How can sport help those with Type 2 diabetes? A look at coping

by

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Abstract

Organized sport is a staple activity in the lives of many Canadians. Sport brings people together and provides a fun and unique form of physical activity. One skill that is said to come from organized sport is the ability to learn coping strategies to manage stress and adversity. If this is indeed the case, then participation in organized sport should be especially beneficial for individuals who rely on coping skills on a daily basis. People living with Type 2 diabetes are indeed such a group. People living with diabetes have to cope with managing their illness which includes blood glucose monitoring, diet, exercise, attending medical appointments, and other related activities. In this research, I examined whether people living with Type 2 diabetes who have a history of participating in organized sport implement different types of coping strategies to manage their illness, thereby improving their quality of life. Participants (n = 455) living with Type 2 diabetes completed online surveys that assessed (a) past participation in organized sport; (b) the extent to which they engage in problem-focused, emotion-focused, and avoidant coping strategies to manage their illness; and (c) health-related quality of life. Responses were analyzed using mediation analysis to test whether having a history of participation in organized sport predicted higher quality of life indirectly via specific coping strategies. Having a history of participation in organized sport was associated with greater self-rated general health and mental health, more use of problem-focused and emotion-focused coping strategies, and less use of avoidance coping strategies. As an individual's level of avoidance coping increased, they generally had lower levels of self-reported general, mental, and physical health. In contrast, emotion-focused coping predicted greater levels of general and mental health. Finally, emotion-focused coping mediated the relationship between hours spent playing organized sport and both general health and mental health. The findings of this study suggest that participants may learn

skills associated with problem-focused and emotion-focused coping strategies to manage stress through engagement in organized sport, which may facilitate better quality of life outcomes.

Keywords: Avoidance Coping; Coping; Emotion-focused Coping; Organized Sport; Problem-focused Coping; Quality of Life; Sport Participation; Type 2 Diabetes.

"The football field is a place where morale, spirit, courage, honor, sportsmanship, fair play, teamwork, and the like, are directly taught. We do not learn these things in our courses in mathematics, English, or history" – Coleman Griffith (as cited in Green, 2003, p. 198).

Introduction

It is often said that organized sport prepares you for life. It is said to build character, resilience, comradery, and teach responsibility and other life skills (Gerabinis et al., 2018). Organized sport is enjoyed by many Manitobans and Canadians—it is a fun activity that brings people together, and promotes a healthy active lifestyle (Sport Manitoba, 2020). One benefit that may be derived from organized sport is learning how to cope with stress and adversity (Josefsson et al., 2017; Kerdijk et al., 2016; Nicholls & Polman, 2007).

Coping is an intentional action people take to manage stress (Lazarus, 2006). People can cope a few different ways such as: (1) attempting to solve the problem that is causing the stress, known as problem-focused coping (PFC); (2) managing the emotions caused by stress, known as emotion-focused coping (EFC); and (3) avoiding the stress all together, known as disengagement/avoidance coping (AVC; Heggeness et al., 2020; Holahan et al., 2005; Lazarus et al., 1980; Schellenberg et al., 2013). Coping is a situational process. Therefore, there is no "correct" way to cope. For example, PFC can be more effective in situations in which an individual has more control over the situation. In contrast, situations in which there is little control to be had, EFC or AVC is considered to be more effective (Lazarus & Folkman, 1984). Since different coping strategies may be more or less effective in different situations, those who experience stress on a daily basis would benefit from learning different ways to cope. Given the stressors people living with Type 2 diabetes (T2D) experience, they would benefit from learning different coping strategies.

People living with T2D experience chronic stress on a daily basis. In addition to feeling physically unwell, living with a chronic illness such as T2D presents emotional, psychological, and social distress (Thorpe et al., 2013). Managing T2D involves managing glucose levels, diet, and exercise in addition to daily demands such as school, work, social activities, and family lives (Finkelstein-Fox & Park, 2018). People with a history of participating in organized sport should have experience managing all types of stressors using a variety of strategies (Nicholls & Polman, 2007), which should benefit them when they face adversity outside of sport. This should be especially beneficial for those living with a chronic illness like T2D. The strategies used by people living with T2D to cope with stress should, in turn, affect their quality of life (QOL; Rubin & Pevrot, 1999).

This research tested whether having a history of participation in organized sport was associated with: (1) the coping strategies used by people living with T2D to manage their illness; and (2) their QOL. In short, do people living with T2D who have a history of participating in organized sport implement more PFC, EFC or AVC coping strategies to manage their illness? Does the use of these different coping strategies, in turn, affect their QOL?

Chapter 1: Literature Review

Quality of Life for People Living with Type 2 Diabetes

T2D is a chronic illness that impacts the endocrine system, which influences the hormones that affect a number of organs, systems, and mechanisms (Diabetes Canada, 2020). Insulin is one hormone produced by the pancreas—an organ involved in the digestive process. Insulin breaks down carbohydrates, allowing the body to process sugars to use as energy. T2D occurs when the pancreas does not produce sufficient insulin, thereby negatively impacting the body's ability to properly break down sugars that are ingested, which results in elevated blood glucose levels (hyperglycemia). People living with T2D need to closely monitor their blood sugar levels from getting too low (hypoglycemia), or too high (Diabetes Canada, 2020). People living with T2D manage their illness by managing their diet, staying active, exercising, taking medication, monitoring their blood sugar levels using a blood glucose monitor, and, in extreme cases, daily insulin injections. Having and managing T2D therefore has the potential to be a consistent source of stress that can impact one's QOL (Diabetes Canada, 2020).

QOL is defined as an overall description of one's physical, social, and psychological well-being. There are several factors that can influence one's QOL, including: environmental factors, health variables, and personal stress (Rubin & Pevrot, 1999). One group who experience a number of stressors that negatively impact their QOL are people living with T2D. People living with T2D are closely followed by doctors and undergo frequent medical appointments and bloodwork to ensure their illness is well-controlled (Diabetes Canada, 2020).

Research demonstrates that people living with a chronic illness, such as T2D, who adopt coping strategies to manage their illness can alleviate anxiety and depressive symptoms, and improve their QOL (Erdley-Kass et al., 2018; Felton & Revenson, 1984). Murakami and

colleagues (2020) surveyed people living with diabetes to assess the coping strategies they use to manage their illness. Results suggested that active coping and problem-solving strategies were associated with an improved QOL. According to Lazarus (2006), coping strategies such as problem-solving can be taught (e.g. Erdley-Kass et al, 2018). One environment that is suited to teach these strategies is organized sport.

Benefits of Participating in Sport

Participation in organized sport has a number of psychological, social, and physical benefits. Some of these benefits include: improved strength, agility, endurance, and psychological benefits such as the ability to self-regulate, and improved cognition, memory, and mood (Belanger et al., 2013). Involvement in a sporting environment with teammates, coaches, and structure instills athletes with belief in their ability to perform effectively in their sport and collaborate with others and regulate their emotions (Eime et al., 2013). These benefits have informed the Canadian Sport Policy (2012) which encourages Canadians to engage in sporting activities to promote active, healthy lifestyles. To date, Sport Manitoba (2021) estimates that over 300,000 Manitobans are participating in sport. Programs such as the Manitoba Games, Fit Kids Healthy Kids, and Women in Sport are all examples of initiatives designed to encourage youth and people of all ages to engage in sport at all levels.

Benefits of sport have been found using a number of methods. For example, Torstveit and colleagues (2017) examined health-related lifestyle habits such as physical activity, diet, and substance use among organized sport participants. The authors concluded that participating in organized sport was associated with greater physical activity, improved diet, and decreased substance use, compared to a non-sporting control group (Oja et al., 2014). Additionally, a systematic review analyzing the benefits of having a history of participation in sport showed that

playing sport promotes healthy behaviours, social and psychological development (Eime et al., 2013). The same review demonstrated that past participation in sport is associated with positive psychological health outcomes such as improved mood, fewer instances of depressive symptoms, enhanced perceived social acceptance, and improved self-regulation (Eime et al., 2013).

According to the Canadian Sport Policy (2012), sport provides opportunity for youth development (Larson, 2000). Positive youth development is an area of research that examines the social, physical, and psychological development of youth through structured programs such as camps, wilderness-adventures, school, and organized sport, among others (Waid & Uhrich, 2020). While a majority of developmental research has been concerned with preventing negative developmental pathologies, positive youth development emphasises the need for fostering positive outcomes (Larson, 2000). Research into positive youth development in sport has explored the benefits of exercise, teamwork, and coaching on physical, social, and psychological development in adolescents (Waid & Uhrich, 2020).

Positive youth development in sport fosters the growth of many life skills that can transfer to other aspects of life (Hermens et al., 2017).The life skill transfer model is used to explain how skills that are learned and developed through sport can transfer to other life domains (Gould & Carson, 2008). The model is composed of seven modules that analyze the factors that are involved in the development and transfer of life skills through sport participation. The seven modules include: internal assets, external assets, sport participation experience, life skills/ personal and development explanations, positive outcomes, negative outcomes, and transferability (Gould & Carson, 2008; Pierce et al, 2017). The design of a program and the teaching strategies of coaches will shape how young athletes will learn life skills through sport.

Current coach characteristics such as their philosophies toward coaching, relationship skills and competencies as coaches inform the relationships coaches develop with their athletes and their team. The coach's characteristics contribute to how skills are taught and in turn, learned by the athlete (Gould & Carson, 2008). When athletes form a connection with a coach, they are better equipped to learn and develop skills. Direct skill developing involve programs that are built into organized sport that are intended to directly teach life skills. These programs and activities involve rule setting, team building activities, and opportunities for athletes to take on leadership responsibilities.

Athletes develop social and psychological skills such as communication, problem-solving and self-regulation though sport. These skills can be transferred to other aspects of life (Gould et al., 2007). An athlete's experiences during sport participation can affect how they develop life skills, and how well those skills transfer to other areas of life. (Gould et al., 2007). Transferability of life skills can differ depending on the situation outside of the sporting context and the psychological processes occurring during the time of transfer (Pierce et al., 2017). An athlete is most likely to transfer social and psychological skills developed in sport to other areas of their life when they encounter a situation in their life that is similar to a situation they have experienced in sport (Gould et al., 2007). Transferability is most likely to occur when the athlete encounters the situation while feeling safe and supported by others, is in the "right frame of mind", and is confident in their ability to apply their skills (Pierce et al., 2017).

Research has shown that participation in organized sport improves one's overall well-being through physical activity, social connections, and cognitive improvements (Belanger et al., 2012). Belanger and colleagues (2012) surveyed young adult cancer survivors to measure sport participation, psychosocial health outcomes, and QOL over a one-month period. Participation in

sport was associated with an improved QOL and psychosocial health. The findings of Belanger and colleagues (2012) are consistent with other research in cancer and physical activity and sport participation (Luo et al., 2019). Given the psychological, social, and physical health benefits of participating in sport, I hypothesize that a history of participating in organized sport will be positively associated with QOL.

Hypothesis 1: *History of participating in organized sport will be positively associated with QOL.*

Coping

Everybody faces adversity at some point in their life (Bonanno, 2004), which requires them to engage in coping. Coping is defined as an intentional action people take to manage stress (Lazarus & Folkman, 1984). There are three widely accepted ways to cope according to modern coping research that was founded by Lazarus and Folkman (1984). First, is problem-focused coping (PFC) which attempts to manage the problem that is causing the stress. Second, is emotion-focused coping (EFC) which attempts to manage the negative emotions that are caused by stress. Finally, avoidance coping (AVC) which involves intentionally avoiding or disengaging from a stressful situation all together (Carver, 1997). Each dimension of coping involves intentional effort to manage stress and is subject to change and adaptation based on the situation the individual is trying to cope with (Lazarus, 2006).

Lazarus and colleagues (1980) conducted seminal research on emotions, stress, and coping. Prior to the work of Lazarus, personality-trait researchers believed that coping was an inherent personality trait that was stable over time and not subject to change (Lazarus, 2006). However, Lazarus and Folkman (1984) found evidence which suggested that coping is a transactional process between the individual and their environment that can change depending on the situation. Lazarus identified that if an environment or context is supportive of one's goal,

they may be more inclined to use a coping strategy that fits those same goals. In addition to identifying that coping is a dynamic process that is subject to change, researchers have begun to explore that coping strategies can be learned (Carver, 1997). Since the work of Lazarus and colleagues (1980), the research has moved from understanding coping as a trait or disposition, to the now widely accepted transactional model of stress and coping.

According to Lazarus and colleagues' (1980) transactional model of stress, people cope with stress by appraising the situation, their level of control over the situation, and their abilities, and adapting accordingly. People begin with a *primary appraisal* to determine whether there is an active threat (what is at stake?). If an active threat is identified, people go on to make a *secondary appraisal* to determine whether there is a way to cope with it (what can I do?). Consider, for example, a T2D patient who is experiencing low blood sugar. They need to make a *primary appraisal* of the situation (in this case low blood sugar levels) to determine whether the situation is threatening. If the situation is deemed threatening, they then make a *secondary appraisal* to determine whether there is a way to cope. In most cases a patient can eat a sugary snack to cope with the stressor of having low blood sugar. There are many different ways to cope with stressors experienced by people living with T2D.

Research has built upon the goodness of fit hypothesis to understand the factors that might influence one to choose a particular coping strategy. One theory researchers use is self-determination theory (SDT). According to Lazarus and Folkman (1980), coping appraisals are shaped by goals and motivation. SDT posits that behaviour is guided by intrinsic and extrinsic motivators (Ryan & Deci, 1985). Extrinsic motivators guide behaviours that are a means to an end such as receiving a reward or avoiding a punishment. Internal motivators guide behaviours that are a means unto itself such as activities that one is passionate about and enjoys for the sake

of pleasure and interest in the activity (Bonneville-Roussy et al., 2016). Behaviour that is guided by internal motivators is referred to as autonomous motivation and behaviour that is shaped by external motivators is referred to as controlled motivation (Ryan & Deci, 2000).

SDT can help to explain how motivation might influence the appraisal of a stressful event, and the appropriate coping response in that moment (Gaudreau et al., 2008). For example, autonomous motivation is often associated with PFC and EFC strategies such as planning or seeking out emotional support because the feel they have control of the situation that is directed by their own behaviour. In contrast, controlled motivation is often associated with AVC strategies such as self-distraction or behavioural disengagement because they feel like their behaviour is determined by factors outside of their control (Gaudreau et al., 2008). SDT has been explored in number of sporting contexts to understand athlete performance and achievement, coping, as well as health contexts and diabetes (Gaudreau et al., 2008; Gillet et al., 2020; Jeno et al., 2019 Rajab et al., 2020;)

It is likely that the coping strategies learned through sport can apply to other contexts, including to coping with a chronic disease such as T2D. People living with T2D have to cope with many stressors on a daily basis. Therefore, it is important to study how coping with managing their illness is affecting their quality of life. Some stressors a T2D patient may have to cope with include: managing their sugar levels, managing diet, and attending other medical appointments. It is therefore likely that sport participation has the potential to influence the extent to which people coping with T2D cope by using PFC, EFC, and AVC.

Problem-focused Coping in Sport

PFC involves coping strategies that manage stress by attempting to solve the problem causing the stress. Coping strategies can either be directed internally toward the individual, or

externally toward the environment (Lazarus, 2006). Problem solving, planning, and seeking out information are all examples of PFC strategies that are widely used by athletes (Finkelstein-Fox & Park, 2018; Nichols et al., 2007). Athletes often face novel and challenging scenarios that they need to adapt to in stressful situations. By using PFC skills including logical analysis, imagery, and problem-solving, they are able to effectively adapt to the stress during a game (Nicholls & Polman, 2007).

Organized sport is a positive environment for emotional and self-regulation, discipline, and resilience where athletes can learn and develop PFC strategies (Crocker et al., 2015). Nicolas and colleagues (2011) observed that supportive coaching behaviour was a predictor of using more of task-oriented coping (i.e., PFC) strategies in a high-level competition. The social support and social structure offered by coaches and teammates contribute to developing discipline, interpersonal, and problem-solving skills (Fraser-Thomas et al., 2005). Organized sport is an environment that can contribute toward the development of problem-solving skills, discipline, and thinking logically. Given the aforementioned transferability of skills developed in sport to other areas of life, I hypothesize that a history of participating in organized sport will be positively associated with PFC.

Hypothesis 2A: *History of participating in organized sport will be positively associated with PFC.*

Emotion-focused Coping in Sport

EFC is a form of coping that involves managing the negative emotions caused by a stressor (Lazarus & Folkman, 1984). Examples of EFC strategies include seeking social-emotional support from peer groups (Heisler et al., 2010), mindfulness (Greg et al., 2007) positive reframing, looking to religion, acceptance, and humour (Carver, 1997). These strategies

can provide comfort and lessen negative emotions for individuals and help to hold on to a sense of hope and optimism (Lazarus & Folkman, 1984). In sport an athlete may miss a shot or strike out which may drive them to practice more to prevent that from happening again (example of a PFC strategy). In that moment, however, practicing may not lessen the negative emotion affecting them. An alternative coping strategy would be EFC which involves consulting teammates or coaches for emotional support, or other emotion-focused techniques.

Athletes report using a number of different EFC strategies to manage stress in sport (Josefsson et al., 2017). By seeking social support, using positive self-talk and relaxation techniques, athletes are able to effectively cope with common stressors such as injuries or errors (Josefsson et al., 2017; Nicholls & Polman, 2007). Those who regularly participate in organized sport report being in a positive mood both while they play, and after the game has ended (Shapiro & Malone, 2016). Positive mood and effective emotional regulation has been shown to be one predictor of effective coping (Rogaleva et al., 2019).

Emotional regulation and social skills are taught and learned through playing the sport itself and through intentional direct coaching (Gould et al., 2007). In addition to managing emotions, youth who participate in organized sport also learn effective communication skills (Gould & Carson, 2008; Pierce et al., 2017). Young athletes form close connections with teammates and coaches and develop the skills necessary to reach out to available and accessible social supports to emotionally regulate (Sebri et al., 2020). Due to the impacts of playing organized sport such as socialization with teammates, rules and structure, and opportunity for teaching social and emotional regulation skills (Gould & Carson, 2008), I hypothesize that a history of participating in organized sport will be positively associated with EFC.

Hypothesis 2B: *History of participating in organized sport will be positively associated with EFC.*

Avoidance Coping in Sport

Avoidance coping (AVC), also referred to as disengagement coping, is a form of coping in which one mentally and physically distances themselves from a stressful situation (Compas et al., 1999). In contrast to PFC that takes an intentional action to address the stressor directly, AVC takes an intentional action to minimize or deny the stressor (Holahan et al., 2005). Examples of AVC include using distraction, separating oneself from the stressor, and turning to substances such as drugs or alcohol to cope (Heggeness et al., 2020).

Coping skills that are learned and developed through sport are generally limited to PFC and EFC (Nicholls & Polman, 2007). Athletes are taught to actively address stress that is within their control, or consult coaches or teammates to manage emotions for stress that is outside of their control rather than avoid it all together (Nicolas et al., 2011). Coping in sport literature has consistently found athletes report fewer instances of using AVC strategies to manage stress in sport in comparison to PFC or EFC (Nicholls & Polman, 2007; Nicolas et al., 2011). Although some athletes believe avoidance lessens the negative emotions following a stressful encounter (Nicholls & Polman, 2007), researchers point to longitudinal data which indicates that avoidance has long-term negative outcomes (Kim & Duda, 2003). For these reasons, I hypothesize that history of participating in organized sport will be negatively associated with AVC.

Hypothesis 2C: *History of participating in organized sport will be negatively associated with AVC.*

Problem-focused Coping and QOL

People living with T2D experience a lower QOL relative to those who are not living with a chronic illness (Rubin & Perot, 1999). One way to improve the QOL affected by T2D is to cope with the stressors associated with the illness using PFC strategies (Amoako & Skelly, 2007; Lowe et al., 2008). According to Lazarus and Folkman's (1984) goodness of fit hypothesis, PFC is adaptive in situations where someone has control over their situation and is therefore able to take action to change the situation. In contrast, when someone does not have control over their situation, EFC or AVC is adaptive because the situation is out of their control and they cannot actively change it. Therefore, it is adaptive to manage the negative emotions that are caused by the stress (Lazarus & Folkman, 1984). Diabetes is a controllable disease and therefore, researchers have found evidence to suggest that PFC is adaptive to manage the illness (Finkelstein-Fox & Park, 2018).

PFC strategies such as diabetes self-management education (Lowe et al., 2008), problem-solving skills interventions (Amoako & Skelly, 2007), and cognitive behavioural therapy (Snoek et al., 2008) are common in coping with the variety of stressors experienced by people living with T2D. Coping is strongly influenced by our environment and the people we surround ourselves with (Lazarus & Folkman, 1984). Freeman-Hildreth and colleagues (2015) studied the mediating effect of coping ability between caregivers involved in the lives of people living with T2D and adherence to treatment. Results suggested caregivers, including doctors and medical professionals, who engaged in compassionate, optimistic patient-centered care supported the coping abilities of people living with T2D, which led to a greater adherence to treatment to manage their illness and improved QOL.

The positive health-outcome effects of coping with a chronic illness and diabetes are well documented. Felton and Revenson (1984) compared coping strategies such as information-seeking (example of PFC) and wishful thinking (example of EFC) between two groups based on controllability of the illness. Illnesses studied included cancer and rheumatoid arthritis (low controllability) and hypertension and diabetes (controllable). The researchers found that the information seeking, active, and problem-focused approaches to coping led to increased adaptability for both patient groups. In contrast, wish fulfilment did not result in any positive or adaptive measures. They concluded that engaging in PFC is an effective strategy for people to manage their illness which improves their QOL (Felton & Revenson, 1984).

More recently, Erdley-Kass et al. (2018) provided hemodialysis patients with six weeks of problem-solving therapy that helped participants (1) identify problems; (2) develop goals; (3) brainstorm alternative solutions; (4) review the advantages and disadvantages of alternative solutions; (5) choose a solution, implement those solutions; and (6) evaluate their decisions. Medical professionals educated patients on problem-solving strategies. After six weeks of therapy, patients reported an increased ability to complete tasks which alleviated their depressive and anxiety symptoms. Using problem-solving skills to cope with a chronic illness has been shown to lessen feelings of anxiety, depression, and hopelessness for people with T2D, thus improving their quality of life (Erdley et al., 2014). Therefore, I hypothesize that PFC will be positively associated with QOL.

Hypothesis 3A: *PFC will be positively associated QOL.*

Emotion-focused Coping and QOL

Even though T2D is a controllable disease, living with a chronic illness has a number of uncontrollable stressors that can be managed by using EFC strategies. EFC strategies are known

to be adaptive in situations where stressors are outside of one's control. EFC has been shown to improve QOL outcomes for a number of populations that include both athletes, and people living with T2D. EFC has been examined in several QOL domains including coping in the workplace (Brown et al., 2005), following traumatic life events (Park et al., 2005), and chronic illnesses such as T2D (Finkelstein-Fox & Park, 2019). Research using qualitative methods has identified the emotional difficulties that living with T2D presents.

Most people who develop T2D develop their illness later in life. According to Diabetes Canada (2021), the average patient diagnosed with T2D is around age 40. Many of those who are diagnosed may have not lived with a chronic illness before and are faced with a change in lifestyle (Duangdao & Roesch, 2008). Initially, people newly diagnosed with T2D experience high levels of anxiety, which is often associated with depression (Duangdao & Roesch, 2008). T2D is often associated with other chronic stress such as guilt, anger, frustration, and depression (Pal et al., 2018). Stuckey and colleagues (2014) surveyed participants living with Type 1(n = 1368) and Type 2 diabetes (n = 7228) to understand their experiences living with the illness. Researchers identified found themes relating to the negative emotional and psychosocial experiences living with diabetes. First, participants reported anxiety related to hypoglycemia, diabetes complications, and depression and other negative moods such as hopelessness. Second, participants reported discrimination at work and from the public and misunderstanding of the disease in the general public.

The third theme identified by Stuckey and colleagues (2014) was the sense of optimism and resilience in the face of living with diabetes. Despite living with a chronic condition, participants reported feeling confident to overcome additional stress and obstacles because they were able to adjust to living with diabetes. Others, focused on living their life with joy, and

optimism. The fourth and final theme that was identified was receiving social and emotional support from family, friends, and professionals. In receiving emotional and compassionate support, people living with diabetes reported being able to cope with their diabetes better because they felt like they were not alone.

The study conducted by Stuckey and colleagues (2014) highlights the social and emotional experiences of living with diabetes. Anxiety, depression, resilience, and social connectedness are common themes that emerge in other research on experiences by people living with diabetes (Duangdao & Roesch, 2008; Pal et al., 2018; Vahasarja et al., 2014).

Carolan and colleagues (2015) conducted a focus group with people living with T2D to explore their experiences living with the diseases. They identified four themes associated with living with T2D including the silent nature of the disease, the personal journey, work to manage diabetes, and access to resources and services (Carolan et al., 2015). Participants needed to cope with the emotional aspect of living with T2D, with some speaking to the fear of facing mortality. One participant commented:

> Once you're diagnosed with diabetes, the risk of heart attack and stroke, and all that, your kidneys, it affected everything … Living in fear of what is going to be next affected. At the moment, I'm having some nerve problems and that's really concerning me. (p.1015)

The study conducted by Carolan and colleagues (2015) identified the distressing experiences people living with T2D are having, which may be eased by using EFC to manage the chronic stress people living with T2D experience.

Sebri and colleagues (2020) argue that the communication and seeking social support that is learned from sport can transfer to other health domains such as living with cancer. Athletes

who have formed close relationships with coaches and teammates may be better prepared to form similar bonds with medical professionals and peers (Sebri et al., 2020). Those who have a history of sport participation may be more inclined to seek out support groups, emotional therapy or simply value the benefits gained from venting negative emotions to friends and family. While these different EFC strategies have been associated with fewer depressive symptoms and less anxiety associated with chronic illnesses with lower controllability such as cancer for example (Osowiecki & Compas, 1999), they do not help individuals coping with T2D which is considered to be a more controllable disease (Finkelstein-Fox & Park, 2019). However, research exploring EFC in people living with T2D has found that people living with T2D who use EFC strategies to cope with their illness did not help them cope with their illness relative to PFC strategies which is consistent with Lazarus and Folkman's (1984) goodness of fit hypothesis (Finkelstein-Fox & Park, 2019; Macrodimitris & Endler, 2001). Due to these past findings, there is no reason to expect that EFC will be associated with the QOL of people with T2D. I have thus not formed a hypothesis about this relationship.

Avoidance Coping and QOL

Stress can feel overwhelming and can be difficult to manage. Those looking to escape stress to lessen the resulting negative emotions through denial or disengagement may actually be causing further stress (Holahan et al., 2005). Research has shown that avoiding stress is associated with negative health outcomes. One example is that avoiding the management of T2D and other chronic illnesses may result in those illnesses worsening. Holahan and Colleagues (2005) examined the negative effects of AVC on depression over a 10-year period and found that AVC was associated with chronic and acute stressors 3 years later, and depressive symptoms 10 years later. Other research exploring adaptive coping has concluded that AVC is associated with

other negative life outcomes such as substance abuse and addiction (Heggeness et al., 2020). Adaptive coping involves managing and overcoming the stressful event, whereas maladaptive coping fails to do so and can lead to poor heath outcomes (Boezeman et al., 2016). Researchers agree that AVC does not effectively manage stress, and in some cases may cause more stress over time (Heggeness et al., 2020; Kim & Duda, 2003). Therefore, I hypothesize that AVC will be negatively associated with QOL.

Hypothesis 3B: *AVC will be negatively associated with QOL.*

Coping as a Mediator

The fourth and final group of hypotheses will explore the mediating effects of PFC and AVC between participating in organized sport and QOL. Coping has often been measured as a mediator to predict QOL in a number of different contexts such as people living with schizophrenia (Ritsner et al., 2003) and chronic illnesses (Kristofferzon, 2019). As discussed, there are many positive outcomes resulting from participating in organized sport, and given these benefits, sport provides an optimal environment to learn and develop coping skills. The benefits of sports are well documented, and researchers believe that benefits such as learning to cope may transfer to other life domains (Gould et al., 2007). As such, I proposed that learning coping strategies should be especially beneficial for people who struggle with stress on a daily basis, such as those living with T2D.

Using the following mediation model, I examined whether coping can be used to explain the relationship between having a history of sport participation and QOL. I predicted that people living with T2D who have a history of participation in organized sport would report greater instances of PFC and fewer instances of AVC. This mediation analysis also tested whether each unique strategy is associated with a higher or lower QOL. I hypothesized that PFC and AVC

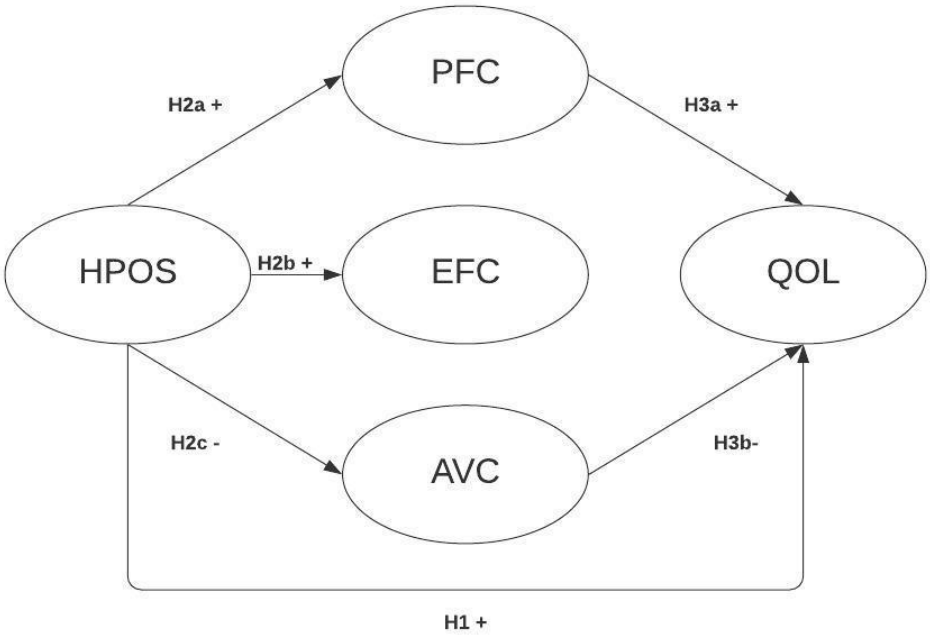
would mediate the relationship between history of participation in sport and QOL. A visual display of the theoretical model and hypothesized relationships is displayed in Figure 1.

Hypothesis 4a: *PFC will have an indirect effect on the relationship between sport history and QOL.*

Hypothesis 4b: *AVC will have an indirect effect on the relationship between sport history and QOL.*

Figure 1

Theoretical mediation model of history of participation in organized sport, coping, and quality of life.



Note. History of participation in organized sport (HPOS); Problem-focused coping (PFC), Emotion-focused coping (EFC), Avoidance coping (AVC); and Quality of life (QOL). The direction of each of the defined pathways are indicated by either positive (+) or negative (-) relationships.

Chapter 2: Methods

Design

The goal of this research was to understand the effect participation in organized sport has on the coping strategies and QOL of people living with T2D. A retrospective design was used to analyze relationships between participation in organized sport, coping strategies and QOL. The aim of this research was to answer three questions. First, to what extent does a having a history of participation in organized sport influence the coping strategies used by people living with T2D to manage their illness? Second, how do those strategies affect their QOL, including general health, physical health, and mental health? Third, do coping strategies explain why playing organized sport contributes positively to the QOL of people living with T2D?

Participants

People living with diabetes (n = 455) were recruited through Prolific Academic, an online crowdsourcing platform where users from around the world can sign up to participate in academic research in exchange for a small amount of money. Prolific is widely used in the social sciences (see Peer et al., 2017) and our lab has used it extensively to collect data from diverse samples of participants. Prolific users were eligible to participate in this research if, upon initial registration with Prolific, they indicated on a standard pre-screening survey that they were living with T2D. The chosen sample size was calculated through power analysis using the Monte Carlo Power Analysis for Indirect Effects (Schoemann et al., 2020). With an estimated power of .90 and a goal of obtaining correlations of 0.2 between each variable in the mediation model, I estimated that a sample size of 465 was required to test for significant effects. At the time of recruitment, 1,300 active Prolific users identified that they were living with T2D and thus qualified to participate in this study.

Procedure

The survey was composed of four sections that measured demographic information, history of sport participation, coping, and QOL. Participants were presented with consent information which informed participants of the purpose of the study, that their participation is voluntary, and that their identity would remain anonymous. The survey was uploaded to Prolific Academic and remained accessible to the target population mentioned above for five hours, at which point 466 responses were collected.

Materials and Measures

History of Participation in Organized Sport

The Seven-day Leisure Time Physical Activity Questionnaire (Perrier et al., 2012) was adapted to measure history of participation in organized sport. Participants were asked to think back to their adolescence (between age 12 to 16) when responding to four questions: (1) which organized sport(s) did they play; (2) what was the highest level of competition they achieved; (3) how many years did they played for; and (4) how often they played in the past as measured by estimated hours per week.

Participants were asked to recall sport participation in their adolescence (between the ages of 12 – 16) because of the psychological and social growth that takes place in sport at that age (Pierce et al., 2017). Researchers have identified that adolescence is a critical period for youth to learn and develop the skills needed to navigate their social environment and deal with adversity (Gould & Carson, 2008; Larson, 2000). Cognitive psychology has also observed that people tend to remember autobiographical memories more readily when thinking back to their adolescence, compared to other moments in their lifetime (Janssen & Murre, 2008).

Hours per week was decided as the best measure of sport participation because it captures participants' sport experience and is commonly used in sport participation and physical activity research (Howie et al., 2009; Rochelle et al., 2013; Walters et al., 2009). Asking to recall hours per week is also a reasonable question for participants to answer when thinking back to past experiences years ago that was required for this retrospective design.

Questions to measure history of sport participation used in this questionnaire were similar to research examining the differences in sport participation in people with spinal cord injuries (Tasiemski & Brewer, 2011) and other physical activity measures such as the Questionnaire for Habitual Physical Activity (QHPA; Baeck, 1982). Other research observing sport history and sport participation have adapted subscales from the QHPA to include types of sport played (Alfono et al., 2002; Dirx et al., 2000). There are limited scales dedicated to measure sport participation history specifically, therefore researchers using the QHPA limit items to be specific to their research questions (see Appendix A).

Coping Strategies

The Brief COPE inventory (Carver, 1997) was used to measure the PFC, EFC and AVC strategies participants implement to cope with managing their illness. The Brief COPE has been shown to be a valid and reliable measure of coping styles as defined by Lazarus and colleagues (1980). Carver (1997) reduced the number of items from his original COPE inventory by collapsing and removing scales that demonstrated low factor loadings across research (Finkelstein-Fox & Park, 2018; Kato, 2013; Stanislawski, 2019). Most notably, the questionnaire is reduced from 60 items to 28 items. The shortened questionnaire reduces burden on participants, noting that responses are more reliable when participants are completing a brief survey instead of a 2-hour long questionnaire (Carver, 1997). The Brief COPE is composed of 14

subscales (2 items for each) including *self-distraction, active coping, denial, substance use, use of emotional support, use of instrumental support, behavioural disengagement, venting, positive reframing, planning, humour, acceptance, religion* and *self-blame* to assess how individuals problem solve, emotionally regulate, and access social support to cope with stressful events. Questions include "I've been concentrating my efforts on doing something about the situation I'm in" (item assessing use of active coping) and "I've been getting comfort and understanding from someone" (item assessing use of emotional support). Participants respond to these questions on a 4-point Likert scale ranging from 1 (*I don't to this at all*) to 4 (*I do this a lot*). Participants were prompted to answer these questions by thinking about how they typically cope with managing their T2D.

The Brief COPE (Carver, 1997) is commonly used to measure of PFC, EFC and AVC. However, there is no standardized criteria to categorize the 14 subscales into PFC, EFC and AVC dimensions. Researchers using this measure to explore these coping dimensions have categorized the 14 subscales to fit their research topic. For example, Schellenberg and colleagues (2013) used the brief COPE to measure EFC and AVC, the authors grouped *use of emotional support, positive reframing, religion* subscales into EFC and *denial*, *venting*, and *behavioural disengagement* subscales into disengagement (AVC; Schellenberg et al., 2013). Other research exploring problem-focused coping have grouped *active coping*, *planning* and *use of instrumental support* subscales into PFC (Yusoff, 2011; see Appendix A).

People living with diabetes experience a number of controllable challenges and obstacles that they need to manage (Rubin & Perot, 1999). Research in coping with diabetes have identified planning, active coping and use of instrumental support as PFC or "adaptive" coping behaviours. Each adaptive coping behaviour involves taking an active role in managing one's

obstacles, such as managing diet (planning), use of instrumental support (reaching out for medical support from doctors health care professionals), taking action to make the situation better (eating healthy, exercising and in some cases taking medication all to actively manage their disease; Amoako & Skelly, 2007; Lowe et al., 2008).

The subscales *planning*, *active coping*, and *use of instrumental support* were grouped together to measure PFC. These subscales reflect a participant's likelihood to take an active approach to addressing obstacles they face managing their diabetes. Empirically, these subscales were all strongly positively correlated with one another (correlation between planning and active coping $r = .638$, $p < .01$; correlation between use of instrumental support and planning $r = .402$, $p < .01$; correlation between use of instrumental support and active coping $r = .373$, $p < .01$), indicating that participants who use planning as one way to cope with managing their diabetes, are likely to also use instrumental support or other active coping behaviours.

Beyond the manageable aspects of the disease that benefit from an active or problem-focused approach to coping, people living with T2D are still left to cope with the emotions that come along with managing a disease (Osowiecki & Compas, 1999). People can cope with emotions a number of different ways including seeking emotional support from others reframing how they think about a problem or situation or accepting the situation they may have little control over (Finkelstein-Fox & Park, 2019).

The subscales *use of emotional support*, *positive reframing* and *acceptance* were grouped together to measure EFC. These subscales reflect a participant's likelihood to actively managing the negative feelings experienced with living T2D. Empirically, these subscales were all positively correlated with one another (correlation between use of emotional support and positive reframing $r = .430$, $p < .01$; correlation between use of use of emotional support and acceptance r

= .130, $p < .01$; correlation between positive reframing and acceptance $r = .283$, $p < .01$), indicating that participants who reach out for emotional support as one way to cope with managing their emotions are likely to reframe their mindsets about their current situation or learn to be more accepting of their diabetes management.

Being diagnosed with or living with chronic stress associated with diabetes can cause anxiety, stress, and worry. For some living with the disease, these worries can lead them to actively avoid their situation all together (Nash, 2013). Ways to avoid stress can include self-distraction such as looking to other activities such as turning to work or watching TV, venting negative emotions to others, or by giving up on dealing or coping with the situation all together.

The subscales *self-distraction*, *venting* and *behavioural disengagement* were grouped together to measure AVC. These subscales reflect a participant's likelihood to actively avoid managing the problems or negative feelings experienced with living T2D. Empirically, these subscales were all strongly positively correlated with one another (correlation between self-distraction and behavioural disengagement $r = .349$, $p < .01$; correlation self-distraction and venting $r = .451$, $p < .01$; correlation venting and behavioural disengagement $r = .337$, $p < .01$), indicating that participants who reach out to express their emotions to others, distract themselves from the stress of diabetes to avoid managing their emotions or obstacles associated with managing their diabetes, are likely to vent their emotions to others or give up on coping.

Quality of Life

QOL was measured using the Health-Related Quality of Life (HRQOL) instrument that has been used extensively across health research (Cieza & Stucki, 2005). Research using this measure has established a strong validity and reliability across many health circumstances (e.g. Vaske et al., 2017). The HRQOL is a measure made up of 14 items to assess various aspects of

QOL. In this research, I focused on 3 dimensions of QOL that are assessed by the HRQOL. First, *self-rated general health* was assessed with a single question: "Would you say that in general your health is: Excellent, Very good, Good, Fair or Poor?". Self-rated general health is widely used across the health literature and has been determined to be a valid measure of general health (Moriarty et al., 2003). Second, *physical health* was assessed with the question: "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?" Finally, *mental health* was assessed with the question: "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" (see Appendix A). Using multiple measures to assess QOL provides comprehensive data on health and well-being. The HRQOL is an appropriate measure for this current study because it can help to assess a broad variety of QOL aspects for people living with T2D (Zimbudzi et al., 2017).

Data Analysis

I ran three parallel multiple mediation analyses using PROCESS, model 4 (Hayes, 2018) to determine the mediating effects of PFC, EFC and AVC on the relationship between hours per week spent playing organized sport and QOL. Hayes (2018) defines mediation analysis as a statistical analysis that examines the relationship between two or more variables, and how the effect of one variable can be divided into direct and indirect effects through one or more additional mediating variables. Parallel multiple mediation explores potential mediators that are not causally related. This analysis tested the direct and indirect pathways between history of participation in organized sport (x) and each indicator of QOL (y), and the mediating effects of PFC (m1), EFC (m2) and AVC (m3).

Chapter 3: Results

Preliminary Analysis and Outliers

Before conducting the analysis, I screened the data for potential outliers and invalid responses. I collected a total of 481 responses, however, 26 responses needed to be excluded for several different reasons. First, 15 participants did not complete the survey. By not reaching the end of the survey, those participants were not compensated as directed in the consent form. Second, two participants answered "no" to the quality control question which asked whether they answered all of the questions honestly. Third, two participants did not record an answer for hours spent playing sport during adolescence and were removed from the analysis. Fourth, I screened for univariate outliers by analyzing z-scores of observed variables including hours, coping scores and QOL measures including self-rated general health, physically unhealthy days, and mentally unhealthy days. I also screened for multivariate outliers by analyzing Mahalanobis distance of participants' responses. Six participants had z-scores of reported hours greater than 3.2, and one participant had a z-score of AVC greater than 3.2 (and two of those participants had a Mahalanobis distance greater than 18.4, $\chi 2$ [*4*] = 18.4, $p < .001$). These participants were removed from the sample. The final sample size analyzed in this study was $n = 455$.

Descriptive Statistics and Correlations

The sample ($n = 455$) consisted of participants identifying as male ($n = 227$, 49.9%), female ($n = 222$, 48.8%), and non-binary ($n = 4$, 0.9%). Two participants did not report a gender (0.4%). A majority of the sample identified as white (80.7%), and additional ethnicities reported in the sample included black (5.9%), South Asian (4.0%) and Latin American (2.0%). The most popular sports participated in were football, basketball, soccer, and "other" (see Figure 2). Descriptive statistics of the observed variables are reported in Table 1.

Bivariate analyses were conducted to examine the intercorrelations of the observed variables (see Table 2). Hours spent playing organized sport was negatively associated with mentally unhealthy days (r = -.120, p =.010) and positively associated with self-rated general health (r = .124, p = .008). Hours spent playing organized sport was also positively associated with EFC (r = .100, p = .032 and PFC (r = .122, p = .009). The most significant association found in this analysis was the relationship between PFC and EFC (r = .640, p < .001).

Table 1

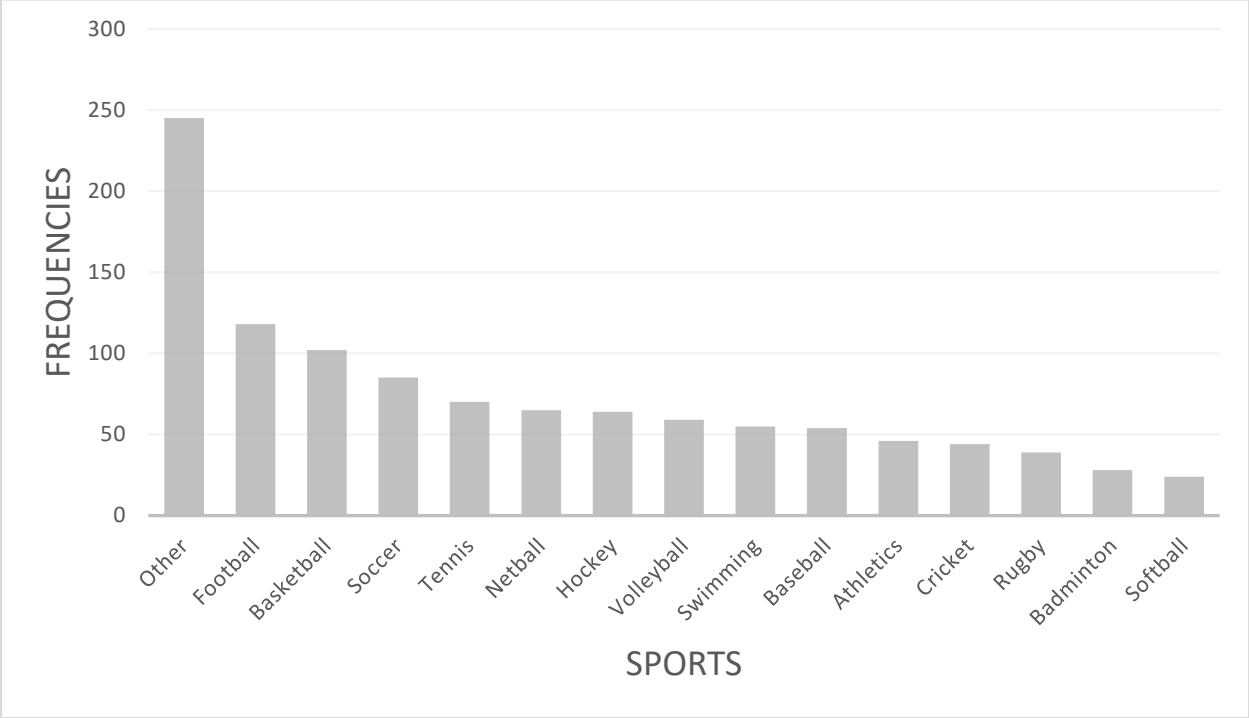
Summary of Descriptive Statistics of Observed Variables

	Min	Max	Mean	S.D.	Skewness	Kurtosis
Hours	0	21	5.90	4.91	1.04	0.75
PFC	1.00	4.00	2.59	0.67	-0.05	-0.37
EFC	1.00	4.00	2.46	0.60	0.18	-0.41
AVC	1.00	3.83	1.87	0.61	0.73	0.21
General Health	1.00	5.00	2.57	0.99	0.22	-0.41
Mentally Unhealthy Days	0	30	10.32	10.54	0.77	-0.85
Physically Unhealthy Days	0	30	8.75	10.40	1.11	-0.26

Note. n = 455. Problem-focused coping (PFC), emotion-focused coping (EFC), avoidance coping (AVC).

Figure 2

Frequency of Sports Played



Regression Assumptions

Five assumptions must be met before analyzing a multiple regression analysis, and in turn a mediation analysis (Hayes, 2018). These assumptions are: (1) established linear relationship between variables, (2) normally distributed residual error, (3) absence of multicollinearity between independent variables, (4) absence of autocorrelation within residual error, and (5) homoscedasticity of residual error (Field, 2017).

Each of the assumptions necessary for a multiple regression analysis was tested as follows. First, scatter plots comparing the relationships between PFC, EFC, AVC, hours and QOL independently of one another were observed to determine that the relationships between variables were linear. After observing the scatter plots, I determined that the relationships between each of the variables were linear. Second, an exploratory and descriptive analysis was run to determine normality of distribution of residual error which determined that residual error was normally distributed as observed in a scatter plot. Third, no significant multicollinearity between independent variables was observed in the bivariate correlation analysis as indicated by variance inflation factor (VIF) scores ranging from 1.02 to 1.78. According to Field (2017), values less than 10 indicate little-to-no multicollinearity. Fourth, I determined that there was no autocorrelation within the residuals as indicated by a Durbin-Watson value of 2.014. Finally, homoscedasticity was present between the independent variables and dependent variable as indicated by scatter plots of the regression analysis.

Table 2.

Summary of Intercorrelations of Observed Variables

	1	**2**	**3**	**4**	**5**	**6**
1. Hours				.		
2. PFC	.122**					
3. EFC	.100*	.638**				
4. AVC	.011	.039	.155**			
5. Mentally Unhealthy Days	-.120*	-.137**	-.199**	.352**		
6. Physically Unhealthy Days	-.027	-.124**	-.106*	.220**	.442**	
7. General Health	.124**	.207**	.250**	-.194**	-.445**	-.607**

Note. n = 455. *$p \leq .05$. **$p \leq .01$. Problem-focused coping (PFC), emotion-focused coping (EFC), avoidance coping (AVC)

Main Analysis

I tested the hypothesis that hours spent participating in organized sport during adolescence would be associated with QOL as mediated by PFC, EFC and AVC using PROCESS, Model 4 (Hayes, 2013). Confidence intervals were reported using unstandardized estimates. Results were calculated using 5000 bootstrap samples and are visually displayed in Figure 3, and a summary of mediation analyses is displayed in Table 3.

Hypothesis 1: Hours participating in organized sport was positively associated with self-rated general health β = .026, *p* = .008, 95% *CI* [.007, .045]. Hours participating in organized sport was not associated with physically unhealthy days β = -0.059, *p* = .571, 95% *CI* [-.263, .145]. Hours participating in organized sport was negatively associated with mentally unhealthy days β = -0.269, *p* = .010, 95% *CI* [-.474, -.064].

Hypothesis 2A: Hours participating in organized sport was positively associated with PFC β = 0.017, *p* = .009, 95% *CI* [.004, .030].

Hypothesis 2B: Hours participating in organized sport was positively associated with EFC β = 0.013, *p* = .032, 95% *CI* [.001, .024].

Hypothesis 2C: Hours participating in organized sport was not associated with AVC β = 0.001 *p* = .821, 95% *CI* [-.011, .013].

Hypothesis 3A: PFC was not associated with self-rated general health β = 0.067, *p* = .432, 95% *CI* [-.100, .235]. PFC was not associated with reported physically unhealthy days β = -1.144, *p* = .219, 95% *CI* [-2.970, 0.681]. PFC was not associated with reported mentally unhealthy days β = 0.490, *p* = .576, 95% *CI* [-1.228, 2.007].

Hypothesis 3B: AVC was negatively associated with self-rated general health β = -0.379 p < .001, 95% *CI* [-.520, -.237]. AVC was positively associated with reported physically unhealthy days β = 4.001, *p* < .001, 95% *CI* [2.463, 5.539]. AVC was positively associated with reported mentally unhealthy days β = 6.733, *p* < .001, 95% *CI* [5.286, 8.180].

Hypothesis 4A: There was no significant indirect effect of PFC on the relationship between sport history and self-rated general health β = 0.001, 95% CI [-.002, .005]. There was no significant indirect effect of PFC on the relationship between sport history and physically unhealthy days β = -0.020, 95% CI [-0.063, 0.017]. There was no significant indirect effect of PFC on the relationship between sport history and mentally unhealthy days β = 0.009, 95% CI [-0.023, 0.046].

Hypothesis 4B: There was no significant indirect effect of AVC on the relationship between sport history and self-rated general health β = -.001, 95% CI [-.005, .004]. There was no significant indirect effect of AVC on the relationship between sport history and physically unhealthy days β = .006, 95% CI [-0.041, 0.058]. There was no significant indirect effect of AVC on the relationship between sport history and mentally unhealthy days β = .009, 95% CI [-0.069, .090].

Although no hypothesized effects were anticipated between EFC and each index of QOL, the analyses allowed me to test these relationships. First, EFC was positively associated with self-rated general health β = 0.408, *p* < .001, 95% *CI* [.220, .597]. EFC was not associated with reported physically unhealthy days β = -1.640, *p* =.117, 95% *CI* [-3.692, .414]. EFC was negatively associated with reported mentally unhealthy days β = -4.757, *p* < .001, 95% *CI* [-6.688, -2.826]. Second, there was a significant indirect effect of EFC the relationship on between sport history and self-rated general health β = 0.005, 95% CI [.001, .011]. There was no

significant indirect effect of EFC on the relationship between sport history and physically unhealthy days β = -0.021, 95% CI [-0.061, -0.006]. There was a significant indirect effect of EFC on the relationship between sport history and mentally unhealthy days β = -.061, 95% CI [-0.127, -0.007].

Table 3.

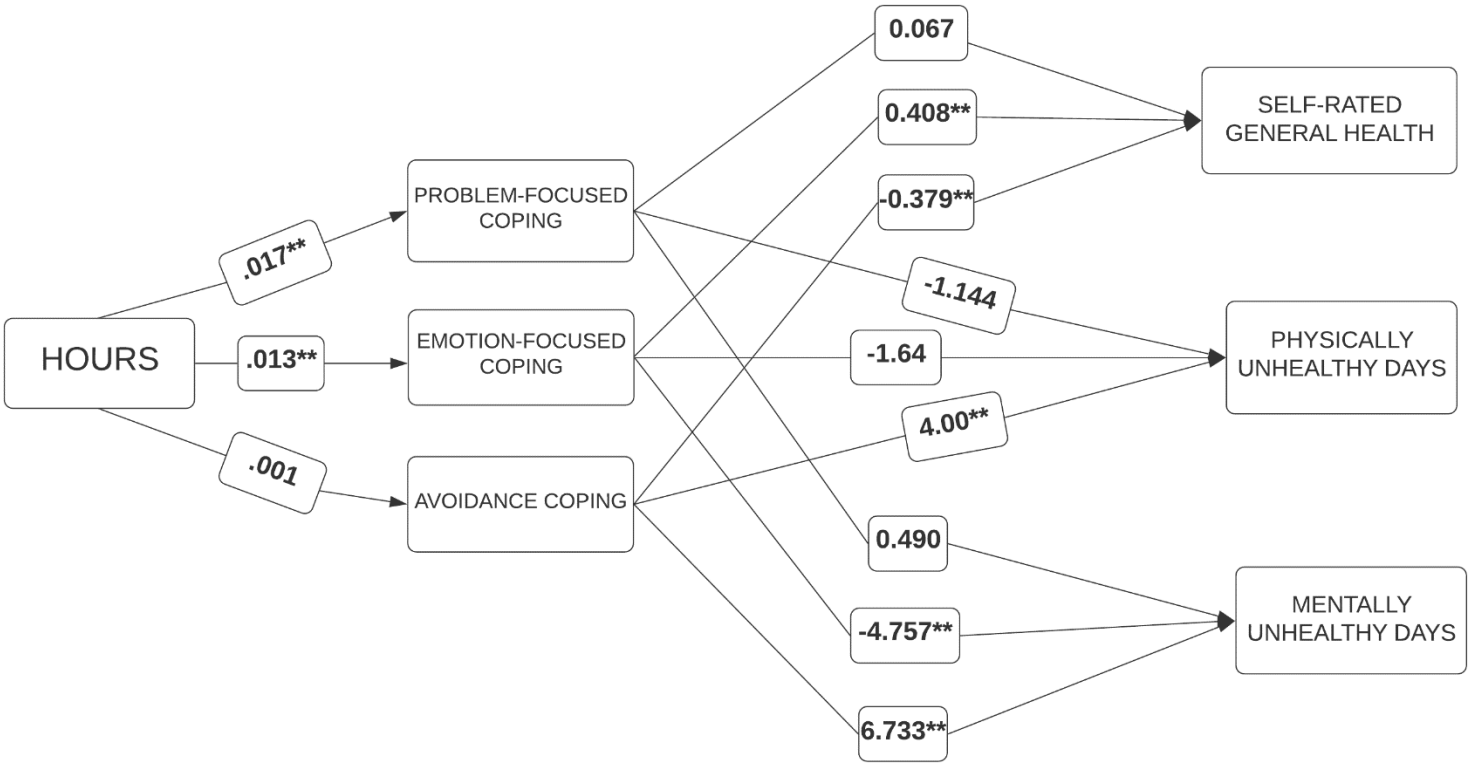
Unstandardized Estimates of Total, Direct and Indirect Effects With 95% Biased-Corrected Bootstrap Confidence Intervals

Paths	**Total Effect**		**Direct Effect**		**Indirect Effect**	
	β	95% CI	β	95% CI	β	95% CI
Hours → General Health	.026*	[.007, .045]	.020*	[.002, .038]		
PFC					.001	[-.002, .005]
EFC					.005*	[.001, .011]
AVC					-.001	[-.005, .004]
Hours → Unhealthy days (Mental)	-.269**	[-.474, -.064]	-.226**	[-.413, -.039]		
PFC					.009	[-.023, .046]
EFC					-.061*	[-.127. -.007]
AVC					.009	[-.069, .090]
Hours → Unhealthy days (Physical)	-.059	[-.263, .145]	-.024	[-.223, .175]		
PFC					-.020	[-.063, .017]
EFC					-.021	[-.061, .006]
AVC					.006	[-.041, .058]

Note. n = 455. *$p \leq .05$. **$p \leq .01$. Problem-focused coping (PFC), emotion-focused coping (EFC), avoidance coping (AVC)

Figure 3

Complete mediation model showing associations between hours of sport participation, coping methods, and quality of life dimensions.



Note. *$p \leq .05$. **$p \leq .01$. Coping methods include: Problem-Focused Coping (PFC), Emotion-Focused Coping (EFC) and Avoidance Coping (AVC). Values represent unstandardized regression coefficients. Pathways directed to quality of life dimensions were ran as separate mediation analysis (e.g. HOURS, PFC, EFC, AVC, self-rated general health). Direct pathways between hours and QOL dimensions are not shown.

Exploratory Analysis

Participants responded to items that reflected their sport participation history which, in addition to hours participating in sport, included the degree they identified as an athlete during adolescences on a scale from 1 – 7 using the Athletic Identity Measurement Scale (Brewer & Cornelius 2001). I also explored the level of sport that they played on a scale from 1 – 4 ranging from recreational to professional. I conducted multiple regression and mediation analyses to explore the relationships between these variables and the extent to which the individuals engaged in PFC, EFC and AVC to cope with managing T2D, and their current QOL living with T2D. I analyzed the mediating effect of PFC, EFC and AVC on the relationship between athletic identity and competition level and the three dimensions of QOL: self-rated general health, mentally unhealthy days, and physically unhealthy days (see Figures 4 and 5 and Tables 4 and 5).

Athletic Identity was positively associated with self-rated general health $\beta = 0.064$, $p = .003$, 95% *CI* [0.021, 0.107], negatively associated with mentally unhealthy days $\beta = -0.631$, $p = .005$, 95% *CI* [-1.070, -0.192] but, not associated with physically unhealthy days $\beta = -0.096$, $p = .689$, 95% *CI* [-0.563, 0.372]. Athletic identity was positively associated with PFC $\beta = 0.060$, $p < .001$, 95% *CI* [.030, .090] and EFC $\beta = 0.065$, $p < .001$, 95% *CI* [.038, .091] but, not associated with AVC $\beta = 0.018$ $p = .212$, 95% *CI* [-.010, .045].

PFC was not associated any of the dimensions of quality of life including self-rated general health $\beta = 0.066$, $p = .432$, 95% *CI* [-.100, .235], physically unhealthy days $\beta = -1.139$, $p = .220$, 95% *CI* [-2.962, 0.685] or, mentally unhealthy days $\beta = 0.478$, $p = .584$, 95% *CI* [-1.234, 2.189]. EFC was positively associated with self-rated general health $\beta = 0.378$, $p < .001$, 95% *CI* [.189, .567], negatively associated with reported mentally unhealthy days $\beta = -4.462$, $p < .001$,

95% *CI* [-6.403, -2.520] but, not associated with reported physically unhealthy days β = -1.591, *p* =.131, 95% *CI* [-3.660, 0.478]. AVC was negatively associated with self-rated general health β = -0.385 p < .001, 95% *CI* [-.525, -.244], positively associated with reported physically unhealthy days β = 4.010, *p* < .001, 95% *CI* [2.471, 5.550] and, positively associated with reported mentally unhealthy days β = 6.793, *p* < .001, 95% *CI* [5.349, 8.237].

There was no significant indirect effect of PFC on the relationship between athletic identity and any of the three dimensions of QOL including self-rated general health β = 0.004, 95% CI [-.007, .015], physically unhealthy days β = -0.068, 95% CI [-0.206, 0.054] or, mentally unhealthy days β = 0.029, 95% CI [-0.078, 0.154].

There was a significant indirect effect of EFC the relationship on between athletic identity and self-rated general health β = 0.024, 95% CI [.010, .044] and on the relationship between athletic identity and mentally unhealthy days β = -.288, 95% CI [-0.484, -0.129]. There was no significant indirect effect of EFC on the relationship between athletic identity and physically unhealthy days β = -0.103, 95% CI [-0.268, 0.036].

There was no significant indirect effects of AVC on the relationship between athletic identity and any of the three dimensions of QOL including self-rated general health β = -.007, 95% CI [-.018, .004], physically unhealthy days β = .071, 95% CI [-0.042, 0.201] or, mentally unhealthy days β = .120, 95% CI [-0.077, .323].

Competition Level. I repeated the analysis above replacing athletic identity with the highest level of competition participants achieved. Competition level was positively associated with self-rated general health β = 0.098, *p* = .029, 95% *CI* [0.010, 0.186], negatively associated with mentally unhealthy days β = -1.108, *p* = .016, 95% *CI* [-2.008, -0.208] but, not associated with

physically unhealthy days β = -0.117, *p* = .810, 95% *CI* [-1.074, 0.840]. Competition level was positively associated with PFC β = 0.099, *p* < .001, 95% *CI* [.037, .161] and positively associated with EFC β = 0.072, *p* = .012, 95% *CI* [.016, .127], but not associated with AVC β = 0.040 *p* = .175, 95% *CI* [-.018, .097].

PFC was not associated with any of the dimensions of QOL including self-rated general health β = 0.063, *p* = .462, 95% *CI* [-.105, .231], physically unhealthy days β = -1.139, *p* = .222, 95% *CI* [-2.970, 0.690] or, mentally unhealthy days β = 0.538, *p* = .016, 95% *CI* [-1.183, 2.258].

EFC was positively associated with self-rated general health β = 0.410, *p* < .001, 95% *CI* [.221, .598], negatively associated with reported mentally unhealthy days β = -4.771, *p* < .001, 95% *CI* [-6.701, -2.841] but, not associated with reported physically unhealthy days β = -1.641, *p* =.117, 95% *CI* [-3.693, 0.412].

AVC was negatively associated with self-rated general health β = -0.387 p < .001, 95% *CI* [-.528, -.246], positively associated with reported physically unhealthy days β = 4.011, *p* < .001, 95% *CI* [2.470, 5.552], and positively associated with reported mentally unhealthy days β = 6.828, *p* < .001, 95% *CI* [5.379, 8.277].

There was no significant indirect effect of PFC on the relationship between competition level and any of the three dimensions of QOL including self-rated general health β = 0.006, 95% CI [-.012, .025], physically unhealthy days β = -0.113, 95% CI [-0.362, 0.079] or, mentally unhealthy days β = 0.053, 95% CI [-0.129, 0.273].

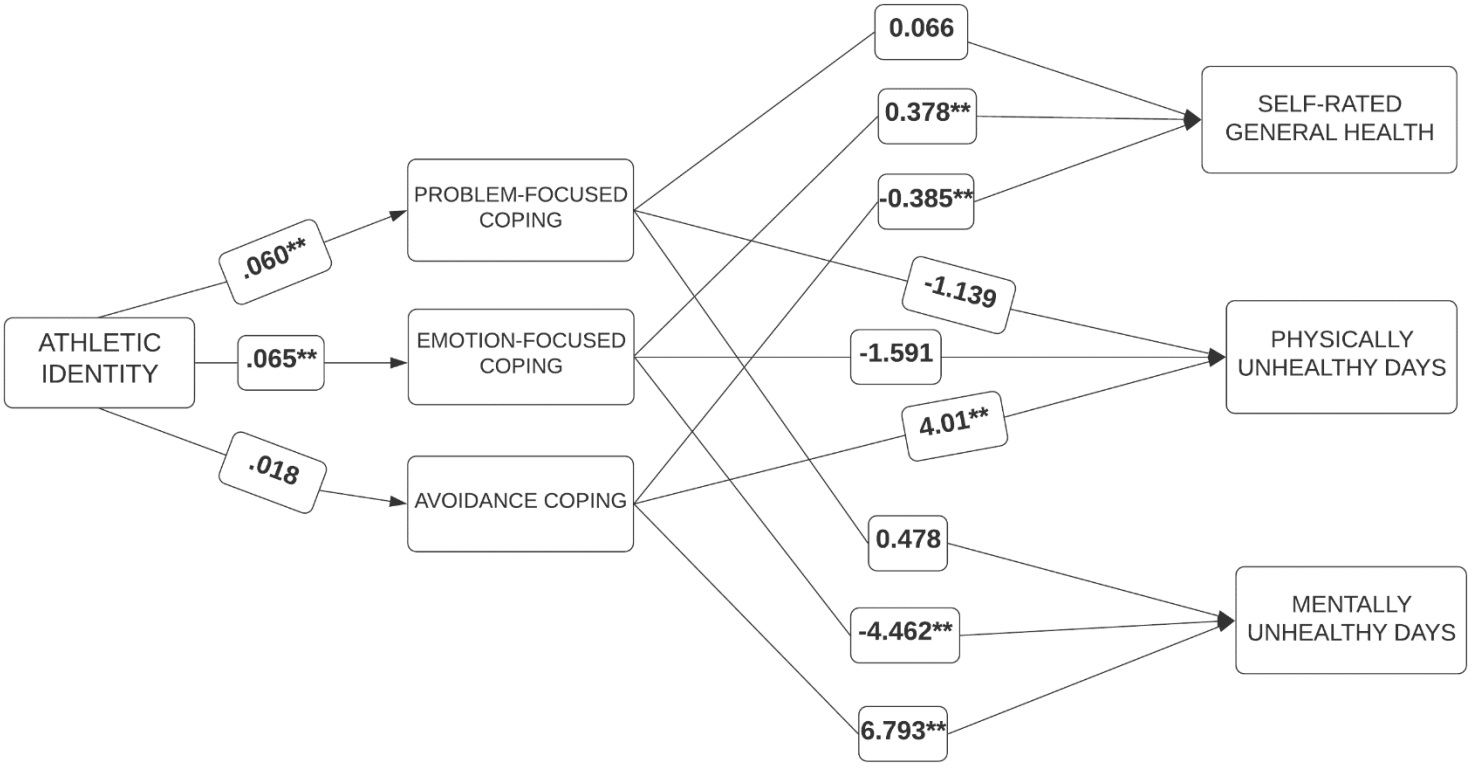
There was a significant indirect effect of EFC the relationship on between competition level and self-rated general health β = 0.029, 95% CI [.004, .059] and on the relationship between competition level and mentally unhealthy days β = -0.342, 95% CI [-.675, -.048]. There

was no significant indirect effect of EFC on the relationship between competition level and physically unhealthy days β = -0.117, 95% CI [-0.330, 0.038].

There was no significant indirect effect of AVC on the relationship between competition level and any of the three dimensions of QOL including self-rated general health β = -0.015, 95% CI [-0.044, 0.009], physically unhealthy days β = 0.160, 95% CI [-0.088, 0.456] or, mentally unhealthy days β = 0.272, 95% CI [-0.153, 0.724].

Figure 4

Complete mediation model showing associations between athletic identity, coping methods and quality of life dimensions.



Note. *$p \leq .05$. **$p \leq .01$. Coping methods include: Problem-Focused Coping (PFC), Emotion-Focused Coping (EFC) and Avoidance Coping (AVC). Values represent unstandardized regression coefficients. Pathways directed to QOL dimensions were ran as separate mediation analysis (e.g. ATHLETIC IDENTITY, PFC, EFC, AVC, self-rated general health). Direct pathways between athletic identity and QOL dimensions are not shown.

Table 4

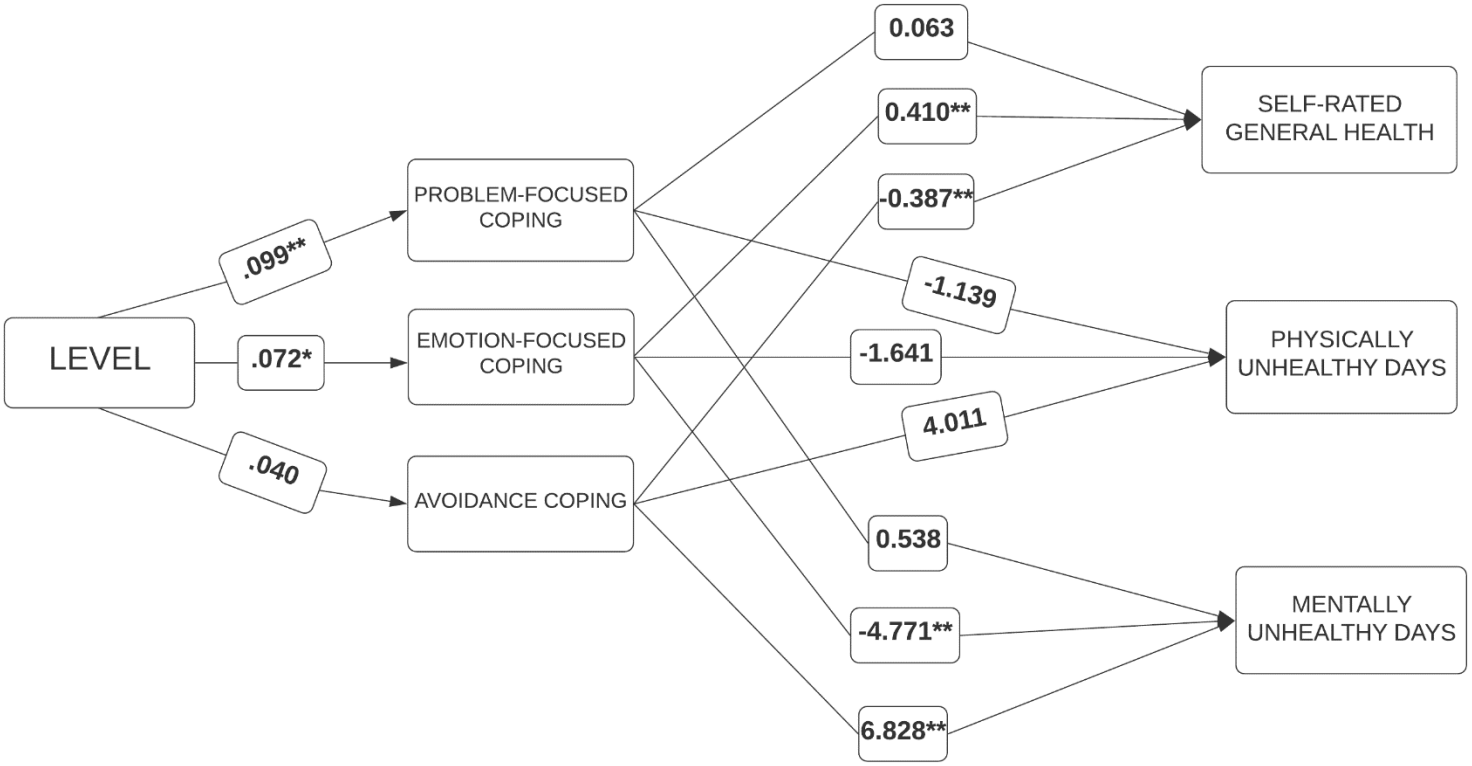
Unstandardized Estimates of Total, Direct and Indirect Effects With 95% Biased-Corrected Bootstrap Confidence Intervals

Paths	**Total Effect**		**Direct Effect**		**Indirect Effect**	
	β	95% CI	β	95% CI	β	95% CI
Identity → General Health	.086**	[.042, .128]	.064**	[.021, .107]		
PFC					.004	[-.007, .015]
EFC					.024*	[.010. .044]
AVC					-.007	[-.018, .004]
Identity → Unhealthy days (Mental)	-.771**	[-1.242, -.300]	-.631**	[-1.070, -.193]		
PFC					.029	[-.078, .154]
EFC					-.288*	[-.484, -.129]
AVC					.120	[-.078, .317]
Identity → Unhealthy days (Physical)	-.196	[-.666, .274]	-.096	[-.563, .372]		
PFC					-.068	[-.206, .054]
EFC					-.103	[-.268, .036]
AVC					.071	[-.042, .201]

Note. n = 455. *$p \leq .05$. **$p \leq .01$. Problem-focused coping (PFC), emotion-focused coping (EFC), avoidance coping (AVC)

Figure 5

Complete mediation model showing associations between competition level, coping methods and quality of life dimensions.



Note. *$p \leq .05$. **$p \leq .01$. Coping methods include: Problem-Focused Coping (PFC), Emotion-Focused Coping (EFC) and Avoidance Coping (AVC). Values represent unstandardized regression coefficients. Pathways directed to QOL dimensions were ran as separate mediation analysis (e.g. LEVEL, PFC, EFC, AVC, self-rated general health). Direct pathways between competition level and QOL dimensions are not shown.

Table 5

Unstandardized Estimates of Total, Direct and Indirect Effects With 95% Biased-Corrected Bootstrap Confidence Intervals

Paths	**Total Effect**		**Direct Effect**		**Indirect Effect**	
	β	95% CI	β	95% CI	β	95% CI
Level → General Health	0.118*	[.026, .210]	0.098*	[.010. .186]		
PFC					.006	[-.012, .025]
EFC					.029	[.004, .059]
AVC					-.015	[-.044, .009]
Level → Unhealthy days (Mental)	-1.125*	[-2.108, -0.141]	-1.108*	[-2.008, -.208]		
PFC					.053	[-.129, .273]
EFC					-.342*	[-.675, -.048]
AVC					.272	[-.128, .741]
Level → Unhealthy days (Physical)	-0.187	[-1.164, 0.789]	-0.117	[-1.074, .840]		
PFC					-.113	[-.362, .079]
EFC					-.117	[-.330, .038]
AVC					.160	[-.088, .456]

Note. n = 455. *$p \leq .05$. **$p \leq .01$. Problem-focused coping (PFC), emotion-focused coping (EFC), avoidance coping (AVC)

Chapter 4: Discussion

Does playing sport at a young age prepare people to cope with adversity later in life such as managing T2D? In turn, do the coping skills learned in organized sport have any effect on QOL for those living with T2D? The current study set out to answer these research questions and found that playing organized sport during adolescence predicted higher levels of PFC and EFC to cope with managing T2D. In turn, using EFC to cope with managing T2D predicted better QOL in terms of general health and mental health. These findings offer new insights into possible effects of sport participation as they relate to coping with diabetes and provide insight into future research and sport promotion among youth.

Participation in Organized Sport and Quality of Life

It is well documented that being physically active, and engaging in a fun, social environment, such as sport, has a positive effect on QOL (Eime et al., 2013; Oja et al., 2014). The findings of this study supported this documented association: hours spent participating in organized sport was associated with an increase in self-rated general health, and fewer mentally unhealthy days.

Research exploring QOL outcomes associated with playing sport has found that time spent playing sport is predictive of decreased stress and depression, and improved self-esteem, healthy behaviours, and continued physical activity (Belanger et al., 2012; Eime et al., 2013; Oja et al., 2014). Such outcomes may be associated with the emotional regulation, emotional self-efficacy, positive affect, and life satisfaction that are promoted through sport (Eime et al., 2013). Positive experiences with coaches, skill development, and support from peers are all contributors to positive mental health (Eime et al., 2013). Participants in the current study may have shared similar positive experiences during their time playing organized sport that can have long-lasting

effects (Stracciolini et al., 2020) which may be associated with positive general health and mental health for people living with T2D.

However, there was no evidence of association between hours spent participating in organized sport and physical health. This was surprising, given the research that has pointed to the general and physical health benefits of participating in sport in the general population and chronic illness contexts (Belanger et al., 2012; Dean et al., 2013; Omorou et al., 2013). A previous study also found an association between participation in sport by women and long-term physical health outcomes, such as decreased hypertension, obesity, and hypercholesterolemia (Stracciolini et al., 2020).

Ultimately, my first hypothesis was only partially supported. Hours spent participating in organized sport was associated with a higher self-rated general health, and fewer mentally unhealthy days; there was no evidence of association between hours spent participating in organized sport and physical health. Interestingly, the associations between hours spent playing sport and the positive general and mental health outcomes for people living with T2D lasted over time. The mean age of the sampled population was 46.5 years, therefore the average participant living with T2D had played organized sport more than thirty years ago. Results from this study provide further evidence of positive health outcomes from playing sport may last over time. Participants who played organized sport more thirty years ago, may be continuing to experience the positive health benefits, and learning coping strategies through sport during formative years may help to explain how these associations continue to last.

Participation in Organized Sport and Coping

Participants who played organized sport during adolescence reported a greater use of PFC and EFC to cope with managing their diabetes; however, there was no evidence of an association

found between hours spent playing sport and AVC. Therefore, hypotheses 2A and 2B were supported, but hypothesis 2C was not supported. Participants would have faced a variety of stressors growing up playing organized sport (Gould et al., 2007). By participating in structured and supportive environment, youth develop the social and psychological skills to use PFC and EFC strategies to cope with these stressors. One factor that is crucial to organized sport are coaches, who foster a supportive environment and directly teach young athletes life skills they can use to manage stress within and outside of playing their sport (Nicholls & Polman, 2007).

Research has pointed to PFC strategies such as planning a routine, thinking of active ways they can make their situation better, and reaching out for instrumental support from teammates or coaching that are associated with stress reduction in athletes (Crocker et al., 2015). Coaching is an integral facet of organized sport and research has shown that supportive coaching is a predictor of using more PFC strategies in high-level competition (Nicolas, et al., 2011). Moreover, athletes who have learned PFC strategies such as logical analysis, problem-solving, and visualization techniques can apply them in high stress scenarios such as coping with high-level competition and adapting to in game stressors (Nicholls & Polman, 2007).

The findings of this research were consistent with the sport and coping literature (Crocker et al., 2015; Josefsson et al., 2017; Nicholls & Polman, 2007). With the help from coaches and teammates, participants may have learned different problem-solving or emotion-regulating skills to cope with the stresses of sport such as coping with a loss, an injury, and transferred those skills to coping with their T2D. According to Lazarus and Folkman (1984) “coping [is] a process that evolves from resources” (p. 158), and experiences that are had from playing organized sport can lay the groundwork to build resources that can be drawn on to cope with future stressors.

Hours spent participating in organized sport was also associated with using EFC to manage stress. Organized sport provides an environment for athletes to learn and develop these skills from their teammates and coaches, and provides opportunity to practice these skills (Crocker, et al., 2015). According to social learning theory (Bandura, 1977), people learn by watching others, through direct instruction and personal experience. Athletes learn life skills involved in EFC, such as emotional regulation, through cognitive reframing and reaching out to friends and family for emotional support. Through a combination of direct instruction from coaches, watching their teammates, and practicing their skills in day-to-day life, athletes learn and develop personal resources to cope with stress (Crocker et al., 2015). Given the inherit demands of sport, athletes must cope with the negative emotions brought on by stress in addition to problem-solving strategies they use to manage controllable stressors. Athletes manage their emotions a number of ways, including reaching out for emotional support from coaches and teammates, using positive self-talk or mindfulness techniques (Heisler et al., 2010, Gregg et al., 2007). Coaches directly teach these emotional-regulation techniques to help athletes cope (Gould et al., 2007). Moreover, time spent with friends and teammates may contribute toward the development of adolescents' social skills, which may help them reach out to others for help when faced with adversity (Gould et al., 2007). The findings of the current study were therefore consistent with coping and sport literature (Crocker et al., 2015; Nicholls & Polman, 2007).

Hours spent playing sport was expected to be predictive of lower levels of AVC. With the opportunities to learn and develop PFC and EFC skills that organized sport provides, I predicted that participants would engage in less AVC. Participants reported using more PFC (mean = 2.6) and EFC (mean = 2.5) strategies compared to AVC (mean = 1.9), however, there was no evidence to support an association between hours spent playing sport and using AVC to cope

with T2D. Lifespan development research and coping literature has established that development is associated with how people cope with stress (Nicholas et al., 2005). It is important to differentiate how children cope with stress, from the manner teens and adults cope with stress (Skinner & Zimmer-Gembeck, 2007). Lifespan development and coping research suggests children and young adolescents perceive and appraise stressful events differently depending on the social-cognitive resources available through maturation and development (Amirkhan & Auyeung, 2007; Nicholas et al., 2005; Skinner & Zimmer-Gembeck, 2007).

Following a literature review of coping in adolescent sport, Nicholas and colleagues (2005) concluded that young children (ages 6 – 11) prefer to use more EFC and AVC strategies after a negative event, and use PFC following a positive event. As children age into middle-aged adolescents (ages 15 – 18), they tend to use more PFC, EFC strategies, and will use AVC occasionally based on the situation at hand where there is little control or emotional resources at hand (Nicholas et al., 2005). This suggests that as adolescents mature, they begin to engage in the transactional process put forward by Lazarus and Folkman (1984). In short, young athletes turn to behavioural efforts based on the social and cognitive resources available to them at their age. One study reviewed by Hoar (2003 as cited in Nicholas et al., 2005) demonstrated that adolescents prefer some strategies classified as AVC including mental disengagement and isolating activities.

It is unclear how AVC skills are directly taught to young athletes in organized sport. For the purpose of this study, AVC was categorized as self-distraction, venting and behavioural disengagement. Participants may not have been taught avoidance skills as directly and deliberately as goal setting, time-management and planning a routine or positive reframing and seeking emotional support in the same way as learning how to take a step back and disengage

when things outside of their control are not going well. There is little research on direct teaching of AVC strategies in sport. However, sport and coping research has identified that athletes commonly turn to AVC to disengage with in-game stressors such as a bad call by a referee or an unforced error in play (Bahramizade & Besharat, 2010; Nichols & Polman, 2007). Little is known how adaptive AVC strategies are directly taught and may transfer to other life domains such as living with diabetes.

The null findings may be explained by lifespan development and coping in sport literature which suggests that children and young adolescents do not yet have the social or cognitive capacity to appraise AVC as an adaptive strategy to cope with stress. Therefore, participants who played organized sport during adolescence may not have built the social or cognitive resources to develop AVC skills to cope with stress or maintain those skills and transfer it to other aspects of life such as developing T2D later in life. While many adult athletes report using AVC to cope with in-game stressors (Nicholls & Polman, 2007), more research is needed into the development of AVC strategies in sport, and how they may transfer to other aspects of life.

Coping and Quality of Life for People Living with T2D

This research explored the relationship between coping strategies and their associations with the QOL of people living with T2D. Based on the theoretical background of the work of researchers such as Lazarus (1987) and Carver (1997), this model tested if coping strategies were associated with QOL.

Living with a chronic illness is difficult. Those living with diabetes face a number of daily stressors that need to be managed including diet, medication, medical appointments, in addition to the chronic stress associated with living with the disease (Carolan et al., 2014). Most

people who develop T2D develop their illness later in life. According to Diabetes Canada (2021), the average patient diagnosed with T2D is around age 40. Most people who develop T2D have not lived with a chronic illness before and are faced with a change in lifestyle (Carolan et al., 2014). Initially, people newly diagnosed with T2D experience fear and uncertainty. For some, it is their first experience with a medical setting which can be scary, all while continuing to manage daily living such as their career, parenting, and education, among other daily living activities (Carolan et al., 2014). Managing diabetes and stressors of active daily living can be exhausting, and people living with T2D need to cope (Seo et al., 2020). Research has shown that living with a chronic illness, such as T2D, is associated with a lower QOL, compared to those who do not have a chronic illness (Rubin & Perot, 1999). Being able to cope with managing T2D using PFC and EFC strategies has been associated with higher levels of QOL, while AVC has been shown to be associated with lower levels of QOL (Amoako & Skelly, 2007; Lowe et al., 2008).

This study found no evidence to support the hypothesis that PFC is associated with greater QOL. Previous research has identified positive relationships between PFC strategies and QOL for people living with T2D. For example, access to diabetes self-management education, problem-solving skills interventions, and cognitive behavioural therapy have been shown to be predictive of an increase in QOL (Amoako & Skelly, 2007; Erdles-Kass et al., 2018; Lowe et al., 2008; Snoek et al., 2008). One possible explanation to understand the lack evidence of the association between PFC and QOL is that this study was conducted during the COVID-19 pandemic. The pandemic created a number of obstacles when using PFC strategies. There has been a shift in the way people managing a chronic illness are able to receive care from medical professionals. Appointments have been reduced or switched to virtual platforms where those

seeking support may feel like they have little control over the situation. Opportunity to use PFC strategies such as seeking out instrumental support from medical professionals or taking direct action to make a change in the way they are currently managing their illness were limited. Moreover, those living with T2D are at a higher risk of severe illness from contracting the virus compared to the general population. As a result, participants may have a more isolating experience during this pandemic and may have their diabetes well managed with medication, diet and established relationships with their doctor, but still need to manage the negative emotions that come from living with the disease, in addition to the isolating factors of the pandemic. Therefore, due to the COVID-19 pandemic, there may have been less opportunity for people to experience greater QOL from relying on PFC.

There was no association found between PFC and QOL across all three dimensions. This was a surprising finding given that Lazarus suggested PFC strategies are more adaptive when people perceive they have control over their situation, and EFC strategies are more adaptive when people perceive they have less control over the situation. The general consensus surrounding the effects of coping and chronic illness suggests using PFC to manage illnesses that are relatively controllable is a more adaptive coping mechanism. Compared to many chronic illnesses, T2D is considered a controllable disease such as being managed through diet and exercises, in addition to medication (Finkelstein-Fox & Park, 2019).

PFC employs strategies that engage in trying to actively change or take control of a stressful situation. One meta-analysis found that PFC was positively related to adjustment to illness, which saw decreased levels of stress and anxiety in people living with diabetes (Duangdao & Roesch, 2008). Additionally, markers for well-managed diabetes such as weight and glycemic control were associated with the use of PFC or approach-oriented strategies such as

planning, active coping and seeking instrumental support (Duangdao & Roesch, 2008). This suggests that PFC is helpful in managing physical health associated with the illness in addition to managing negative mental health outcomes such as depression and anxiety that is associated with high levels of stress (Finkelstein-Fox & Park, 2019). Murakami and colleagues (2020) explore the effects of coping on glycemic control with people living with T2D and found no effect of PFC on glycemic control; however, adaptive EFC such as positive reframing was associated with higher levels of glycemic control. Finkelstein-Fox and Park (2019) found evidence to support the goodness of fit theory in chronic health contexts and found that people living with a controllable illness such as T2D used more PFC strategies and in turn those coping strategies were associated with a increased QOL. In contrast, those living with a chronic illness that was perceived as less controllable used more EFC strategies, which in turn was associated with an increase in QOL.

The most interesting finding from this study was the relationship between EFC on QOL. EFC was associated with higher levels of self-rated general health and fewer mentally unhealthy days for people living with T2D. Additionally, EFC mediated the relationship between hours participating in sport and both self-rated general health and mentally unhealthy days. Research exploring coping with chronic illnesses and T2D have found that EFC is associated with lower QOL and health related outcomes (Finkelstein-Fox & Park, 2019). For example, Macrodimitris and Endler (2001) found that using EFC strategies predicted higher levels of depression and anxiety. Moreover, Duangdao and Roesch (2008) found that using EFC was associated with lower levels of glycemic control and weight management. The general consensus surrounding EFC and diabetes suggests that strategies such as seeking-emotional support, venting feelings, or

thinking more positively about a situation does not actively manage the disease and therefore is not conducive to better health (Finkelstein-Fox & Park, 2019).

Duangdao and Roesch (2008) conducted a meta-analysis exploring the effects of coping and adjustment to diabetes. After exploring over one thousand studies, results revealed that EFC was not associated with adjustment to illness overall. However, when analyzing individual subscales, EFC was negatively associated with anxiety and depression. Authors note that a large number of studies analyzed included more "active" EFC coping dimensions such as seeking social support and positive reframing, compared to other EFC that have since been categorized more frequently under AVC such as turning to drugs and alcohol or venting. In addition, using EFC and PFC together predicted higher levels of adjustment to illness. Duangdao and Roesch (2008) suggested that using EFC may be an active approach to rest and recharge personal resources, which in turn will lead to using further PFC strategies to attempt to change the situation causing stress.

The positive association between EFC and indices of QOL may also have been due to COVID-19 pandemic. As mentioned earlier, participants had limited access to using traditional PFC strategies such as doctors or pharmacy visits. This also removed a sense of control from participants, which is a central factor for using PFC (Lazarus & Folkman, 1984). In response, it is likely that participants turned to EFC such as actively seeking out emotional support or accepting the current situation to cope with managing with T2D. Managing negative emotions caused by living with T2D has been shown to be associated with decreased depression and anxiety which may predict improved mental health and general health. (Osowiecki & Compas, 1999) In combination with reduced agency to seek out active ways to cope with T2D due to the COVID-19 pandemic, it is possible that participants turned to using more EFC strategies when

they perceived to have little control over their situation which was associated with fewer reported mentally unhealthy days and higher levels of self-rated general health.

Coping with stress is not easy. Those looking to escape negative feelings they experience from stress may disengage in order to cope with their stress. In some situations, avoidance can ease negative emotions in short term situations, but it is associated with negative long-term outcomes (Kim & Duda, 2003). Researchers have suggested that avoidance coping is also associated with further stress (Heggeness et al., 2020). AVC has also been associated with long-term negative QOL outcomes such as increased acute and chronic stressors and increased depressive symptoms. The findings were consistent with the literature suggesting that AVC is associated with lower QOL outcomes (Heggeness et al., 2020). Avoiding managing T2D by not following a diet and exercise plan, not managing blood glucose, or not taking medications can lead to worsening symptoms and lower QOL outcomes (Finkelstein-Fox & Park, 2019). AVC was associated with decreased self-rated general health and an increase in both reported physically unhealthy days and mentally unhealthy days.

Finally, this study explored the mediating effect of coping on the relationship between participating in organized sport and QOL. Previous research has explored the mediating effects of coping in health contexts such as schizophrenia (Ritsner et al., 2003) and chronic illnesses (Kristofferzon, 2018). As discussed throughout this paper, organized sport has a number of positive psychological, physical, and social benefits (Gerabinis et al., 2018; Sport Manitoba, 2020). Organized sport is conducted in an environment that provides opportunity to learn and develop coping skills—the results of this study support this observation.

Following three mediation analyses, I found that coping mediated the relationship between hours and self-rated general health, and hours and mentally unhealthy days, but not

physically unhealthy days. Specifically, EFC was the only coping dimension to mediate the relationship between hours spent playing organized sport and QOL. Therefore, the results suggest that the positive effects of organized sport on the mental health and general health of people living with T2D can be explained by the EFC skills they have learned from playing sport. Those who participated in organized sport during adolescence may have learned EFC skills to manage stress and may have transferred those skills to other domains of life, such as managing their T2D, which, in turn, may have led to better mental health. Using regression analysis and cross-sectional methods means that a causal connection cannot be concluded from these results. However, the results of this study indicate that there is a correlation between participating in sport and mental health, and that this relationship can be explained by EFC. To understand this relationship, we can look to the life skill transfer model.

The life skill transfer model outlines the mechanisms to help explain how skills that are learned and developed through sport, can transfer to other life domains (Gould & Carson, 2008). Athletes' experiences during their time playing sport can affect how life skills develop, and how well these skills will transfer to other areas of life. (Gould et al., 2007). The results of my research indicate EFC mediated the effect between playing organized sports in adolescence and fewer mentally unhealthy days for people living with T2D. Participants who played sport were likely presented with opportunities to learn and develop coping skills from their coaches and the inherit demands of the sport. Those who experienced stress and negative feelings following poor game experiences such as a loss or poor performance may have learned EFC strategies from their coaches and teammates. For instance, the individual may have either reached out to teammates for emotional support, or their coach may have helped them reframe the loss into a positive learning experience. In turn, the individual may have learned EFC skills from these experiences

and applied them later in life when managing T2D. Life skill transfer can be facilitated through opportunity motivation, intention and structural support and context (Gould et al., 2007).

Limitations

This research was not without limitations. First, this study utilized a retrospective design. Participants were asked to recall to prior life events that may have happened between 4 and 60 years ago. It is likely that some participants did not record their answers with complete accuracy. Second, the survey administered to participants was self-report, meaning that it is also likely that participants could have underestimated or overestimated their responses. Third, this was a cross-sectional design that only captures a brief moment in time and cannot account for any long-term effects. Fourth, participation in organized sport was defined by hours alone. There was no data collected that accounted for any other experiences had while participating in sport that may have played a role in coping and QOL such as coaching or program development.

Future Directions

Research expanding on this study can examine specific sport contexts that may play a role in developing coping skills. Using hours to measure sport participation provided a quantity of sport participation but did not reflect the quality of sport experiences had by participants. Positive youth development research points to the factors involved in skill development such as intentionality and coaching. (Gould & Carson, 2008; Pierce et al, 2017). Education programs that are designed to intentionally teach life skills such as coping is one predictor of skill development and transfer (Gould & Carson, 2008). Intentionality refers to program designs that are intended to develop skills by creating opportunities that will increase chances of developmental outcomes (Bean et al., 2014). By measuring intentionality, researchers would be able to form stronger conclusions in determining that playing sport plays a role in developing coping skills.

In addition, researchers can look at the role and influence coach philosophies, coaching styles and the relationships coaches have with their athletes play in sport participation, coping, and QOL. Future research should explore the role of coaching, intentional programs through sport designed to teach coping skills to manage stress, and the associations with coping with diabetes. Moreover, the sample population can be expanded to include other chronic illnesses such as cancer or renal failure. The current research used cross-sectional and retrospective measures, and therefore cannot make causal claims, or determine any long-term effects. This study used a retrospective design and identified associations between experiences participants are currently living, and experiences they had early in life. Further research should observe long-term effects of sport and coping as they relate to coping with a chronic illness.

Conclusion

The Canadian Sport Policy (2012) suggests that playing sport at any level is associated with positive QOL outcomes. This premise was tested by measuring hours of sport played per week and QOL outcomes, as mediated by coping strategies. Hours spent playing sport during adolescence predicted an increase in self-rated general health, and a decrease in mentally unhealthy days. No relationship was detected between relationship between hours and physically unhealthy days. EFC was associated with fewer reported mentally unhealthy days, and greater levels of self-rated general health. EFC also mediated effect between hours and self-rated general health and mentally unhealthy days. These finding are important because they can steer research to explore the longitudinal effects of sport, coping and health.

It is important to encourage people to participate in sport from a young age for its social, psychological, and physical health benefits. This research identified that playing sport is associated with better QOL outcomes for people living with T2D, and coping was found to play

an important role in this relationship. Specifically, those who managed their emotions coping with T2D reported better QOL outcomes. These results support the life skill transfer model (Gould & Carson, 2008) which suggests that skills that are learned and developed through sport may transfer to other aspects of life. This information can guide parents and diabetes professionals to encourage sport involvement for adolescents for its role in positive youth development. Furthermore, this research can be used to inform and support policy such as the Canadian Sport Policy (2012) in its roll to continue to encourage youth sport participation. Playing sport and developing and practicing the skills used to cope with stress may provide Canadians with the skills necessary to manage with the emotional stressors of developing and managing chronic illnesses later in life, such as T2D.

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Appendix A Online Survey

(Note: University of Manitoba letterhead will be displayed at the top of each survey page).

PAGE 1

STUDY NAME:

Organized Sports, Coping and Type 2 Diabetes Study

PRINCIPAL INVESTIGATOR:
Cody Rogers, MA (Candidate)
University of Manitoba
Faculty of Kinesiology and Recreation Management
Winnipeg, MB, Canada
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This consent form, a copy of which can be printed for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

What is the purpose of this study?

We are recruiting people who are currently living with type 2 diabetes to complete an online survey. The goal of this study is to learn about people's coping strategies they've gained from playing organized sports, and if they use similar strategies to cope with managing their diabetes.

What will I be asked to do?

You will be asked to complete an online survey that asks questions about you, your time spent playing organized sports (if any), and the coping strategies you use to cope with managing your diabetes. The online survey will take approximately 10 minutes to complete. At the end of the survey, there will be a page debriefing you about a few more details of the study, including how we plan to analyze the responses.

Are there any risks or benefits if I participate?

We are aware of no risks of participating in this study. Although we are also not aware of any direct benefits to you if you participate, your participation will help us learn more about how participating in organized sports may help people cope with managing type 2 diabetes.

Will I be compensated?

To thank you for your contribution to this research project, you will be paid **£1.11**. The payment amount corresponds to wage requirements in our province of Manitoba, Canada ($11.65 CAD per hour). You will receive payment even if you choose not to answer some of the questions – however, you will need to continue to the final page of the survey in order for Prolific Academic to record your participation in this survey.

How can I see the results?

You will have the option of receiving a summary of the results once we have completed this study. If you are interested, please contact the primary investigator (at the email address above), or provide your **Prolific** email address below and we will send you the result once the study is over (which will be approximately in May 2021). Please use your Prolific email address only (it ends with "@email.prolific.ac"), and **not** your personal email address.

[] Yes, I'd like to provide my Prolific email address to receive a summary of the results.

[*Note: If the above "Yes" box is selected, the following will be displayed to the participant*:

Enter your Prolific email address here: _____]

Who else will see the research results?

The results from this study will be presented in scientific journals, book chapters, and/or at conferences and public lectures. The results will be presented in aggregate and will not focus on any individual's responses.

Will my answers be anonymous? How will they be stored?

If you choose to provide your email address for a summary of the results, it will be stored in a separate data file and will be permanently deleted after the results are distributed, which will be approximately in May 2021. To verify participation and payment, we will ask for your Prolific ID number, which will also be stored in a separate data file and will be permanently deleted after all payments have been confirmed, which will be approximately in May 2021. Before these two data files are deleted, they will be accessible only by Cody Rogers (principle investigator) and Dr. Ben Schellenberg (academic advisor to primary investigator) who have provided an Oath of Confidentiality and stored on a password-protected computer in a locked laboratory at the University of Manitoba Fort Garry Campus.

The other survey questions will not ask you any questions to identify yourself (e.g., your name, phone number) – your responses will therefore be anonymous. The anonymous data file of survey responses will be stored, indefinitely, on a university network drive, a desktop computer in a research laboratory, and on an external hard drive. These three locations are password-protected. The desktop computer and external hard drive are physically located in a locked room at the University of Manitoba Fort Garry Campus.

To facilitate open science and collaboration between researchers, the anonymized data file, or parts of the file, will be shared with other researchers or posted on public data repositories. Sharing anonymous research data is a best practice in data management and is in compliance with national research data archiving policies. It is important to emphasize that data shared in this way will be anonymous, meaning that the chances that your response could be linked back to you personally is extremely low.

Can I withdraw from this research?

You are not obligated to respond to any questions that you do not want to answer. You are also free to refuse to participate and to withdraw from the study at any time without being penalized – if you do so, we will remove your responses from all data files. However, for the Prolific Academic system to record your participation in this survey, you must continue to the last page of the survey. So, if you decide to withdraw at any point from this study, please continue to the last page of the survey by clicking the "Continue" button at the bottom of each page - you can do this even if you do not answer any questions.

It is important to note that, once you have completed the survey, you will no longer be able to withdraw from the study.

INFORMED CONSENT

Selecting "I Agree" on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

This research has been approved by the Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator at 204-474-7122 or humanethics@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

[] I AGREE TO PARTICIPATE IN THIS RESEARCH.

If you agree to participate in this study, click the "Next" button below to proceed to the survey. We strongly encourage you to print this consent page for your own records.

Press NEXT to continue to the survey!

PAGE 2

Thank you for agreeing to take part in this survey! The following online survey will ask you questions about you, your time spent playing organized sports (if any), and the coping strategies you use to cope with managing your diabetes. We ask that you answer all the questions in this survey as honestly as possible.

Press NEXT to continue to the survey!

PAGE 3 [History of Sport Participation Questionnaire]

For this first series of questions, please tell us about your experiences participating in organized sports. Importantly, please remember back to your adolescents, between the ages of 12 and 16 when answering the following questions.

A. First, please enter each sport that you have been involved in **between the ages of 12 and 16**

_____

B. Next, select the highest level of competition you achieved while playing **any of the sports** that you've listed.

- None
- Recreational/intramural
- Regional (City)
- Provincial
- National/International

C. How many years did you participate in each sport?

Sport	Years Played

D. On average, how many hours per week did you participate in organized sports between the ages of 12 and 16? ___

___

PAGE 4 [ATHLETIC IDENTITY MEASUREMENT SCALE; (Brewer& Cornelius, 2001)]

These items deal with how you identify as an athlete. Similarly to the previous questions, please think back to your adolescents between the ages of 12 – 16 when answering the following 10 items.

		Strongly Disagree						Strongly Agree
1.	I consider myself an athlete.	1	2	3	4	5	6	7
2.	I have many goals related to sport.	1	2	3	4	5	6	7
3.	Most of my friends are athletes.	1	2	3	4	5	6	7
4.	Sport is the most important part of my life.	1	2	3	4	5	6	7
5.	I spend more time thinking about sport than anything else.	1	2	3	4	5	6	7
6.	I need to participate in sport to feel good about myself	1	2	3	4	5	6	7
7.	Other people see me mainly as an athlete.	1	2	3	4	5	6	7
8.	I feel bad about myself when I do poorly in sport.	1	2	3	4	5	6	7
9.	Sport is the only important thing in my life.	1	2	3	4	5	6	7
10.	I would be very depressed if I were injured and could not compete in sport.	1	2	3	4	5	6	7

Press NEXT to continue the survey!

PAGE 5 [BRIEF COPE; CARVER, 1997]

These items deal with the ways you've been coping with the ongoing **managing your type 2 diabetes.** There are many ways to try to deal with problems. These items ask what you've been doing to cope with managing your type 2 diabetes. Obviously, different people deal with things in different ways, but we're interested in how you've been trying to deal with it. Each item says something about a particular way of coping. We want to know to what extent you've been doing what the item says. How much or how frequently. Don't answer on the basis of whether it seems to be working or not – just whether or not you're doing it. Try to rate each item separately in your mind from the others. Make your answers as true FOR YOU as you can.

To cope with managing my diabetes …		I haven't been doing this at all	I've been doing this a little bit	I've been doing this a medium amount	I've been doing this a lot
1.	…I've been turning to work or other activities to take my mind off things.	1	2	3	4

2.	…I've been concentrating my efforts on doing something about the situation I'm in.	1	2	3	4
3.	…I've been saying to myself "this isn't real."	1	2	3	4
4.	…I've been using alcohol or other drugs to make myself feel better.	1	2	3	4
5.	…I've been getting emotional support from others.	1	2	3	4
6.	…I've been giving up trying to deal with it.	1	2	3	4
7.	…I've been taking action to try to make the situation better.	1	2	3	4
8.	…I've been refusing to believe that it has happened.	1	2	3	4
9.	…I've been saying things to let my unpleasant feelings escape.	1	2	3	4
10.	…I've been getting help and advice from other people.	1	2	3	4
11.	…I've been using alcohol or other drugs to help me get through it.	1	2	3	4
12.	…I've been trying to see it in a different light, to make it seem more positive.	1	2	3	4
13.	…I've been criticizing myself.	1	2	3	4
14.	…I've been trying to come up with a strategy about what to do.	1	2	3	4
15.	…I've been getting comfort and understanding from someone.	1	2	3	4
16.	…I've been giving up the attempt to cope.	1	2	3	4
17.	…I've been looking for something good in what is happening.	1	2	3	4
18.	…I've been making jokes about it.	1	2	3	4
19.	…I've been doing something to think about it less, such as watching movies and/or TV, reading, daydreaming, or sleeping.	1	2	3	4
20.	…I've been accepting the reality of the fact that it has happened.	1	2	3	4
21.	…I've been expressing my negative feelings.	1	2	3	4
22.	…I've been trying to find comfort in my religion or spiritual beliefs.	1	2	3	4
23.	… I've been trying to get advice or help from other people about what to do.	1	2	3	4
24.	…I've been learning to live with it.	1	2	3	4
25.	…I've been thinking hard about what steps to take.	1	2	3	4
26.	…I've been blaming myself for the things that happened.	1	2	3	4
27.	…I've been praying or meditating.	1	2	3	4
28.	…I've been making fun of the situation.	1	2	3	4

PAGE 6 [Health-Related Quality of Life Measure]

For the following questions, please tell us about your daily general health experiences living with type 2 diabetes. There are no wrong answers. Please respond according to how you view your health living with diabetes right now.

1. Would you say that in general your health is
   Please Read
   a. Excellent
   b. Very good
   c. Good
   d. Fair
   e. Poor

2. Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?
   a. Number of Days _ _
   b. None

3. Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?
   a. Number of Days _ _
   b. None

4. During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?
   a. Number of Days _ _
   b. None

These next questions are about physical, mental, or emotional problems or limitations you may have in your daily life.

1. Are you LIMITED in any way in any activities because of any impairment or health problem?
   a. Yes
   b. No

2. What is the MAJOR impairment or health problem that limits your activities?

a. Arthritis/rheumatism
b. Back or neck problem
c. Fractures, bone/joint injury
d. Walking problem
e. Lung/breathing problem
f. Hearing problem
g. Eye/vision problem
h. Heart problem
i. Stroke problem
j. Hypertension/high blood pressure
k. Diabetes
l. Cancer
m. Depression/anxiety/emotional problem
n. Other impairment/problem

3. For HOW LONG have your activities been limited because of your major impairment or health problem?

a. Days _ _
b. Weeks _ _
c. Months _ _
d. Years _ _

4. Because of any impairment or health problem, do you need the help of other persons with your PERSONAL CARE needs, such as eating, bathing, dressing, or getting around the house?

a. Yes
b. No

5. Because of any impairment or health problem, do you need the help of other persons in handling your ROUTINE needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes?

a. Yes
b. No

1. During the past 30 days, for about how many days did PAIN make it hard for you to do your usual activities, such as self-care, work, or recreation?

a. Number of Days _ _
b. None

2. During the past 30 days, for about how many days have you felt SAD, BLUE, or DEPRESSED?

a. Number of Days _ _
b. None

3. During the past 30 days, for about how many days have you felt WORRIED, TENSE, or ANXIOUS?

a. Number of Days _ _
b. None

4. During the past 30 days, for about how many days have you felt you did NOT get ENOUGH REST or SLEEP?

a. Number of Days _ _
b. None

5. During the past 30 days, for about how many days have you felt VERY HEALTHY AND FULL OF ENERGY?

a. Number of Days _ _
b. None

Press NEXT to continue the survey!

PAGE 7 [Demographics]

For this part of the survey, we would like to know more about you and your experiences completing this survey.

1. What is your age? _____

2. What is your gender? _____

3. How many years has it been since you were diagnosed with Type 2 diabetes? _____

4. Which of the following categories best describes your ethnic or cultural background?

____ Aboriginal/First Nations
____ Arab/West Asian (e.g., Armenian, Egyptian, Iranian, Lebanese, Moroccan)
____ Black
____ Chinese
____ Filipino
____ Japanese
____ Korean

____ Latin American
____ Métis
____ South Asian (e.g., East Indian, Pakistani, Punjabi, Sri Lankan)
____ South East Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese)
____ White/European (e.g., English, French, Scottish, Irish)
____ Other (please specify: _____)

5. Please enter your Prolific ID number: _____

6. Did you answer all the questions on this survey honestly? If so, please type "Yes" in the space below. If not, please type "no". _____

Press NEXT to continue the survey!

PAGE 8

Thanks!

Thanks for taking the time to participate. In this study, we are studying how people's coping strategies they've gained from playing organized sports, and if they use similar strategies to cope with managing their diabetes. We are measuring different experiences of people participating in organized sports, and how they cope with managing their diabetes. We will address these questions by statistically analyzing the responses using correlations, mediation and multiple regression.

We hope you have enjoyed participating in our study. If you have any questions about our study or if you would like to receive a copy of our results (once available, approximately in May, 2021), please contact us at rogersc1@myumanitoba.ca

To receive your payment from Prolific Academic, press the NEXT button below!

Press NEXT to complete the survey and record your participation!