and they wrote down what they actually did. This arrangement gave participants a sense of competence when they were able to achieve attainable goals, while also meeting the researchers' needs for quantitative data that reflected the actual physical activities performed by the participants.

Nilsson et al. (2019) recognized the importance of language as contributing to participants' sense of competence. They conducted their activity groups and focus group discussions in the refugees' native language of Arabic, and used translators to translate back into Swedish for the researchers and facilitators to understand. Their rationale for running groups in Arabic was to maximise participants' comfort and competence while participating in the groups. Ley et al. (2018) also recognized that language was a barrier for the participant in their case study, and they accommodated this by utilizing observers to note participant facial expressions and other outward physical expressions of emotion as qualitative data. Ley et al. (2018) also engaged in reflective processes throughout the research to watch for personal bias in the observers, which acts as a measure to increase confidence in the results. Very similar findings were also replicated in other qualitative studies (Caddick et al., 2015; Nilsson et al. 2019), indicating that the strategies of observation and reflection were accurate means of gathering and ensuring the quality of the data while prioritising participant needs for competence.

Psychoeducation, or helping participants understand what happens during a trauma and how trauma treatment works, also contributes to participants' sense of competence. Cognitive elements such as psychoeducation have been included in some physical activity for PTSD interventions with success (Nilsson et al., 2019; Rogers et al., 2014). In addition to cognitive

psychoeducation on the nature of trauma, interoceptive and mindfulness instruction can also be seen as specific forms of psychoeducation around attentional practices, which were used successfully in other studies (Mehling et al., 2017; Shors et al., 2018). Some psychoeducation may have also occurred during studies that included care by multidisciplinary teams made up of trauma experts, medical doctors, counsellors, psychiatrists, or psychotherapists (Ley et al., 2018; Nilsson et al., 2019).

Finally, seeing positive results from participation also contributes to participants' feelings of competence, which can translate to more self-efficacy in general. This is illustrated beautifully in the case study by Ley et al. (2018). The participant, "Rashid", took up exercising on his own because it was effective for him, and a year after completing the program, Rashid independently engaged in running and strength training three times a week. As Ley et al. (2018) state, "This finding suggests that he is coping with some effectiveness with major challenges relating to his depression disorder (e.g., low vitality and energy levels), his traumatic experiences (e.g., somatized pain), and his postmigration situation (e.g., isolation)" (p. 500).

Relatedness

In an exercise intervention for PTSD, the SDT element of relatedness may be present in the quality of the relationships that are available to the participant while they are participating in the intervention as a whole. These relationships may exist between participants or between participants and support staff.

Relatedness between participants may develop when participants interact with each other as part of the intervention, whether riding waves together while surfing (Caddick et al., 2015; Rogers et al., 2014), working and competing together in a sport such as basketball (Ley et al., 2018), or in a group dance activity (Bernstein, 2019; Levine & Land, 2016). In these interactive

experiences there will be social dynamics and a group process, even if they are not explicitly focused on in the same manner as a therapeutic group (Yalom & Leszcz, 2005).

However, even in studies where participants exercise together, but don't interact, the need for relatedness may be fulfilled simply from feeling a sense of belonging and solidarity with the other participants. As Pebole and Hall (2019) stated, "Our program evaluation data reveal participants received social support from exercise staff and other participants" (p. 9). They also acknowledged that "there are several significant aspects of behavior change theory that were not assessed in this study, and that may have impacted exercise participation, including but not limited to social support, enjoyment, self-efficacy, and exercise environment" (Pebole & Hall, 2019, p. 9).

Even some of the measures used to gather data or run the intervention groups could be considered to contribute to a sense of relatedness, such as focus group discussions (Nilsson et al., 2019), interviews (Ley et al., 2018), or the opportunity for participants to train as a group facilitator (Bernstein, 2019). In one study, Mitchell et al. (2014) found that simply coming to the research facility each week to fill out questionnaires with other control group members contributed to positive change in participants' PTSD symptoms, likely due to a combination of behavioural activation and a sense of belonging and solidarity with other group members.

Relatedness may also develop between participants and support staff. Studies varied in the amount of support available to participants, with some studies providing no support (Crombie et al., 2018), exercise support only (Mitchell et al., 2014; Pebole & Hall, 2019; Rosenbaum et al., 2015a), support staff trained in both physical activity and group process or mindfulness instruction (Mehling et al., 2017; Rogers et al., 2014), or support and data collection engaged in simultaneously by the researcher (Bernstein, 2019; Caddick et al., 2015). Others provided a multidisciplinary team (Ley et al., 2018; Nilsson et al., 2019; Shors et al., 2018) or a combination

of a multidisciplinary team available outside of physical activity sessions plus an exercise physiologist and a trauma expert available while participants were exercising (Ley et al., 2018).

Clearly, the amount of additional support that can be made available to participants will depend on the amount and source of funding supporting the program and is not always a choice based solely on what would be best for the participants or most aligned with the theoretical orientation of the study. However, the qualitative studies that had a multidisciplinary team available noted that the team itself was an important area of support, and therapeutic change, for participants (Ley et al., 2018).

The need for relatedness may be similar to a therapeutic relationship between the participants and the support team. Despite the recognition of the importance of the therapeutic relationship in other forms of treatment (Miller et al., 1997), it is an understudied area with little data gathered on the quality of the therapeutic relationship in the treatment of PTSD with physical activity. While Levine and Land (2016) did discuss the importance of the quality of the therapeutic relationship in studies of dance and movement therapy, this is a potential area for future research.

Gaps in the Literature

With the research on physical activity for PTSD at such an early stage, it is unsurprising that several gaps were identified in the literature. Overall, there was a lack of explicit positioning in terms of overall theoretical orientation in the studies of physical activity for PTSD. Few studies explicitly positioned their work as being informed by either the medical model of trauma, characterised by the DSM-5 diagnosis criteria, or the somatic model of trauma, based on nervous system dysregulation as diagnostic criteria. There was also a lack of discussion around the specific needs of trauma survivors and what is required to provide physical activity interventions

in a context of trauma-informed care beyond the incorporation of SDT. This is important because it might inform practitioners and highlight the types of practitioner knowledge that is required to provide trauma-informed interventions. This likely includes understanding the role of gender in providing a physical activity intervention for people with PTSD, which was identified as a clear theme in the studies reviewed yet there was little rationale for the gender-specific activities provided.

The issue of theoretical orientation reflects the divide that currently exists in the treatment of trauma, and the dominance of the medical model in traditional treatment approaches. It makes sense that interventions would focus on the medical model and use the DSM-5 diagnosis as inclusion criteria given that the medical model provides a much more predictable and empirically accessible framework to guide a study. The medical model is also aligned with the current best-practice treatments recommended by the APA. However, it is also surprising that no studies I reviewed explicitly aligned themselves with somatic models of trauma treatment despite the recent popularity of these models in clinical practice and their alignment with findings in neuroscience (Porges, 2011). The only studies I reviewed that mentioned somatic models were the dance/movement therapy studies, which also focused on the emotional expressiveness involved in movement (Bernstein, 2019; B. Levine & Land, 2016).

It was also noted that very few studies explicitly acknowledged the unique needs of trauma survivors and specific ways that interventions should be designed to accommodate these needs. Again, in alignment with the medical model, most studies used the DSM-5 PTSD criteria as inclusion criteria, excluding all types of developmental or complex trauma. Exceptions were Bernstein (2019), who provided an expressive dance program for sexual trafficking survivors in India, and Massey and Williams (2020), who performed a meta-study on sporting activities for people who had experienced trauma during their youth. It is easy to understand why researchers

would prefer to have discrete inclusion criteria that follow the standard diagnostic guidelines, however, in practice it is common to see people who have had traumatic experiences of a complex and developmental nature in addition to discrete traumatic events in adulthood. It is important to determine whether the cPTSD population responds to physical activity in the same way as PTSD populations or if they have unique treatment needs. In terms of trauma-sensitive intervention design, only the yoga study indicated the specific trauma-informed practices used when working with participants, such as the use of invitational language and explicit permission to not engage with postures that were invited (Mitchell et al., 2014).

In addition, no studies of physical activity for PTSD treatment that I reviewed mentioned ways of making physical activity accessible for people with disabilities or the potentially limiting effect of previous experiences and attitudes around exercise. Only one study acknowledged the systemic nature of trauma and the importance of recognizing this and being careful not to continue to perpetuate it by reinforcing harmful narratives around masculinity (Massey & Williams, 2020). Inclusion is an important part of making interventions accessible, and can help participants find the motivation to engage in physical activity by providing opportunities to have the need for relatedness fulfilled.

Inclusion also touches on gender, which was a surprisingly significant factor in the studies reviewed. Many studies showed wide disparities in gender balance in their participants, with either all male or all female participants. No studies mentioned the inclusion of trans, gender noncomforming, or nonbinary people as participants. There were also many unexamined assumptions about the gender of the participants and the type of physical activity that would be suitable for them. This was reflected in studies where men were offered “intense” activities such as surfing, and women were offered aerobic activity, dance or yoga. With so many studies strictly adhering to standard gender norms for the types of “acceptable” physical activity for males or

females, it raises the question of whether this type of gendered activity helps participants meet basic psychological needs such as competence or relatedness, or whether it is actually reinforcing harmful gender stereotypes and narratives about masculinity and femininity that could contribute to the problematic systems that generated the trauma in the first place. Are there any risks or benefits to offering activities that contradict standard gender norms, such as dance and yoga for men or weightlifting for women?

Finally, from the perspective of a therapist who would like to utilise physical activity in the treatment of PTSD, it was unclear what type of therapist knowledge is required to facilitate a physical activity for PTSD intervention beyond the incorporation of SDT elements. The studies reviewed came from a wide variety of professional orientations, such as kinesiology, occupational therapy, nursing, psychology, and psychiatry. There was also considerable variety in the sizes of support teams and consistency of therapeutic relationship between participants and researcher/facilitators. The qualities needed in the therapist and/or therapeutic team likely align with the qualities of an effective therapist in traditional talk therapy, although it would be helpful to know if there are different qualities needed or exercise-specific knowledge required when guiding participants through a physical activity intervention.

Conclusion

By reviewing the literature around PTSD, physical activity, and SDT, and the ways these elements are combined to create interventions for the treatment of PTSD, several themes emerged. First, the dominant medical model of mental illness influences the way that PTSD is defined and treated, which impacts intervention design. However, while physical activity alone may help relieve symptoms of PTSD, it is difficult to maintain motivation to participate without some intrinsic desire to engage in movement, and a strictly medical approach may perpetuate the

barriers to treatment that people with PTSD experience. A more holistic and somatic view of trauma, and its treatment, is more likely to recognize the complex interrelationships between intervention elements such as movement and social connections, which work together to meet people's needs and help them integrate their traumatic experiences. A somatic view is also more likely to focus on embodiment as part of the process of engaging with physical activity, which may be an important part of recovering from PTSD.

Second, the fulfilment of the three basic psychological needs found in SDT is an important part of facilitating the motivation for people to participate in a physical activity intervention for PTSD. Similar to the way that people with PTSD experience greater barriers to engaging in exercise, they also likely experience less fulfilment of their basic psychological needs in their everyday life than do healthy individuals. Creating a space where these needs can be met may be an important part of what makes physical activity interventions therapeutic for people with PTSD.

Finally, the theme of inclusion and exclusion was present throughout the literature. From the way researchers define trauma to whether or not people feel comfortable going to a fitness centre, the question of "who is included here?" kept emerging. This ranged from the question of the gender or culture of participants, what language they spoke in their everyday life and in the intervention, what activities were expected of them, and whether or not they felt able to engage in those activities. Inclusion interacts with the basic psychological need for relatedness and may also interact with beliefs that people hold about themselves and their ability to engage in exercise or physical activity.

Overall, the literature shows that interventions that facilitate the fulfilment of the three basic psychological needs are more likely to motivate participants with PTSD symptoms to engage in physical activity. Facilitating the emergence of intrinsic or integrated motivation is also

important in ensuring that physical activity becomes a part of the participant's own preferred lifestyle, supporting them beyond the duration of the intervention itself. In this way, physical activity can become a resource and source of strength that people with PTSD can rely on throughout their lives.

Chapter Three - Discussion, Next Steps, and Conclusion

In this chapter, I will discuss the main findings of the literature review and how these findings address the research questions posed for this capstone. These findings centre around the ways that the fulfilment of the basic psychological needs can create an environment in which motivation may emerge, how this may be especially important in people who have unresolved trauma, and the specific knowledge and skills clinicians or facilitators need to be able to design and implement a group that maximises the fulfilment of those basic psychological needs. I will then briefly touch on some limitations of this work, especially as it relates to the social structures that perpetuate trauma. Next, I outline a proposed group program that offers physical activity as an intervention for PTSD, based on the findings revealed in the literature review. This includes descriptions of the group setting, composition, selection and training of facilitators, physical activity planning, and how the group facilitators would receive assessment and feedback.

Discussion

In the literature review, I examined research in the areas of trauma, physical activity, motivation, and SDT in order to identify best practices that support the motivation of people with PTSD to participate in physical activity interventions. The research questions guiding the review asked what helps people with PTSD maintain motivation to participate in a physical activity intervention and how can these motivating factors be implemented effectively? An additional question focused on the background knowledge that a clinician or researcher needs in order to implement these motivating factors and design an effective intervention.

Main Findings

In response to the first research question, on how to support the motivation of people with PTSD to participate in physical activity interventions, I found that fulfilment of the basic psychological needs of autonomy, competence and relatedness contributed to the emergence and maintenance of motivation to participate (Ley et al., 2018; Pebole & Hall, 2019; Rosenbaum et al., 2015b). This often happened in the context of an SDT-informed program design (Ley et al., 2018), although not exclusively (Mitchell et al., 2014; Nilsson et al., 2019). However, even in programs that were not explicitly SDT-informed, qualitative data gathered from participants often referred to experiences such as having fun, feeling encouraged by others, or feeling healthier physically (Nilsson et al., 2019), which can be understood as the fulfilment of needs for autonomy (I'm doing what I want), relatedness (I belong here) and competence (I can enact positive change). As such, SDT has emerged as an essential framework guiding motivation and is an important consideration for therapists working both in physical activity interventions and regular talk therapy.

While SDT has emerged as an important theoretical approach to motivation in the general population, it also appears that participants who have experienced trauma also need to have their basic psychological needs met in order for intrinsic motivation to emerge. I suggest that SDT-informed intervention design is even more important for people who have experienced trauma. There are a few reasons why this may be the case, including the fact that people with PTSD often have difficulty meeting their basic psychological needs outside of the therapeutic environment (Nilsson et al., 2019). People with PTSD are more likely to be extremely sensitive to cues of psychological and physical danger due to their traumatic experiences and the effect these experiences have on memory and the neuroception of safety (Ogden & Fisher, 2018; Porges,

2011). Safety is a key element of successful trauma treatment in many models (Courtois, 2013; Herman, 2015), and the fulfilment of the basic psychological needs may be an important part of creating that safety.

In response to the second research question, how can these findings be implemented effectively, the literature review revealed that there were many different ways for the basic psychological needs to be fulfilled in a physical activity intervention. In addition to a program design that supports the fulfilment of the basic psychological needs, studies that reported many participant experiences of enjoyment often also reported low numbers of dropouts (Caddick et al., 2015; Ley et al., 2018; Pebole & Hall, 2019). When people experience enjoyment of an activity, they are more likely to want to continue doing it. This is the foundation of SDT; fulfilment of needs for autonomy, competence and relatedness combined with an enjoyment of the activity allows for intrinsic motivation to emerge (Deci & Ryan, 2000). In order for the need for autonomy to be met, a person must experience a sense of being able to choose for themselves according to their values (Deci & Ryan, 2000). In order for competence to be fulfilled, a person needs to have the sense that they are able to engage with the activity in a way that is effective and appropriately skillful (Deci & Ryan, 2000). In order for the need for relatedness to be met, a person needs to feel that they belong either with the people they are engaged with or with another trusted person who can act as a secure base for attachment needs (Deci & Ryan, 2000).

Some key elements that supported the fulfilment of the basic psychological needs in physical activity interventions for PTSD included a collaborative approach to goal-setting (Pebole & Hall, 2019), allowing participants to have flexibility in terms of choosing the intensity or type of activity engaged in each session (Pebole & Hall, 2019), autonomy supportive language and style of facilitating the activity sessions (Mitchell et al., 2014), and a group environment that

fostered a sense of belonging and safety (Bernstein, 2019; Caddick & Phoenix, 2015; Nilsson et al., 2019).

In fact, the specific "dose" of physical activity in terms of intensity, duration or type of activity seemed to be less important to the reduction of symptoms and maintenance of motivation than the SDT-informed orientation of the intervention and opportunity to fulfil the basic psychological needs (Rodrigues et al., 2018). Oppizzi and Umberger (2018) remarked that "In future research, it is recommended that intervention protocols and exercise doses are standardized to enhance study rigor and strengthen findings" because physical activity was found to be effective to some degree within a wide range of intensities and durations (p. 186). In fact, all studies reviewed in this capstone's literature review found that physical activity reduced PTSD symptom burden to some degree (Bernstein, 2019; Caddick et al., 2015; Crombie et al., 2018; Knappe et al., 2019; Levine & Land, 2016; Ley et al., 2018; Massey & Williams, 2020; Mehling et al., 2017; Mitchell et al., 2014; Nilsson et al., 2019; Oppizzi & Umberger, 2018; Pebole & Hall, 2019; Rogers et al., 2014; Rosenbaum et al., 2015a; Rosenbaum et al., 2015b; Shors et al., 2018). The variation in effectiveness appeared to be due to factors other than exercise type or intensity. Studies that adhered rigidly to exercise requirements or had difficulty meeting participants' basic psychological needs experienced higher numbers of dropouts (Crombie et al., 2018; Knappe et al., 2019; Rogers et al., 2014), while studies that were rich in opportunities for participants to meet their basic psychological needs showed reductions in PTSD symptom burden, while maintaining participant motivation and lower dropout rates (Caddick et al., 2015; Ley et al., 2018; Mehling et al., 2017; Mitchell et al., 2014; Nilsson et al., 2019; Pebole & Hall, 2019; Rosenbaum et al., 2015a; Shors et al., 2018).

Finally, the literature review revealed that a certain amount of background knowledge is required to deliver a physical activity intervention for people with PTSD. This knowledge

includes knowing how to support participants by providing pre-program counselling on goals, appropriate activity programs, and an encouraging and supportive social environment (Pebole & Hall, 2019). While some studies were able to provide an environment that was supportive of the fulfilment of the basic psychological needs without being explicitly informed by SDT (Pebole & Hall, 2019), designing a program with SDT in mind will help inform the physical activities that are planned, and how the group dynamic and therapeutic relationships will be handled during the delivery of the program (Teixeira et al., 2012).

From a physical activity perspective, a person who wants to deliver a physical activity intervention for PTSD needs to have enough knowledge of exercise physiology to design an appropriately challenging activity program for each participant, each of whom will likely be arriving with a wide variety of fitness levels, experiences of chronic pain, and/or disembodiment. This knowledge can be outsourced by bringing an exercise physiologist or trainer who has experience working with people who have mental illness onto the team to be responsible for the design and implementation of the physical activity component of the intervention. The person delivering the intervention also needs to know how to facilitate participants' engagement with those activities in a way that supports autonomy, competence, and relatedness (Rodrigues et al., 2018). This includes autonomy-supportive practices such as using invitational language (Mitchell et al., 2014), encouraging participants to modify exercises based on day-to-day functioning (Pebole & Hall, 2019), and facilitating needs for relatedness by using empathic listening, and supporting participants through difficult or triggering moments (Ley et al., 2018).

From an interpersonal perspective, facilitators also need to have the skills to interact with participants in an autonomy-supportive way that supports the SDT-informed design of the intervention in a real-world environment. This includes supporting clients in having positive relationships with each other and with the support staff, as well as working through traumatic

material if and when it arises during a session. While many interventions did not have a trauma expert or counsellor attending every physical activity session, the studies that did have this available to participants remarked on how participants made use of that support and how beneficial it was for them (Ley et al., 2018). At a minimum, all support staff should have a basic understanding of how trauma works and how to support someone with empathic listening and attunement.

Regardless of whether these skills and knowledge are found in one person or several, the essential background knowledge includes exercise physiology and physical activity program design, understanding of how trauma occurs and how it is healed, awareness of how to use SDT in theory and practice, and the relational skills to support participants both individually during the activity sessions and as a group during group activities. Additional supports may include wraparound or multidisciplinary care teams that include medical doctors, individual counsellors and holistic health practitioners such as massage therapists, physiotherapists, and nutritionists. This degree of wraparound care was not always seen in the research, although participants in one study did express interest in a program that combined physical activity with nutritional support and advice (Pebole & Hall, 2019). In general, a multidisciplinary team was found to provide a greater level of care and was helpful in refugee populations with a high degree of both trauma and physical health conditions (Ley et al., 2018).

Limitations and Structural Power

While the literature does show that physical activity is a promising adjunct treatment for PTSD, there are some limitations that are important to mention. First, physical activity may not be sufficient as a standalone treatment for PTSD. While many studies did show reductions of PTSD symptom severity and other markers such as reduction of depression and anxiety

symptoms from physical activity interventions alone, trauma is complex and full treatment will require some degree of integration and memory consolidation work (Courtois, 2013). However, physical activity can be an excellent complement to this, and can be especially useful in cases where people have difficulty relating to or being aware of their body. Physical activity can help give people with PTSD a foundation of safety and increased embodiment that makes further treatment possible.

In addition, no matter how effective a physical activity intervention is or how well it facilitates the emergence of motivation in participants, it does nothing to address the systems of structural power that maintain a social and ecological environment in which so many people are sustaining traumatic experiences in the first place. People playing basketball together in a supported environment may be a meaningful bubble of safety and transformation, and yet outside that bubble, there is rampant patriarchy, child abuse, war, terrorism, and capitalism that continue to traumatise people. More work is required to address the causes of trauma that exist at the systemic level.

Another limitation is that it is currently unclear whether some elements of physical activity interventions as they are currently designed may in fact contribute to those systems of structural power. For example, if physical activity interventions reinforce harmful gender stereotypes and roles by assigning gender-normed activities to participants, they may inadvertently contribute to those systems of structural power that generated their traumatic experiences in the first place (Massey & Williams, 2020). More research is required to understand the influences of gender on experiences of physical activity interventions for PTSD and the way that gender interacts with SDT in these settings.

Next Steps - A Program Proposal

In this section, I will propose a program that incorporates SDT elements with physical activity as a treatment for PTSD, which can be offered as an adjunct to traditional talk therapy. Ideally, participants would be referred by their clinicians to join the group, although they may also apply on their own. The goals of the program are to make physical activity accessible to as many people with PTSD as possible, and to do so in a way that maximizes the fulfilment of the participants' basic psychological needs, while also preserving the benefits of the physical activity for PTSD symptoms.

Setting

This program will ideally occur at a fitness facility where the group will have dedicated time without the public or other people present. Possible settings could include reserved time at a community centre or privately owned gym, at a fitness facility connected to a psychiatric hospital or university, or at a gym facility connected to an interdisciplinary clinic. It's important that the participants feel that they are safe and that their experiences there are private.

Ideally, the facility also provides opportunities for a wide variety of activities, including cardio, weight training, sports, and games. Activities such as swimming, hiking and kayaking could also occur in a relatively private area in nature. As long as there is a large open space for the group to move around in, a selection of equipment that includes weights, sporting goods like balls, hockey sticks, etc, and some mats for yoga or mobility work, it would be possible to design a program around the resources that are available. When participants' needs for autonomy are being prioritized, there will naturally be more flexibility and choice around the specific physical activities that are engaged in, which reduces the need for rigid expectations around the equipment available.

Group Design

Following the principles of therapeutic group design (Yalom & Leszcz, 2005), groups will have around 10 participants and at least 2 support people present. One of those support people will be an activity specialist such as a physical trainer or exercise physiologist, and the other will be a trauma or mental health specialist such as a counsellor, although ideally both people have experience working with physical activity for people with mental health challenges.

Group membership will be determined by a combination of a referral process in which local clinicians are encouraged to refer clients that could benefit from the program, and a self-referral option. Participants will be screened over the phone or by video before being assigned to a group, with inclusion criteria being the presence of PTSD or cPTSD symptoms and the desire to engage in physical activity in a group setting. Exclusion criteria will include psychosis, being unable to speak English, and not being willing or able to meet group agreements for confidentiality and respect. In addition, people with active suicidality or disordered eating will be required to have an individual counsellor/clinician supporting them outside of the group time as well. Participants will have the option to join either a group of same-gender participants or a multi-gender group to encourage a sense of safety and choice for those who have experienced trauma from gender-based violence. Groups will be closed to promote group safety and will run for 12 weeks in order to give participants enough time to see physical and mental results from their efforts. Sessions will run for 90 minutes twice a week.

Facilitator Selection and Training

The selection, training, and support of facilitators is a key element that will contribute to the success of the group. Facilitators will be selected based on their professional background in either trauma counselling or exercise physiology/physical training for people with mental illness.

In addition, there will be a half-day workshop on SDT and the three basic psychological needs for facilitators and peer mentors before the program begins running groups. This workshop will be focused on understanding what the basic psychological needs are, why they are important for creating safety and motivation, and ways that the fulfilment of those needs can be facilitated by the choices made in running the group and interacting with participants. Specific ways to support the emergence of autonomy will be highlighted in this workshop, such as highlighting available choices, helping participants connect with their intrinsically-motivated reasons for participating, and reflecting back participants' experiences of enjoyment as they occur (Teixeira et al., 2012). Facilitators will also be encouraged to take a team approach to supporting participants. It is equally important for facilitators to feel supported in meeting their basic psychological needs as well, and they will be encouraged to work with a sense of autonomy, within their zone of competence, and with good relationships between themselves, other facilitators or peer mentors, and the participants of the group.

Activity Design

For the physical activity portion of the intervention, activities will be planned to maximise perceived competence and will be delivered in a way that maximises autonomy. Before the group meetings begin, participants will meet individually with a trainer who has experience working with people with PTSD or other serious mental illness. In this meeting they will discuss and assess for current level of fitness, their goals for participation in the program, and their perceived barriers to participation and ways they might overcome those barriers. This is designed to maximize experiences of competence by planning for activities participants can actually do and feel good about doing.

Each session will have a familiar structure and ritual, including an opening check-in (15 min), warm up (10 min), skill work (20 min), main activity (20 min), cool-down (10 min), and ending with a quick check-out (15 min). Within this structure, participants will have the opportunity to sample different kinds of movement across the four-month program, including activities that develop strength, mobility, expressiveness, speed, cooperation, competition, and interoception. As the activities are presented to the group, directions will be given on how to perform the movement and how to choose a level of progression/intensity that fits for each individual, using invitational language.

In order for participants to choose an appropriate level of intensity, facilitators will teach participants how to judge their perceived level of difficulty/exertion and how to monitor body cues such as heart rate and respiration. These skills also support the development of interoception and body awareness. Participants will be encouraged to seek a facilitator if they are overwhelmed or triggered and need support to regulate themselves, and facilitators will be watching for this occurring in group members regardless of whether the participants are explicitly seeking out a facilitator for support. Other psychoeducational components will be briefly included in the skill work component of each session, such as goal setting, self-talk, arousal and attention management strategies, and brief explanations of how trauma works in the brain and body.

Finally, a group culture of fun and belonging will be cultivated using a variety of strategies. Group safety is an important part of creating a culture that feels fun and supportive, and facilitators will be working to ensure that participants are not giving each other critical feedback or engaging in other types of discouraging or relationally unsafe behaviour. There will also not be any sharing of trauma stories or group processing of traumatic material; this group is a place to have an experience of respite from the ongoing effects of PTSD in one's life (Ley et al., 2018). In terms of intentionally cultivating an experience of fun and feelings of belonging,

facilitators will focus on introducing activities that are not too intense at first and which contain a mix of both individual activity and social interaction. As Bernstein (2019) described, it's also important to find the activities, metaphors and styles of interacting that fit with the cultural identities of the participants. The facilitators will also include the appropriate use of playfulness, humour, and encouragement.

Additional Supports

Certain supports will be required to meet the unique needs of people with PTSD. Ideally, each participant has individual counselling or therapeutic support outside the group. As described earlier, the selection and training of the facilitators will also contribute significantly to the support available to participants. It would also be a valuable opportunity for graduates of the group to be peer facilitators who can also participate alongside and provide support, encouragement, and inspiration to members of a new group. This mentorship can be another avenue to fulfil needs for competence, autonomy and relatedness in a way that supports and encourages new group members and encourages the development of a healthy group culture and cohesiveness. This role may be filled in early sessions of the group by recruiting individuals who have healed from PTSD and enjoy engaging in exercise to participate alongside new group members. As the program matures and group members progress in their healing, they may apply to be peer facilitators in future groups.

Assessment and Feedback

Assessment and feedback would be integrated into the design of the program so that we can evaluate the success of the intervention and the effect it is having on participants. However, it is important that assessment and feedback is done in a way that maximises relational safety and

the fulfilment of participants' basic psychological needs. This could happen through several different avenues.

The first strategy for assessment and feedback is observation and debriefing by group facilitators. By meeting together after sessions and reflecting together on what seems to be working and what is not, facilitators can use their clinical judgment to evaluate whether the group is having experiences of meeting their basic psychological needs without asking participants to give feedback. While this is somewhat vulnerable to bias, it is possible to observe in a fairly objective way whether participants are having fun, forming healthy relationships, enacting autonomous decisions and able to engage in the physical activities at a level and intensity that supports an experience of competence. By observing and reflecting together in a facilitator-only check-in following the end of each session and at the conclusion of each 12-week program, program facilitators will be able to improve on the program with each iteration.

The next avenue for assessment and feedback could be the check-in and check-out that happen at the beginning and end of each session. By incorporating invitations for participants to reflect on and share their experiences of the program in the check-in and check-out, facilitators can encourage participants to both engage in self-reflection and share feedback to the group. This can be done in a way that reduces pressure for individuals to share more than they feel comfortable, such as offering non-verbal indications like thumbs up/down/sideways, numerical ratings of how they feel when they came in vs. how they feel when they are leaving, or in creative and metaphorical check-ins such as describing their inner state as a type of weather or animal. Of course, participants will always have the option to pass.

More detailed information can be obtained through anonymous evaluations gathered electronically at the midway point and end of each 12-week program. This can be an opportunity

for participants to share more detailed feedback on what is or is not working for them, and to ensure the program is meeting participants' needs and reducing symptoms.

Another means of gathering information that does not require the awareness or participation of participants is tracking and evaluating the data on attendance rates and drop-outs. This data can be gathered and compared to other programs and studies mentioned in the literature review to evaluate the effectiveness of our strategies to encourage motivation.

Finally, taking a self-reflective stance and engaging in regular journaling can help evaluate the inner states that the facilitators may be inadvertently bringing to the group. Journaling on question prompts such as how I might be imposing my bias on the group or whether I am being culturally sensitive can help encourage a stance of taking responsibility for the way I hold a position of power in this environment. Self-reflection and non-defensively receiving feedback can help facilitators evaluate whether they are perpetuating any beliefs or contexts in which traumatic events can occur. Another important element in avoiding harm is engaging in regular supervision and consultation with another counsellor who is familiar with working with trauma and PTSD, especially when difficult material emerges in the group. In order to ensure the facilitators are working together as a team and supporting each other in reflexively evaluating their approach, the group facilitators will debrief together after each session, reflecting on what went well, what might be improved, and whether the facilitators are heading towards the goals of providing a space in which the participants' needs for autonomy, competence and relatedness can be met while engaging in physical activity together.

Conclusion

Trauma affects a tremendous number of people worldwide and unresolved trauma persists in symptoms of PTSD and cPTSD. Finding ways to relieve these symptoms that are effective and

accessible to the greatest number of people can help reduce the burden of suffering caused by trauma. Physical activity is one way that people can begin to shift their experience of PTSD symptoms, and this may be an important avenue for people who have barriers to doing traditional talk therapy. People with PTSD may also experience barriers to participating in physical activity, such as feeling unable to engage in movement without causing injury or embarrassment or avoiding experiences that create feelings of physiological arousal. One way of lowering these barriers is to design physical activity interventions for PTSD with SDT and the somatic approach to trauma as a theoretical orientation. SDT will maximise opportunities to have basic psychological needs such as autonomy, competence and relatedness fulfilled and the somatic approach will take people's experience of nervous system dysregulation into account. When the three basic psychological needs are fulfilled, intrinsic motivation may emerge, increasing participants' willingness to participate and reducing barriers to treatment. Even though trauma is often complex and requires some amount of conscious processing and reconsolidation to fully resolve, SDT-informed physical activity can be a first step on the road to a life of greater freedom and choice.

References

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

American Psychological Association. (2020). *Clinical practice guideline for the treatment of posttraumatic stress disorder: PTSD treatments.* https://www.apa.org/ptsd-guideline/treatments

Bachmann, C. J., Beecham, J., O'Connor, T. G., Scott, A., Briskman, J., & Scott, S. (2019). The cost of love: Financial consequences of insecure attachment in antisocial youth. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 60(12), 1343–1350. https://doi.org/10.1111/jcpp.13103

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497–529. https://doi.org/10.1037/0033-2909.117.3.497

Beebe, B., Messinger, D., Bahrick, L. E., Margolis, A., Buck, K. A., & Chen, H. (2016). A systems view of mother – infant face-to-face communication. *Developmental Psychology*, 52(4), 556–571.

Bell, M. (2011). The feel of mobility: How children use sedentary lifestyles as a site of resistance. *Sport, Education and Society*, 16(3), 385–397. https://doi.org/10.1080/13573322.2011.571882

Bernstein, B. (2019). Empowerment-focused dance/movement therapy for trauma recovery. *American Journal of Dance Therapy*, 41(2), 193–213. https://doi.org/10.1007/s10465-019-09310-w

Bezyak, J. L., Berven, N. L., & Chan, F. (2011). Stages of change and physical activity among individuals with severe mental illness. *Rehabilitation Psychology*, 56(3), 182–190. https://doi.org/10.1037/a0024207

Briere, J. N., & Scott, C. (2015). *Principles of trauma therapy: A guide to symptoms, evaluation, and treatment* (2nd ed.). SAGE Publications.

Caddick, N., Smith, B., & Phoenix, C. (2015). The effects of surfing and the natural environment on the well-being of combat veterans. *Qualitative Health Research*, 25(1), 76–86. https://doi.org/10.1177/1049732314549477

Cambridge Dictionary. (n.d.). Competence. In *Cambridge.org dictionary*. Retrieved December 14, 2020, from https://dictionary.cambridge.org/dictionary/english/competence

Canadian Society for Exercise Physiology. (2017a). *Canadian physical activity guidelines for adults ages 18-64 years: An integration of physical activity, sedentary behaviour, and sleep.* https://csepguidelines.ca/adults-18-64/

Canadian Society for Exercise Physiology. (2017b). *Canadian physical activity guidelines for children and youth (ages 5-17 years): An integration of physical activity, sedentary behaviour, and sleep.* https://csepguidelines.ca/children-and-youth-5-17/

Choi, K. W., Chen, C.-Y., Stein, M. B., Klimentidis, Y. C., Wang, M.-J., Koenen, K. C., & Smoller, J. W. (2019). Assessment of bidirectional relationships between physical activity and depression among adults: A 2-sample mendelian randomization study. *JAMA Psychiatry*, 76(4), 399–408.

Cipriani, A., Furukawa, T. A., Salanti, G., Chaimani, A., Atkinson, L. Z., Ogawa, Y., Leucht, S., Ruhe, H. G., Turner, E. H., Higgins, J. P. T., Egger, M., Takeshima, N., Hayasaka, Y., Imai, H., Shinohara, K., Tajika, A., Ioannidis, J. P. A., & Geddes, J. R. (2018). Comparative efficacy and acceptability of 21 antidepressant drugs for the acute treatment

of adults with major depressive disorder: A systematic review and network meta-analysis. *The Lancet*, 391(10128), 1357–1366. https://doi.org/10.1016/S0140-6736(17)32802-7

Connors, G. J., DiClemente, C. C., Velasquez, M. M., & Donovan, D. M. (2013). *Substance abuse treatment and the stages of change: Selecting and planning interventions* (2nd ed.). The Guilford Press.

Courtois, C. A. (2013). Complex trauma and traumatic stress reactions. In *Treatment of Complex Trauma: a Sequenced, Relationship-Based Approach* (pp. 3–27). The Guilford Press.

Crenshaw, K., & Dobson, A. (2016, October). *The urgency of intersectionality* [Video]. TED Conferences. https://www.ted.com/talks/kimberle_crenshaw_the_urgency_of_intersectionality

Crombie, K. M., Brellenthin, A. G., Hillard, C. J., & Koltyn, K. F. (2018). Psychobiological responses to aerobic exercise in individuals with posttraumatic stress disorder. *Journal of Traumatic Stress*, 31, 134–145. https://doi.org/10.1002/jts

Danielsson, L., & Rosberg, S. (2015). Opening toward life: Experiences of basic body awareness therapy in persons with major depression. *International Journal of Qualitative Studies on Health and Well-Being*, 10, 1–14. https://doi.org/10.3402/qhw.v10.27069

DeBeer, B. B., Kittel, J. A., Cook, A., Davidson, D., Kimbrel, N. A., Meyer, E. C., Gulliver, S. B., & Morissette, S. B. (2016). Predicting suicide risk in trauma exposed veterans: The role of health promoting behaviors. *PLoS ONE*, 11(12), 1–12. https://doi.org/10.1371/journal.pone.0167464

Deci, E. L., & Ryan, R. M. (2000). Self-determination theory and the facilitation of intrinsic motivation. *American Psychologist*, 55(1), 68–78. https://doi.org/10.1037/0003-066X.55.1.68

Deci, E. L., & Ryan, R. M. (2008). Self-determination theory: A macrotheory of human motivation, development, and health. *Canadian Psychology*, 49(3), 182–185. https://doi.org/10.1037/a0012801

CFR.org Editors. (2020). *Demographics of the U.S. military*. Council on Foreign Relations. https://www.cfr.org/backgrounder/demographics-us-military

Farris, S. G., Abrantes, A. M., Uebelacker, L. A., Weinstock, L. M., & Battle, C. L. (2019). Exercise as a nonpharmacological treatment for depression. *Psychiatric Annals*, 49(1), 6–10. https://doi.org/10.3928/00485713-20181204-01

Fetzner, M. G., & Asmundson, G. J. G. (2015). Aerobic exercise reduces symptoms of posttraumatic stress disorder: A randomized controlled trial. *Cognitive Behaviour Therapy*, 44(4), 301–313. https://doi.org/10.1080/16506073.2014.916745

Firth, J., Rosenbaum, S., Stubbs, B., Gorczynski, P., Yung, A. R., & Vancampfort, D. (2016). Motivating factors and barriers towards exercise in severe mental illness: A systematic review and meta-analysis. *Psychological Medicine*, 46(14), 2869–2881. https://doi.org/10.1017/S0033291716001732

Fisher, J. (2019). Sensorimotor psychotherapy in the treatment of trauma. *Practice Innovations*, 4(3), 156–165. https://doi.org/10.1037/pri0000096

Gaston, L. (2015). *Limitations of therapies for treating PTSD: A Perspective*. Traumatys. http://www.traumatys.com/wp-content/uploads/2017/09/Limitations-of-Trauma-Focused-Therapies-Gaston-2015.pdf

Glowacki, K., Duncan, M. J., Gainforth, H., & Faulkner, G. (2017). Barriers and facilitators to physical activity and exercise among adults with depression: A scoping review. *Mental Health and Physical Activity*, 13, 108–119. https://doi.org/10.1016/j.mhpa.2017.10.001

Goldstein, E., Topitzes, J., Brown, R. L., & Barrett, B. (2020). Mediational pathways of meditation and exercise on mental health and perceived stress: A randomized controlled trial. *Journal of Health Psychology*, 25(12), 1816–1830. https://doi.org/10.1177/1359105318772608

Gordon, B. R., McDowell, C. P., Lyons, M., & Herring, M. P. (2017). The effects of resistance exercise training on anxiety: A meta-analysis and meta-regression analysis of randomized controlled trials. *Sports Medicine*, 47(12), 2521–2532. https://doi.org/10.1007/s40279-017-0769-0

Government of Canada. (2020). *Posttraumatic stress disorder (PTSD)*. https://www.canada.ca/en/public-health/topics/mental-health-wellness/post-traumatic-stress-disorder.html

Gradus, J. L. (n.d.). *Epidemiology of PTSD*. U.S. Department of Veteran's Affairs: PTSD: National Center for PTSD. https://www.ptsd.va.gov/professional/treat/essentials/epidemiology.asp

Grzywacz, J. G., & Marks, N. F. (2001). Social inequalities and exercise during adulthood: Toward an ecological perspective. *Journal of Health and Social Behavior*, 42(2), 202–220. https://doi.org/10.2307/3090178

Guina, J., Nahhas, R. W., Kawalec, K., & Farnsworth, S. (2019). Are gender differences in DSM-5 PTSD symptomatology explained by sexual trauma? *Journal of Interpersonal Violence*, 34(21–22), 4713–4740. https://doi.org/10.1177/0886260516677290

Harada, N. D., Wilkins, S. S., Schneider, B., Elrod, M., Hahn, T. J., Kleinman, L., Fang, M., & Dhanani, S. (2013). The influence of depression and PTSD on exercise adherence in older veterans. *Military Behavioral Health*, 1(2), 146–151. https://doi.org/10.1080/21635781.2013.829400

Hawryliw, S. T. (2017). Sedentary behaviour, therapists, and clients: Promoting positive health behaviours in therapy. *Canadian Journal of Counselling and Psychotherapy / Revue Canadienne de Counseling et de Psychothérapie*, 51(4), 306–326.

Herman, J. (2015). *Trauma and recovery: The aftermath of violence - from domestic abuse to political terror*. Basic Books.

Hernandez-Wolfe, P., & Mcdowell, T. (2013). Social privilege and accountability: Lessons from family therapy educators. *Journal of Feminist Family Therapy*, 25(1), 1–16. https://doi.org/10.1080/08952833.2013.755079

Huebner, M., Meltzer, D., Ma, W., & Arrow, H. (2020). The masters athlete in Olympic weightlifting: Training, lifestyle, health challenges, and gender differences. *PLoS ONE*, 15(12 December), 1–19. https://doi.org/10.1371/journal.pone.0243652

Imel, Z. E., Laska, K., Jakupcak, M., & Simpson, T. L. (2013). Meta-analysis of dropout in treatments for posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology*, 81(3), 394–404. https://doi.org/10.1037/a0031474

Kabat-Zinn, J. (2005). *Coming to our senses: Healing ourselves and the world through mindfulness.* Hyperion.

Katzman, M. A., Bleau, P., Blier, P., Chokka, P., Kjernisted, K., Van Ameringen, M., Antony, M. M., Bouchard, S., Brunet, A., Flament, M., Rabheru, K., Grigoriadis, S., Richter, P. M. A., Mendlowitz, S., O'Connor, K., Robichaud, M., Walker, J. R., Asmundson, G., Klassen, L. J., … Szpindel, I. (2014). Canadian clinical practice guidelines for the management of anxiety, posttraumatic stress and obsessive-compulsive disorders. *BMC Psychiatry*, 14(SUPPL.1), 1–83. https://doi.org/10.1186/1471-244X-14-S1-S1

Kim, J. H., Rajeev, M., Chiampas, G., d'Hemecourt Pierre, Chris, T., Cianca, J., Smith, R. N., Wang, T. J., Roberts, W. O., Thompson, P. D., & Baggish, A. L. (2012). Cardiac arrest

during long-distance running races. *The New England Journal of Medicine*, 366(2), 130-140. http://dx.doi.org.proxy.cityu.edu/10.1056/NEJMoa1106468

Klain, I. P., De Matos, D. G., Leitão, J. C., Cid, L., & Moutão, J. (2015). Self-determination and physical exercise adherence in the contexts of fitness academies and personal training. *Journal of Human Kinetics*, 46(1), 241–249. https://doi.org/10.1515/hukin-2015-0052

Knapen, J., Vancampfort, D., Moriën, Y., & Marchal, Y. (2015). Exercise therapy improves both mental and physical health in patients with major depression. *Disability and Rehabilitation*, 37(16), 1490–1495. https://doi.org/10.3109/09638288.2014.972579

Knappe, F., Colledge, F., & Gerber, M. (2019). Impact of an 8-week exercise and sport intervention on post-traumatic stress disorder symptoms, mental health, and physical fitness among male refugees living in a greek refugee camp. *International Journal of Environmental Research and Public Health*, 16(20). https://doi.org/10.3390/ijerph16203904

Kohn, A. (2018). *Punished by rewards*. Houghton Mifflin Harcourt.

Kolnes, L. J. (2016). "Feelings stronger than reason": Conflicting experiences of exercise in women with anorexia nervosa. *Journal of Eating Disorders*, 4(1), 1–16. https://doi.org/10.1186/s40337-016-0100-8

Levine, B., & Land, H. M. (2016). A meta-synthesis of qualitative findings about dance/movement therapy for individuals with trauma. *Qualitative Health Research*, 26(3), 330–344. https://doi.org/10.1177/1049732315589920

Levine, P. (1997). *Waking the tiger*. North Atlantic Books.

Lewis, C., Roberts, N. P., Gibson, S., & Bisson, J. I. (2020). Dropout from psychological therapies for post-traumatic stress disorder (PTSD) in adults: Systematic review and meta-

analysis. *European Journal of Psychotraumatology*, 11(1). https://doi.org/10.1080/20008198.2019.1709709

Ley, C., Rato Barrio, M., & Koch, A. (2018). "In the sport I am here": Therapeutic processes and health effects of sport and exercise on PTSD. *Qualitative Health Research*, 28(3), 491–507. https://doi.org/10.1177/1049732317744533

Luyten, P., & Fonagy, P. (2015). The neurobiology of "we." *Personality Disorders:Theory, Research and Treatment*, 6, 366–379. https://doi.org/10.1016/B0-7216-0797-7/50051-3

Massey, W. V., & Williams, T. L. (2020). Sporting activities for individuals who experienced trauma during their youth: A meta-study. *Qualitative Health Research*, 30(1), 73–87. https://doi.org/10.1177/1049732319849563

Mehling, W. E., Chesney, M. A., Metzler, T. J., Goldstein, L. A., Maguen, S., Geronimo, C., Agcaoili, G., Barnes, D. E., Hlavin, J. A., & Neylan, T. C. (2017). A 12-week integrative exercise program improves self-reported mindfulness and interoceptive awareness in war veterans with posttraumatic stress symptoms. *Journal of Clinical Psychology*, 74(4), 554–565. https://doi.org/10.1002/jclp.22549

Merriam-Webster. (n.d.). Autonomy. In *Merriam-Webster.com dictionary*. Retrieved December 14, 2020, from https://www.merriam-webster.com/dictionary/autonomy

Merriam-Webster. (n.d.). Exercise. In *Merriam-Webster.com dictionary*. Retrieved December 11, 2020, from https://www.merriam-webster.com/dictionary/exercise

Mehrtash, S., & Ince, M. L. (2018). Perceived autonomy support and basic psychological needs of participants in a women's health-related exercise programme according to exercise stage of change and exercise type. *Montenegrin Journal of Sports Science and Medicine*, 7(1), 45–51. https://doi.org/10.26773/mjssm.180306

Miller, S. D., Duncan, B. L., & Hubble, M. A. (1997). On the shoulders of Carl Rogers: The contribution of the therapeutic relationship to treatment outcome. In *Escape from Babel: Toward a unifying language for psychotherapy practice* (pp. 81–121). W. W. Norton & Co.

Mitchell, K. S., Dick, A. M., DiMartino, D. M., Smith, B. N., Niles, B., Koenen, K. C., & Street, A. (2014). A pilot study of a randomized controlled trial of yoga as an intervention for PTSD symptoms in women. *Journal of Traumatic Stress*, 27, 121–128. https://doi.org/10.1002/jts

Morres, I. D., Hatzigeorgiadis, A., Stathi, A., Comoutos, N., Arpin-Cribbie, C., Krommidas, C., & Theodorakis, Y. (2019). Aerobic exercise for adult patients with major depressive disorder in mental health services: A systematic review and meta-analysis. *Depression and Anxiety*, 36(1), 39–53. https://doi.org/10.1002/da.22842

National Institute of Mental Health. (2017). *Post-traumatic stress disorder (PTSD)*. https://www.nimh.nih.gov/health/statistics/post-traumatic-stress-disorder-ptsd.shtml

Native Youth Sexual Health, N. (2016). Indigenizing harm reduction: Moving beyond the four-pillar model. *Visions: BC's Mental Health and Substance Use Journal*, 11(4), 36. https://www.heretohelp.bc.ca/visions/indigenous-people-vol11/indigenizing-harm-reduction

Nilsson, H., Saboonchi, F., Gustavsson, C., Malm, A., & Gottvall, M. (2019). Trauma-afflicted refugees' experiences of participating in physical activity and exercise treatment: A qualitative study based on focus group discussions. *European Journal of Psychotraumatology*, 10(1). https://doi.org/10.1080/20008198.2019.1699327

Ogden, P., & Fisher, J. (2015). *Sensorimotor psychotherapy: Interventions for trauma and attachment*. W. W. Norton & Co.

Ogden, P., & Fisher, J. (2018). Integrating body and mind: Sensorimotor psychotherapy and treatment of dissociation, defense, and dysregulation. In U. Lanius PhD, S. Paulsen, & F. Corrigan (Eds.), *Neurobiology and Treatment of Traumatic Dissociation*: *Towards an Embodied Self* (pp. 399-422). Springer Publishing Company.

Ogden, P., & Minton, K. (2000). Sensorimotor psychotherapy: One method for processing traumatic memory. *Traumatology*, 6(3), 149–173. https://doi.org/10.1177/153476560000600302

Ogilvie, K., & Rivier, C. (1997). Gender difference in hypothalamic-pituitary-adrenal axis response to alcohol in the rat: Activational role of gonadal steroids. *Brain Research*, 766, 19–28.

Oliveira de Carvalho, A., Filho, A. S. S., Murillo-Rodriguez, E., Rocha, N. B., Carta, M. G., & Machado, S. (2018). Physical exercise for Parkinson's disease: Clinical and experimental evidence. *Clinical Practice & Epidemiology in Mental Health*, 14(1), 89–98. https://doi.org/10.2174/1745017901814010089

Olsen, H. M., Brown, W. J., Kolbe-Alexander, T., & Burton, N. W. (2018). A brief self-directed intervention to reduce office employees' sedentary behavior in a flexible workplace. *Journal of Occupational and Environmental Medicine*, 60(10), 954–959. https://doi.org/10.1097/JOM.0000000000001389

Oppizzi, L. M., & Umberger, R. (2018). The effect of physical activity on PTSD. *Issues in Mental Health Nursing*, 39(2), 179–187. https://doi.org/10.1080/01612840.2017.1391903

Payne, P., Levine, P. A., & Crane-Godreau, M. A. (2015). Somatic experiencing: Using interoception and proprioception as core elements of trauma therapy. *Frontiers in Psychology*, 6, 93. https://doi.org/10.3389/fpsyg.2015.00093

Pebole, M. M., & Hall, K. S. (2019). Insights following implementation of an exercise intervention in older veterans with PTSD. *International Journal of Environmental Research and Public Health*, 16(14). https://doi.org/10.3390/ijerph16142630

Porges, S. W. (2011). *The polyvagal theory*. W. W. Norton & Co.

Psychology Today. (n.d.). *Motivation*. https://www.psychologytoday.com/us/basics/motivation

Read, D. L., Clark, G. I., Rock, A. J., & Coventry, W. L. (2018). Adult attachment and social anxiety: The mediating role of emotion regulation strategies. *PLoS ONE*, 13(12). https://doi.org/10.1371/journal.pone.0207514

Rodrigues, F., Bento, T., Cid, L., Neiva, H. P., Teixeira, D., Moutão, J., Marinho, D. A., & Monteiro, D. (2018). Can interpersonal behavior influence the persistence and adherence to physical exercise practice in adults? A systematic review. *Frontiers in Psychology*, 9(NOV). https://doi.org/10.3389/fpsyg.2018.02141

Rogers, C. M., Mallinson, T., & Peppers, D. (2014). High-intensity sports for posttraumatic stress disorder and depression: Feasibility study of ocean therapy with veterans of operation enduring freedom and operation Iraqi freedom. *American Journal of Occupational Therapy*, 68(4), 395–404. https://doi.org/10.5014/ajot.2014.011221

Rogers, K. A., & Ebbeck, V. (2016). Experiences among women with shame and self-compassion in cardio-based exercise classes. *Qualitative Research in Sport, Exercise and Health*, 8(1), 21–44. https://doi.org/10.1080/2159676X.2015.1056826

Rooney, K., Hunt, C., Humphreys, L., Harding, D., Mullen, M., & Kearney, J. (2005). A test of the assumptions of the transtheoretical model in a post-traumatic stress disorder population. *Clinical Psychology and Psychotherapy*, 12(2), 97–111. https://doi.org/10.1002/cpp.441

Rosenbaum, S., Sherrington, C., & Tiedemann, A. (2015a). Exercise augmentation compared with usual care for post-traumatic stress disorder: A randomized controlled trial. *Acta Psychiatrica Scandinavica*, 131(5), 350–359. https://doi.org/10.1111/acps.12371

Rosenbaum, S., Vancampfort, D., Steel, Z., Newby, J., Ward, P. B., & Stubbs, B. (2015b). Physical activity in the treatment of Post-traumatic stress disorder: A systematic review and meta-analysis. *Psychiatry Research*, 230(2), 130–136. https://doi.org/10.1016/j.psychres.2015.10.017

Schore, A. N. (2001). Effects of a secure attachment relationship on right brain development, affect regulation, and infant mental health. *Infant Mental Health Journal*, 22(2), 7–66. http://allanschore.com/pdf/SchoreIMHJAttachment.pdf

Schuch, F. B., Morres, I. D., Ekkekakis, P., Rosenbaum, S., & Stubbs, B. (2017). A critical review of exercise as a treatment for clinically depressed adults: Time to get pragmatic. *Acta Neuropsychiatrica*, 29(2), 65–71. https://doi.org/10.1017/neu.2016.21

Shors, T. J., Chang, H. Y. M., & Millon, E. M. (2018). MAP training my brain (™): Meditation plus aerobic exercise lessens trauma of sexual violence more than either activity alone. *Frontiers in Neuroscience*, 12(APR), 1–12. https://doi.org/10.3389/fnins.2018.00211

Smith-Marek, E. N., Baptist, J., Lasley, C., & Cless, J. D. (2018). "I don't like being that hyperaware of my body": Women survivors of sexual violence and their experience of exercise. *Qualitative Health Research*, 28(11), 1692–1707. https://doi.org/10.1177/1049732318786482.

Statistics Canada. (2019). *Tracking physical activity levels in Canadians, 2016 and 2017*. (2019). https://www150.statcan.gc.ca/n1/daily-quotidien/190417/dq190417g-eng.htm?indid=20803-1&indgeo=0

Teixeira, P. J., Carraça, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, 9(1), 1. https://doi.org/10.1186/1479-5868-9-78

Tronick, E. Z. (1989). Emotions and emotional communication in infants. *American Psychologist*, 44(2), 112–119. https://doi.org/10.4324/9780429478154-5

Van Ameringen, M., Mancini, C., Patterson, B., & Boyle, M. H. (2008). Post-traumatic stress disorder in Canada. *CNS Neuroscience and Therapeutics*, 14(3), 171–181. https://doi.org/10.1111/j.1755-5949.2008.00049.x

Van Der Kolk, B. A. (2014). *The body keeps the score: Brain, mind and body in the healing of trauma*. Penguin Books.

Van Der Kolk, B. A., Stone, L., West, J., Rhodes, A., Emerson, D., Suvak, M., & Spinazzola, J. (2014). Yoga as an adjunctive treatment for posttraumatic stress disorder: A randomized controlled trial. *Journal of Clinical Psychiatry*, 75(6), 559–565. https://doi.org/10.4088/JCP.13m08561

Van Der Kolk, B., Ford, J. D., & Spinazzola, J. (2019). Comorbidity of developmental trauma disorder (DTD) and post-traumatic stress disorder: Findings from the DTD field trial. *European Journal of Psychotraumatology*, 10(1). https://doi.org/10.1080/20008198.2018.1562841

Vancampfort, D., Stubbs, B., Venigalla, S. K., & Probst, M. (2015). Adopting and maintaining physical activity behaviours in people with severe mental illness: The importance of autonomous motivation. *Preventive Medicine*, 81, 216–220. https://doi.org/10.1016/j.ypmed.2015.09.006

Yalom, I. D., & Leszcz, M. (2005). *The theory and practice of group psychotherapy* (5th ed.). Basic Books.

Yehuda, R. (1999). Linking the neuroendocrinology of post-traumatic stress disorder with recent neuroanatomic findings. *Seminars in Clinical Neuropsychiatry*, 4(4), 256–265.

Zen, A. L., Whooley, M. A., Zhao, S., & Cohen, B. E. (2012). Post-traumatic stress disorder is associated with poor health behaviors: Findings from the heart and soul study. *Health Psychology*, 31(2), 194–201. https://doi.org/10.1037/a0025989