

**ONE STEP AT A TIME: PHYSICAL ACTIVITY AND WELLNESS IN POST-
SECONDARY STUDENTS**

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ONE STEP AT A TIME: PHYSICAL ACTIVITY AND WELLNESS IN POST-SECONDARY
STUDENTS

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Abstract

This project examines the relationship between physical activity and wellness in the university student population. Countless studies have found positive relationships between physical activity and psychological health. However, there are numerous individual and societal barriers to participating in physical activity. Increases in sedentary behaviour in our society is associated with increased prevalence of mental health concerns. Therefore, it is the utmost importance to educate and motivate university students to participate in physical activity. I believe understanding the biological connection between physical activity and mental health outcomes provides the motivation to be active. A PowerPoint via Microsoft Teams was presented to the M.Ed. 2022 cohort with a handout for tips to become more active. When university students' mental and physical health improves, it allows for greater enjoyment in their studies and increased satisfaction throughout their lives.

Keywords. Physical activity, wellness, mental health, university students

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One Step at a Time: Physical Activity and Wellness in Post-Secondary Students

Wellness is an essential aspect for a healthy life. Hettler (1976) defined six dimensions of wellness. The six dimensions are social, occupational, spiritual, intellectual, physical, and emotional. Positive changes in one dimension have the potential to improve wellness in other dimensions. For example, increasing physical wellness may increase social wellness through sport participation.

I am passionate about physical wellness from my experience as a competitive athlete and university studies. Physical activity and participation in sport were highly valued in my family. My physical activity levels were well above average. When I stepped back from competitive play, I noticed that I wasn't feeling like myself. My fatigue and anxious feelings increased while my mood and sleep quality decreased.

When I enrolled in university, I was fascinated with neuroscience. This led me to study the mind-body connection. I realized my low physical activity levels were significantly and negatively impacting my overall wellness. Physical activity became my top priority once more and my wellness flourished. My passion for the mind-body connection made me dedicated to lead by example in my family, peer group, and fellow university students. I saw my classmates struggling with mental health concerns, fatigue, and stress. Understandably, university students are under great academic pressure, and face many challenges when attempting to increase their physical activity levels.

Individuals face numerous barriers to increase their physical activity. Sedentary behavior has been increasing in recent decades (Yang et al., 2019), resulting in increased mental health issues (Meyer et al., 2020). Increasingly common sedentary behaviors include watching television, various forms of computer usage, and traveling (Colley et al., 2022). In the university

population, heavy course loads and prioritizing other activities (Thomas et al., 2019; Arzu et al., 2006) leads to lower physical activity (Aceijas et al., 2017). Challenges experienced to attending fitness centers are lack of confidence and knowledge, social anxiety, cost, time, and location barriers, and a negative attitude toward the atmosphere (Morgan et al., 2016; Nikolajsen et al., 2021; De Herdt et al., 2013; Gammage et al., 2004). It is estimated that 50% of university students in the United States of America have been recently diagnosed with a mental health disorder (Lipson et al., 2021). The mental health crisis creates an additional barrier to participating in physical activity.

These physical, mental, and emotional barriers must be addressed. University students who can overcome these barriers have reportedly higher GPAs, mental health, and happiness levels than inactive peers (Danbert et al., 2014; Murphy et al., 2018). Physical activity should be accessible, encouraged, and incorporated into university life.

This article outlines how physical activity may improve mental health outcomes in the university and general population. The biological link between physical activity and mental health will be discussed. My hope is to inspire positive change at the university level to prioritize physical activity to address the mental health crisis. University students are potentially our next generation of parents, caregivers, and professionals. Thus, it is crucial for educational systems, government agencies, students, staff, faculty, and family members to prioritize physical activity so our next generation has the highest chance of success.

Literature Review

This article emphasizes the importance of physical activity in university students. Underlying biological mechanisms explains how physical activity may improve mental health outcomes. Overcoming barriers to participating in physical activity is crucial to improve the wellness of university students as they begin the next step in their lives. The first section explores wellness.

Hettler (1976) viewed wellness as a multidimensional and holistic concept. The model of wellness includes social, intellectual, emotional, spiritual, occupational, and physical interdependent domains. Hettler (1976) defined social wellness as positive community involvement and maintaining positive relationships with others and the environment. Individuals can achieve intellectual wellness through life-long learning, applying oneself to challenges, and making good decisions. Aspects of emotional wellness center around an optimistic view of life, where an individual enjoys one's life and is accepting of their emotions. Spiritual wellness is the drive for meaning and purpose. Realizing one's authentic self and being tolerant of others are also aspects of the spiritual domain. The fifth domain, occupational wellness, refers to being satisfied with one's work and learning transferable skills (Hettler, 1976). The final dimension is physical wellness which focuses on maintaining a healthy lifestyle through physical fitness, proper sleep habits, nutrition, and relaxation. Combined, these dimensions play an important role in success, health, and happiness.

Physical Wellness

Hettler's (1976) dimensions are interconnected, meaning positive changes in one area can lead to positive change in other dimensions. For example, higher levels of physical activity can improve sleep quality and quantity (Kredlow et al., 2015), reduce stress (Mikkelsen et al., 2017),

increase life satisfaction (Dolan et al., 2013), and improve overall physical and mental health (Miller et al, 2016). The term ‘physical activity’ will be used in place of ‘exercise’, ‘sport’, or ‘training’ to be more inclusive to the variety of active movements. Individuals can be physically active in a variety of settings from parks and natural spaces, to organized settings such as fitness centers (Public Health Agency of Canada, 2020). Types of physical activities within these environments include cardiovascular exercises, strength-training, yoga, and competitive and recreational sport. The physical wellness dimension resonates with me from my competitive sport and university experiences.

Personal Connections

In my early years I was heavily involved in recreational, competitive, and extracurricular sports. When I stepped away from competitive sports, and therefore became less active, I noticed significant changes in several factors of my life. First, my sleep quality decreased, resulting in brain fog and decreased motivation. I felt less productive and experienced more pressure to produce quality academic work. Then as my stress and anxiety levels increased, my sleep quality further decreased. It was exhausting and stressful to even consider participating in any physical activity when I was feeling so poorly. I was in a perpetual cycle of unproductivity, stress, and fatigue.

In university, I became more knowledgeable about the mind-body connection from taking numerous psychology and neuroscience courses. My workplace also emphasized the connection between sleep, nutrition, exercise, and brain performance. Specific books, *The Ripple Effect: Sleep Better, Eat Better, Move Better, Think Better* (Wells, 2018), and *Spark: The Revolutionary New Science of Exercise and The Brain* (Ratey & Hagerman, 2013), were highly influential in applying physical wellness concepts into my life. I began prioritizing my physical and mental

health by developing sleep and physical activity routines, setting boundaries, and increasing my self-awareness of my thoughts and behaviours. As I learn more about my mental health in my university years, it has become my passion to explore the connections between physical activity and mental health in the university student population.

Physical Activity Benefits in University Students

For university and college aged students, physical activity has academic and mental wellness benefits. Studies from Ireland and Madrid report correlations between physical activity time and mental health outcomes. Murphy and colleagues (2018) compared active and inactive students in Ireland and their self-reported overall health, happiness, and mental health. Only 64.3% of met the 150 minute/week physical activity guidelines. University students who met the guidelines were 2.2 times more likely to report “good” or “very good health”, 55% more likely to report better mental health, and 2.2 times more likely to report feeling happy than their inactive peers. Murphy and colleagues (2018) found the most common forms physical activity were sports, weight training, cardio workouts, and walking. These leisure-time activities demonstrate positive health outcomes. Individuals can also engage in physical activity at work or on their commute.

A study in Madrid compared university students who engaged in low, moderate, and high levels of physical activity, and whether the physical activity took place in an occupational, commuting, or leisure setting (Rodriguez-Romo et al., 2022). These self-reported measures were compared to their mental health outcomes. University students who reported higher levels of overall physical activity also reported better mental health outcomes. Specifically, high levels of overall, commuting, leisure-time physical activity, and moderate levels of occupational physical activity corresponded to a decreased chance of suffering from a mental health disorder. Both

studies clearly demonstrate that being active in all areas of life result in better overall physical and mental health. The relationship between physical activity and mental health and academic outcomes could be related to physical activity-induced physiological mechanisms that aid in brain growth.

Physical activity causes the release of numerous beneficial hormones and neurotransmitters that promote brain growth. This growth occurs from the formation of new neurons (neurogenesis; Kumar et al., 2019) and blood vessels (angiogenesis; Adair & Montani, 2010). Brain-derived neurotrophic factor (BDNF) and serotonin are two of the key outputs of physical activity that facilitate neurogenesis (Huang et al., 2013; Pahlavani, 2024). Studies have shown that neurogenesis and angiogenesis occur in the hippocampus, the brain area responsible for learning and long-term memory formation (Renderio & Rhodes, 2018). It is believed that this hippocampal growth is responsible for improvements in memory, cognition, and learning from being physically active. Adequate blood flow in the brain is crucial as it accounts for 20% of energy used at rest (Raichle & Gusnard, 2002). The increased brain density in key areas, such as the hippocampus, plus additional blood flow in the brain can help physically active university students excel over their more sedentary peers.

Indeed, Danbert and colleagues (2014) investigated university fitness center memberships and cumulative GPA scores. University students who purchased a fitness center membership had a significantly higher cumulative GPAs on a 4.0 scale compared to students without a membership. Specifically, members had 0.13 GPA points higher than non-members. While this difference may not seem important, it could be the key to being accepted into graduate program or a scholarship, or even passing a course. Graduate programs and scholarships are highly competitive academic areas. I believe every GPA point increase is worth it to reach your goals.

Despite these benefits in the university student population, students face challenges to meet physical activity guidelines.

Sedentary Behaviour and Physical Activity Barriers

Canadian Physical Activity guidelines recommend at least 2.5 hours per week of physical activity by incorporating moderate and vigorous aerobic activity, and strength-training exercises (Public Health Agency of Canada, 2018). However, in 2019 it was estimated that only 58.3% of individuals ages 18 to 39 meet these guidelines (Statistics Canada, 2021). Numerous challenges and barriers to participate in physical activity have been identified over diverse populations.

One challenge to participating in physical activity is an increase in sedentary time. Sedentary behavior has been increasing in recent decades (Yang et al., 2019). This study was conducted in the United States of America and revealed sitting time increased by approximately 1 hour from 2007 to 2016 in adolescents and adults. Accelerometer measurements from 2012 and 2013 in Canada revealed adults spend up to 9 hours of sitting per day (Colley et al., 2022). Common factors that increase sedentary behavior are watching television, computer usage for work, leisure, and academics, traveling/commuting, and reading (Yang et al., 2019; Colley et al., 2022).

Both studies utilized self-reported surveys. Inaccuracy in self-report surveys is a valid concern. I would assume a self-report survey on sedentary time could evoke feelings of shame and/or guilt due to weight concerns, societal pressures for productivity and activity, and wanting to provide ‘correct’ answers. While sedentary behaviour data is useful for determining trends, I believe the reported data is likely lower than real-life amounts. It becomes difficult to be active in a society with few non-sedentary alternatives. For examples, standing desks that are cost-

prohibitive and insufficient or unsafe bike lanes. There are numerous individual factors that may limit an individual from participating in physical activity.

World-wide data on individual factors further explain the challenges and barriers faced when attempting to participate in physical activity. Fitness center members in Europe reported self-related barriers to exercising such as motivational factors, lack of knowledge, and negative attitudes towards the fitness culture (Nikolajsen et al., 2021). Further findings from the United Kingdom highlight fitness center costs, location, inconvenient class times, dislike of the fitness center atmosphere, and lacking confidence using fitness center equipment as more barriers (Morgan et al., 2016). Specifically in individuals with anxiety-related disorders, common barriers include negative thoughts and feelings about physical activity, and avoidance behavior when thinking of or engaging in physical activity (Mason et al., 2019). Anxiety around physical activity includes social anxiety.

Social anxiety is also common with fitness center avoidance behavior. Social anxiety is defined as “anxiety due to a concern about how one will be perceived by others” (De Herdt et al., 2013). Individuals who have mental health challenges are more likely to experience social anxiety when participating in physical activity, compared to healthy controls. However, it is not to say that healthy subjects are immune to social anxiety in fitness environments. Gammage and colleagues (2004) manipulated self-efficacy in a fitness center environment with female participants. The low-efficacy condition included mirrors and windows within the fitness room and close-up video recordings of individuals within the group. The high-efficacy condition did not include mirrors and windows, and video recordings were less invasive. Those in the low-efficacy condition reported higher levels of social anxiety and were not looking forward to the fitness class as much as the high-efficacy condition. These individual psychological factors negatively influence the likelihood of participating in physical activity. Uncontrollable factors,

such as COVID-19, significantly and negatively affected one's ability to engage in active behaviours.

COVID-19 was especially disruptive to physical activity levels and psychological health worldwide (Violant-Holz et al., 2020). Countless studies have shown a decrease in physical activity during social distancing and lockdowns. Caputo and Reichert (2020) showed a world-wide reduction in physical activity measured by time or step counts. Specifically, Tison and colleagues (2022) reviewed daily steps counts from 2019 to 2022. The average daily step counts dropped from 5300 to approximately 3900 at the onset of lockdowns. Post-pandemic daily step counts remain on average 10% lower than the pre-pandemic baseline. Numerous studies have demonstrated adverse effects to increased sedentary time. Lockdowns limited the ability to participate in physical activity and caused significant stress, anxiety, and anger across populations (Violant-Holz et al., 2020). COVID-19 caused great psychological distress and lowered levels of physical activity. These sedentary themes are also found in the university student population.

Sedentary behaviour due to individual, societal, and uncontrollable factors can also be analyzed in the university population. Aceijas and colleagues (2017) found that only 40% of university students are physically active due to numerous challenges. Increases in technology usage and reliance on computers has resulted in increased sitting time (Leslie et al., 2001). The reliance on technology for university students could be caused by heavy workloads (Thomas et al., 2019) and social obligations (Arzu et al., 2006). Other significant barriers to physical activity were prioritizing academics over exercising and not having enough energy. Additional barriers are stress, low perceived self-skill, lack of social support, and busy fitness areas (Thomas et al., 2019). A review article by López-Valenciano and colleagues (2021) found that university students' physical activity changed significantly during COVID-19 lockdowns, decreasing by up

to 365% compared to pre-COVID-19 activity levels. College students' mental health declined during the pandemic (Kim et al., 2021). Instances of depression, alcohol use disorder, and eating disorders increased during COVID-19. It could be hypothesized that many of these challenges and barriers for university students are associated with the lack of mandatory physical activity in post-secondary education.

I believe that the transition from mandatory physical activity in grade school to voluntary exercise in post-secondary education has had a significant negative impact on university students' mental and physical health. More research is needed on current physical activity guidelines in grade schools to determine if skills, benefits, and general knowledge of physical activity are being taught. In my experience, gym class consisted of sports, tests, and games, and very little information on exercise equipment, benefits of physical activity, and health benefits. Indeed, Fredriksson and colleagues (2018) compared adults' knowledge of physical activity to their activity levels. Majority of participants did not know physical activity recommendations and risks of inactive lifestyles. Adults who had more knowledge about physical activity were more active. It is imperative educational institutions consider mandatory physical activity in post-secondary students to improve their wellness and mental health.

Mental Health Challenges

It is estimated that one in five Canadians experience a mental health challenge per year (Centre for Addiction and Mental Health, n.d.). The most common mental illnesses include substance use disorders, depression, and anxiety (Stephenson, 2023). The young adult age group in Canada is the most likely to experience a mental health challenge and death by suicide. Lipson and colleagues (2021) found over 50% of college students in the United States of America screened positive for at least one mental health concern from 2016 to 2019. The most common

mental health concerns reported were depression, anxiety, and eating disorders. Hamer and colleagues (2014) found negative correlations between sedentary time and mental health, such as anxiety and depression measures, in adults. Further Meyer and colleagues (2020) found that since COVID-19, sedentary behavior has increased, resulting in higher levels of depression, loneliness, stress, and poorer mental health. While there are a variety of mental health concerns, this paper will focus on depression and anxiety.

Depression.

Depression is a major mental health concern (Richards, 2011). ‘Depression’ is an umbrella term that includes major depressive disorder (MDD), persistent depressive disorder, premenstrual dysphoric disorder, disruptive mood dysregulation disorder, and others (American Psychiatric Association [APA], 2022). This article outlines the generalities of depressive disorders. The typical symptoms are depressed mood, decreases in pleasure, significant weight changes, increased fatigue, diminished self-esteem, impaired cognition, and thoughts of death over the past two weeks that is not due to substances or a medical condition (APA, 2022). Additionally, the severity of symptoms must interfere with social, occupational, or other important areas of functioning.

Anxiety.

Anxiety refers to anticipation of future threats (APA, 2022). Excessive fear and anxiety are the general characteristics of anxiety disorders and must occur most days for at least six months for a diagnosis. Additionally, the symptoms of any disorder must cause significant impairment in everyday life such as academically, socially, or occupationally. Anxiety disorders include social anxiety disorder, generalized anxiety disorder (GAD), panic disorder, and others, and are prevalent in approximately 1-4% of the worldwide population. Each anxiety disorder differs in the events, situations, or objects that elicit the fear or anxiety. Some symptoms of

generalized anxiety disorder, for example, are restlessness, muscle tension, sleep disturbances, and difficulty controlling worrying thoughts. The main risk factors for developing an anxiety disorder are genetic predispositions and environmental stressors. Some stressors may include a loss, divorce, natural disaster, bullying, parenting style, abuse, and racism.

Depression and anxiety are two of the most common mental health challenges faced by the general population and university students (Centre for Addiction and Mental Health, n.d.; Lipson et al, 2021). Therefore, article details how sedentary behaviour, physical activity, and mental health influence the underlying biological mechanisms involved in the stress response.

Biological Mechanisms of Stress and Physical Activity

Several individual and cultures factors may influence the likelihood of experiencing a mental illness such as age, genetics, discrimination, poverty, gender, and racism. While systemic inequalities are out of one's control, physical activity is an individualistic factor that may improve mental health outcomes. My learning is significantly more impactful when I understand the brain-body mechanisms, rather than just the outcomes. It also increases my motivation to move my body knowing the numerous benefits. I hope a biological explanation elicits motivation in university students as well to increase their physical activity levels. The following sections explain the biological system involved in the stress response. Followed by research on how sedentary and active behaviour influence this biological system and mental health outcomes.

Hypothalamic-Pituitary-Adrenal (HPA) Axis

The hypothalamic-pituitary-adrenal (HPA) axis is composed of the hypothalamus, pituitary gland, and adrenal glands (Mikkelsen et al., 2017; Miller et al., 2016). The hypothalamus, located in the brain, is responsible for maintaining homeostasis in the body (Daniela et al., 2022). It also controls the two major branches of the nervous system: the

parasympathetic nervous system (PNS) and the sympathetic nervous system (SNS). Each branch of the nervous system controls opposing functions in the body. When an individual is relaxed, or in a “rest and digest” state, the PNS branch is activated. Conversely, stressful situations activate the SNS, or the “fight or flight” state. The pituitary gland is located below the hypothalamus and controls the release of several hormones in the body (InformedHealth, 2011). The final component of the HPA axis are the adrenal glands which are situated on the top of each kidney (Dutt et al., 2023). They produce various hormones such as cortisol. Cortisol will be the focus in this article as it relates to mental and physical stressors and mental health.

The HPA axis releases several hormones and chemicals when exposed to an internal or external stressor (e.g., Thau & Sharma, 2023). Stressors can be categorized as acute, chronic, or traumatic (Scott, 2022). Acute stressors are sudden and temporary such as being chased. Prolonged or chronic stressors may include a frustrating job. Traumatic stressors are life-threatening events that may lead to post-traumatic stress disorder. These stressors activate the SNS and therefore fight or flight response (Thau & Sharma, 2023; Daniela et al., 2022). The hypothalamus releases corticotropin releasing factor to act on the pituitary to release adrenocorticotrophic hormone (Snipes, 2019). The adrenocorticotrophic hormone travels through the bloodstream to the adrenal glands to release cortisol, also known as the body’s stress hormone (Daniela et al., 2022; Thau & Sharma, 2023; Caplin et al., 2021). Cortisol acts on most organ systems to elicit fight or flight symptoms such as increased heart rate (Thau & Sharma, 2023), sweaty palms, muscle tension, and nausea (Sperber, n.d.). When cortisol levels in the bloodstream reach a certain threshold, it inhibits the hypothalamus and pituitary gland from releasing more hormones, thus interrupting the circuit, and returning to a relaxed state (Caplin et al., 2021).

In sum, a physical, social, or mental stress activates the HPA axis. Through the hypothalamus-pituitary gland-adrenal gland pathway, cortisol is released. The HPA axis returns the body to a relaxed state after sufficient cortisol has been released to manage the stressor. The HPA axis positively or negatively adapts when chronically exposed to positive or negative stressors.

Cross-Stressor Adaptation Hypothesis.

The cross-stressor adaptation hypothesis states that any stressor that is “of sufficient intensity and/or duration” can cause adaptive or maladaptive changes to the stress response system (Sothmann et al., 1996; Daniela et al., 2022). In acute stress situations, the fight or flight response can help one adapt, survive, or react quickly (Thau & Sharma, 2023). The stress response can improve memory consolidation, fear conditioning, and habit learning (Wingenfel & Wolf, 2010). While there are survival benefits when exposed to a stressor, chronic stress can cause dysregulation in the central nervous system.

Chronic stress can cause wide-spread maladaptive changes to the central nervous system. These maladaptive changes are impaired working memory and long-term memory retrieval (Wingenfel & Wolf, 2010), atrophy of the prefrontal cortex (Daniela et al., 2022), increased SNS activation, dysregulated mood and sleep, and even mental health disorders such as depression and anxiety (Caplin et al., 2021). Sedentary lifestyles have similar negative consequences such as hyperactivity of the HPA axis, increased cortisol, and higher levels of inflammatory markers (Mendelli et al., 2022; Chantry et al., 2022). Chronic stressors have negative effects on the central nervous system. However, physical activity can build tolerance against chronic stress.

Chen and colleagues (2017) discuss how chronic physical activity can combat the negative consequences of chronic stress. Described as the “exercise-[cortisol] paradox”, physical activity increases cortisol levels in the short- and long-term. Despite the negative consequences

of increased cortisol levels discussed above, chronic physical activity reduces the stress response to novel stimuli. Indeed, Budde and colleagues (2015) analyzed physical activity and cortisol output across numerous studies and age groups. They found that moderate physical activity, or an intensity above 60% of maximum oxygen intake, increases cortisol levels immediately after physical activity.

Further, Caplin and colleagues (2021) investigated how physical activity influenced the response to a subsequent psychosocial stressor. Participants ran at a light, moderate, or vigorous intensity for 30 minutes followed by the Trier Social Stress Test (TSST) after 45 minutes of rest. The TSST involves a public speaking task and a “serial subtraction task in front of a panel of evaluators”. Saliva samples were taken before, during, and after physical activity and the TSST to measure salivary cortisol. The participants in the light and moderate physical activity conditions experienced higher fluctuations in their salivary cortisol than the participants in the vigorous condition. This may be due to insufficient cortisol released during light to moderate activity to deactivate the HPA axis. Salivary cortisol levels returned to pre-TSST levels sooner for participants in the vigorous condition than the light or moderate conditions. While this study recruited healthy, young male participants, I believe this research can be expanded to other populations.

The study results can be translated to the university setting. University students who regularly participate in physical activity are regulating their HPA axes. This increased stress tolerance could allow for a lesser stress response to assignments, exams, and deadlines. Thus, they would be able to produce timely high-quality work, and excel in their academic life and future career. Unfortunately, academic stress isn't the only challenge university students face. Mental health challenges can create an additional barrier to academic success.

Mental Health and the HPA Axis

Depression and anxiety are common mental health challenges. Research suggests that these mental health challenges are associated with HPA dysregulation, which may be hindering students' academic success.

Depression and the HPA Axis

It is hypothesized that HPA axis hyperactivity, and therefore elevated cortisol levels, are associated with depression (Dziurkowska and Weso, 2021). Around 50% of individuals with a depressive disorder have elevated cortisol levels. Cortisol can pass the blood-brain barrier and bind to receptors in several areas of the brain. The hippocampus is susceptible to elevated cortisol levels due to high concentrations of cortisol-binding receptors. Chronic elevated cortisol levels cause neuronal death and may be associated with the impaired memory effects in depressive disorders. However, it is unclear if elevated cortisol cause depressive disorders, or if depressive disorders dysregulate cortisol secretion.

Zajkowska and colleagues (2022) investigated this causality between the HPA axis, cortisol levels, and MDD onset in adolescents across multiple studies. Despite methodological differences, the findings support that higher cortisol levels in adolescents in the morning and nighttime could be a risk factor for MDD. It is therefore increasingly important to maintain mandatory physical activity sessions from grade-school to post-secondary education. This could potentially minimize the risk of developing MDD during university by early regulation of the HPA axis through physical activity. While depression is one major mental health concern, many students may also have to overcome anxiety.

Anxiety Disorders and the HPA Axis

Faravelli and colleagues (2012) compared HPA axis functioning in GAD, panic disorder, and social phobia. Most research suggests that there is increased HPA axis activity in individuals with GAD. It is hypothesized that chronic stress and lack of coping skills cause a chronic increase in cortisol levels. There are conflicting results for HPA axis activity and panic disorder. Some data show increased cortisol levels at the beginning of a panic attack and within the first hour of waking. Other data show no differences in cortisol levels during panic attacks and at resting state. Individual and methodology differences, such as novel stimuli, social support, and perceived control, may cause these conflicting results. More research is required in this area. The relationship between HPA axis activity and social phobia is also unclear. Some studies report elevated cortisol levels in social phobia individuals than those with PTSD patients and healthy controls. There are reports of increases and decreases in cortisol levels after speaking tasks. Again, more research is needed in this area. Most research suggests a hyperactive HPA axis in individuals with anxiety disorders in general. Sedentary behaviours may also contribute to depression and anxiety development or symptomology.

Physical Activity Levels, Mental Health, and The HPA Axis

Sedentary Behaviour and Mental Health

Sedentary behaviour has been associated with higher risk of depression, depressive symptoms, and anxiety (Huang et al., 2020; Hallgreen et al., 2020). Hallgreen and colleagues (2020) recorded data from 23,644 working adults on the quantity of sedentary behaviour and frequency of “worry, depressed mood, or anxiety”. Measures of sedentary behaviour during leisure-time, occupationally, and a combination of leisure and occupationally. Total sedentary time was associated with greater chances of experiencing depression and anxiety symptoms.

Specifically, higher durations of leisure-time sedentary behavior increase the chances of experiencing depression and anxiety symptoms. The relationship between occupational sedentary behaviour and depression and anxiety symptoms were not significant.

Similarly, Huang and colleagues (2020) analyzed sedentary time and risk of depression across 12 studies. Sedentary behaviour was differentiated into active and passive sedentary behaviour. Active sedentary behaviour refers to activities with mental stimulation such as knitting, driving, or occupational work. Passive sedentary behaviour lacks mental stimulation and includes watching television or sitting while talking. Increased time in both types of sedentary behaviour, but especially passive sedentary behaviour, are associated with an increase in depression and anxiety symptoms. It is concerning that sedentary behaviour is increasing in university student populations due to academic workloads and general cultural shifts (Leslie et al., 2001; Yang et al., 2019). This may exacerbate depression and anxiety development and severity. Therefore, it is crucial to encourage physical activity in university students to minimize risks and symptomology.

Physical Activity and Mental Health

Several studies demonstrate physical activity can reduce depressive and anxiety symptoms. Tstatoulis & Fountoulakis (2006) reviewed how physical activity alleviates depressive symptoms. Studies reported that the number of depressive symptoms on the Beck Depression Inventory were reduced more in a physical activity condition than no treatment condition. It has also been shown that chronic physical activity alleviates depressive states and reduces urinary cortisol levels in adolescent females with mild depression.

As with depression, physical activity may also reduce anxiety symptoms. Aylett and colleagues (2018) conducted a meta-analysis of the effectiveness of physical activity on anxiety.

The types of physical activity used were aerobic, high intensity, low intensity, and no treatment controls. Aerobic physical activity reduced anxiety more in patients with clinically raised anxiety compared to waitlist controls. High intensity physical activity was also more effective than low intensity physical activity. However, more studies are needed due to low sample sizes and different physical activity methods. A specific study during the COVID-19 lockdowns analyzed how physical activity games could alleviate anxiety.

Hu and colleagues (2020) found that physical activity was an effective intervention for anxiety during the COVID-19 pandemic. Physical activity regimens were a 20-minute moderate intensity 'exergame' and 120 minutes per week over eight weeks 'exergame'. Both regimens reduced anxiety levels. Some mechanisms that contribute to improving anxiety include regulating cortisol and inflammation levels, and increasing neurogenesis and angiogenesis. These studies clearly show that physical activity has benefits for those with mental health challenges such as depression and anxiety. The mechanism for improving depressive and anxiety symptoms is found through the HPA axis.

Physical Activity, Mental Health, and the HPA Axis

The biological mechanism between physical activity and improvement in depressive and anxiety symptoms is the HPA axis. As discussed previously, dysregulation of the HPA axis may contribute to depression and anxiety (Faravelli et al., 2012; Dziurkowska and Weso, 2021). Physical activity acts as a positive stressor on the HPA axis to regulate the stress response and cortisol output (Chen et al., 2017, Sothmann, 1996). Hu and colleagues (2020) reviewed how physical activity may influence the HPA axis' role to promote mental health outcomes. Studies demonstrated that physical activity possibly regulate the HPA axis, measured by decreased cortisol output, and thus relieving depressive and anxiety symptoms. A reduction in cortisol

allows for an increase in BDNF, neurogenesis, and angiogenesis, thus improving mental health outcomes.

Overall, there is substantial evidence that physical activity can reduce depression and anxiety symptoms and severity. The university student population would significantly benefit from regular physical activity to aid with academic stress and mental health challenges.

Recommendations

There are countless ways to improve one's physical and mental health. Being educated about the mind-body connection has given me purpose for my physical activity. *The Ripple Effect: Sleep Better, Eat Better, Move Better, Think Better* (Wells, 2018) greatly increased my knowledge of how physical activity, nutrition, thinking, and sleep are highly interrelated. For example, increasing your physical activity expends a greater amount of energy than usual, leading to greater fatigue and a higher quality sleep. After a good night's sleep, you will feel clear-minded and able to make better decisions about meals. The healthy food and proper nutrients will fuel your brain and body. With the increased energy and quality food, then you can partake in more physical activity and the positive cycle continues. Another takeaway from *The Ripple Effect: Sleep Better, Eat Better, Move Better, Think Better* (Wells, 2018) was 1% daily improvements. This means that a tiny daily change can have significant benefits in the long-term.

In addition to *The Ripple Effect: Sleep Better, Eat Better, Move Better, Think Better* (Wells, 2018), *Spark: The Revolutionary New Science of Exercise and The Brain* (Ratey & Hagerman, 2013) focused on physical activity and its effects on anxiety, depression, attention deficit hyperactive disorder, the menstrual cycle, aging, and stress. While the research within *Spark* (Ratey & Hagerman, 2013) is becoming dated, the evidence unanimously agrees that physical activity has neurological, physiological, and psychological benefits. Countless other

books on physical activity, mental health, and wellness are available for purchase or from your local library.

Becoming more active may be daunting, but there are activities for every age, skill, and activity level. Research has shown that university students participating in physical activity with others is preferred over structured classes and being alone (Burke et al., 2006). This may increase motivation and decrease anxiety surrounding physical activity.

I also believe that action precedes motivation. There have been many instances in my life where I've thought, "I should do x". No matter how often or deeply I've thought about that topic, I don't always end up doing it. A large contributing factor to my procrastination with physical activity is the expectation to perform my best and anything less than my best is not worth doing. I have worked hard to challenge these beliefs through counselling and self-reflection. Here are a few things that have worked for me to overcome my procrastination with physical activity.

First, I have worked to change my self-talk. Instead of "should-ing" myself, I change my language to "I **want**". I believe it places more responsibility and accountability on myself and it makes me think of how good I will feel when I get active. A second tip is remembering that action precedes motivation. It becomes much easier to get active when I'm dressed in my workout clothes than my pajamas. Thirdly, I am becoming more aware of my mood, energy states, and sleep quality. I know that being active will allow me to sleep more soundly, have more energy the next day, and feel better. Sometimes my workout goals are not to have the best workout and feel great in the moment. My motivation to be active can be to sleep better so I feel better the next day. A fourth tip is finding enjoyment in my chosen physical activity. For many years, I was a competitive gymnast and curler, plus I have tried various fitness classes and modalities. I have found a love for yoga and lifting weights, and have enjoyed kickboxing, rock climbing, and dancing. Though no matter how many minutes or kilometers I have jogged

and sprinted, I realize running is not an enjoyable exercise for me. I much prefer biking, the stair master machine, or jumping for my cardiovascular health. Finally, I remember all that I have learned about the mind-body connection. It is comforting to know that the benefits of movement are vast. Lifting the heaviest weights or doing the most repetitions of an exercise does not have to be the focus of being active. As stated before, the benefits on the brain, sleep quality, mood, and energy levels can occur with a wide range of activities and intensity levels.

The University of Lethbridge has several physical activity options. The fitness centre is equipped with free weights, cardio and weight machines, track, and various other exercise equipment. The staff in the fitness centre can give you a tour, help with machine setup, and spotting exercises. Personal trainers are also available to guide you through a workout program. Finally, the fitness centre membership is included in your tuition, so why not try it out! The University of Lethbridge also has a pool, competitive and recreational sports, and fitness classes. I hope that you will find some enjoyment in what the University of Lethbridge has to offer for fitness activities. If not, you might enjoy walking, hiking, or biking around Lethbridge's parks. Keep up to date with Lethbridge's activities in their Leisure Guide (City of Lethbridge, 2024).

To take care of your mental health, the University of Lethbridge has counselling services available to all students. Counselling may help with, but is not limited to, anxiety, depression, academic performance, goal setting and achieving, communication, problem solving, emotions, and interpersonal concerns. Remember that counselling is not limited to times of stress, sadness, or trauma. Counselling can be just as helpful when things are going well for you. Other medical professionals, like family doctors, are important to see regularly for your overall health.

Conclusion

Improving wellness should be a priority for the university student population. It is evidenced by the research that increasing one's physical activity has significant benefits for overall wellness, mental health, and academic success. Without physical activity education and motivation, the wellness crisis will continue to worsen. Our future generation of professionals and caregivers will face ever-increasing mental health struggles and lowered levels of wellness. My personal recommendations aim to provide inspiration to those who do not know where to begin or enhance their wellness journey. I hope that one day these recommendations could make a positive impact in the university structure by incorporating more mandatory physical activity. Overall, I hope this literature review inspires curiosity to find enjoyable and sustainable physical activities. It just takes one step at a time!

Methodology

The purpose of this project was to educate university students on the importance of physical activity on one's wellbeing. The secondary purpose was to provide motivation and resources for university students to participate in physical activity.

A PowerPoint presentation (Appendix A) was created and contained the following topics from this article. These topics are wellness, what is physical activity and sedentary behaviour, benefits of physical activity, challenges to being active, and how physical activity affects mental health. The presentation included a handout containing physical activity examples, a select list of areas to be active in Lethbridge, and information on physical activities offered at the University of Lethbridge (Appendix B).

This project was presented via Microsoft Teams on March 25th at noon MDT. Attendees included Dr. Danny Balderson, Dr. Elaine Greidanus, and students from 2022 MEd Counselling Psychology cohort. An email invite was sent with the Microsoft Teams link (Appendix C) on March 24th. The presentation's duration was approximately 25 minutes with a question-and-answer period following the presentation. Attendees will receive a copy of this paper upon final completion.

A self-reflection section was added to this project discussing strengths and improvements for potential future reiterations of this project.

Presentation Self-Evaluation

I believe I executed this project and presentation very well. There are numerous strengths and areas of improvement I would like to highlight.

Strengths

I presented with enthusiasm to keep attendees engaged. I spoke with an upbeat tone, used introductory university-level language, and balanced my eye contact between my camera and slides. My skills presenting with energy, maintaining eye contact, and being articulate have been difficult to improve due to previously lacking confidence. Growing up, I was very shy in front of groups of people in any setting. This made it quite difficult to be an engaging presenter. The “fake it ‘til you make it” saying was instrumental for incorporating peer and professor feedback into my presentations. However, I felt very uncomfortable pretending to be outgoing during my presentations. During this presentation, I believe the “fake it ‘til you make it” paid off. While my heart was still racing and I was nervous to make errors, my passion for the subject and comfort level amongst my peers and supervisory committee helped me feel calmer.

Combined with my physical presence discussed above, my technical skills allowed for a well-rounded presentation. My use of animations, appropriate design choices, and presenting the topics in a logical manner complimented my interpersonal presentation skills. I prepared my presentation with every detail in mind from choosing calming and positive colors (e.g., greens, blues), animations that followed my script, and keeping each slide neat. Being detail-oriented has always been a strong suit of mine whether for presentations or everyday life. I thoroughly enjoy organizing, being creative, and finding new ways of explaining topics. So, my technology skills support my creativity and presentation of ideas. I felt that my presentation was satisfactory due to my personal and technical skills, however, there were some areas that needed improvement.

Areas of Improvement

If I were to present this topic again, I would make a few minor improvements. For one, having more practice before I presented would have greatly reduced stutters, “ums”, and pauses. These speech errors cause me distress due to my perfectionism tendencies. Each error created distress which created more awareness of the errors to cause more speech errors. I believe I was able to recover from the errors by taking a deep breath before continuing the presentation. The balance between practicing self-compassion and my perfectionism tendencies is difficult to manage. My self-criticism and self-compassion are at war with each other when I reflect on my performances in academics or in sport. The criticism voice tells me I should have mastered presenting since I’m completing a master’s program. It also believes that errors are an example of a lack of preparation, confidence, and knowledge. On the other hand, my self-compassion reminds me that I am a human who is allowed to make minor errors. The criticism has lessened as I have matured and have gained life experience. So while I believe my presentation was overall well done, I know I am my own worst critic. In addition to my speech errors, I realize I could have improved some technical aspects of my presentation.

Some improvements for my presentation include more interactive slides and troubleshooting my introductory animation. One example of an interactive slide would ask participants to discuss their favourite types of physical activity at the end of the presentation. I shared my experiences with sport and activities, and I think it would have fostered motivation and a community feeling for others to share their enjoyment and experiences. In addition to including more discussion-based slides, I was not prepared to troubleshoot my introductory animations. I had planned the initial slide to cycle through quotes, GIFs, and comics related to physical activity and mental health. The purpose of the slide was to engage my audience prior to starting my presentation. I tested the slide within PowerPoint but neglected to practice my

presentation within Microsoft Teams. These adjustments for a potential future iteration would have increased attendee engagement.

A final area of self-improvement is the ability ask for help. I felt anxious while developing this project because I wanted to prove to myself and my supervisory committee that I could produce quality work. My perfectionism tendencies clashed with my limited research experience in addition to working at a master's level. This created anxiousness, self-doubt, and fear. I did not want to be perceived by my supervisory committee as incapable or undeserving of graduating. I was able to lessen these negative feelings with each draft submission. My supervisory committee provided the utmost support and constructive feedback to assist with this project. As I approach project completion, my self-talk has become more positive that as a student I am allowed to ask questions and I did not need to know all the answers. If I were to complete a similar project in the future, I will remind myself that it is okay to ask for help.

Question and Answer Section Post-Presentation

The question-and-answer section is the most difficult part of a presentation. The uncertainty of what will be asked and the self-doubt surrounding negative thoughts such as “Did I actually make sense?” elicit more feelings of anxiousness. There was only one clarifying question about the content of a study. I couldn't remember the details of the study, but I followed up with the attendee via email to provide her with the article in question. It also provided some relief as I assumed attendees understood my presentation and research explanations. Other questions involved more creativity and extrapolation from my paper. I believe I answered intelligently and as clearly as possible given the impromptu nature of the questions. In the future, it would be helpful to take a moment to collect my thoughts and relax before answering questions.

Overall, I am immensely proud of myself for producing quality work despite my fears and self-doubt. I was able to present in an engaging manner and have gained more experience on how to improve future presentations. A huge thank you to my supervisory committee for their time, effort, and support throughout this project.

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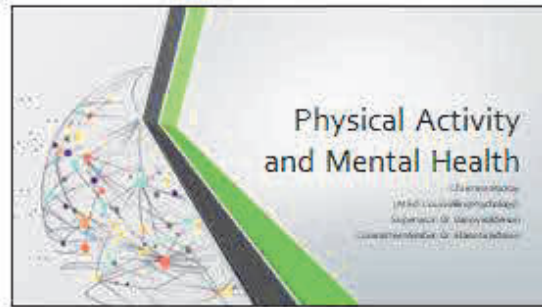
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Appendix A

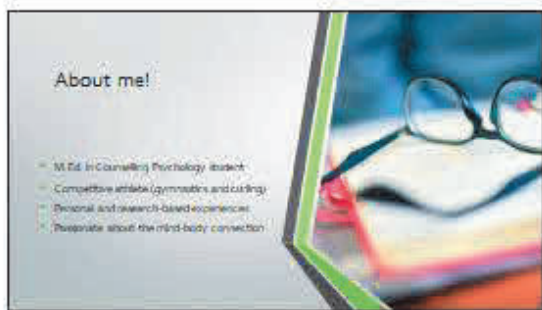
PowerPoint Presentation Slides



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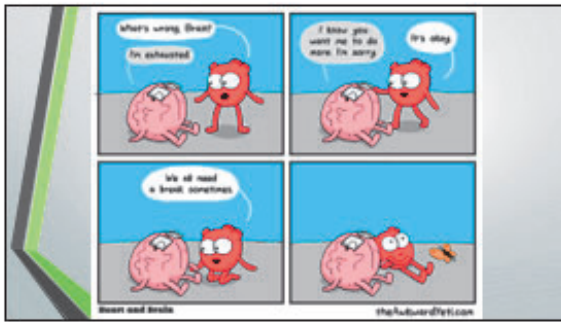
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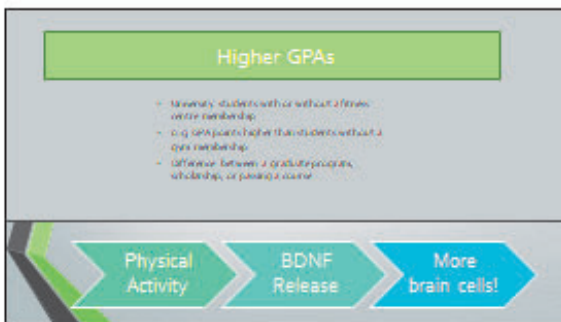
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7

Benefits of Physical Activity

8



9

Higher happiness and overall health

Well-being

- Students meeting physical activity guidelines v.s. not meeting guidelines
- Active students had better overall health, mental health, and happiness

Mood

- Students and levels of physical activity (low, medium, high) and location (occupational, commuting, leisure)
- More physical activity = better mental health
- More physical activity during leisure and occupation are protective to poor mental health

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Mental Health

Depression

- Depressed mood, decreases in pleasure, ..., diminished self-esteem and cognition, etc.

Anxiety

- Restlessness, muscle tension, sleep disturbances, and difficulty controlling worrying thoughts

11

Physical Activity on Mental Health

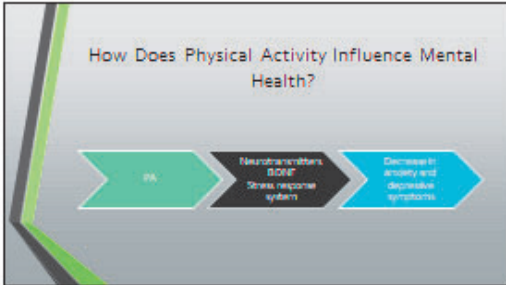
Depression

- Physical activity condition reported lower BDI scores than no treatment condition
- Alleviates depressive states

Anxiety

- High intensity, aerobic (cardio) physical activity seems most effective to relieve anxiety symptoms

12



13

- ### How to Become More Active
- Learn more about the benefits of physical activity
 - Have a 2-minute side dance party to your favourite song
 - Join a club or team
 - Get a walking/cycling buddy

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Thank you!
Questions?

15

Appendix B

Handout: How to Improve Physical Activity

Ideas to Stay or Get Active!

The 1st Choice Savings Centre for Sport and Wellness within the University of Lethbridge includes the Ascent Climbing Centre, Fitness Centre, three gymnasiums, indoor track, and Max Bell Regional Aquatic Centre. Students are granted access to all facilities through scanning their Student Identification Card after paying tuition and fees. Individual and group personal training programs are available for an additional fee. The University of Lethbridge also offers group fitness classes and programs included in their fitness centre membership.



Things to do In and Around Lethbridge

[Hiking 260km of trails](#)

[Summer Activities in Lethbridge](#)

[Lethbridge Corn Maze](#)

[Downtown Walking Mural Tour](#)

[Exploring the Helen Schuler Nature Centre](#)

[Henderson Pool](#)

[Park Lake Provincial Park](#)

[Stafford Lake Resort](#)

[Bocce Ball & Horseshoes](#)



Highlight some activities you would like to try.

| | | |
|-------------------|----------------|---------------|
| Dance | Hockey | Tennis |
| Powerlifting | Skating | Pickleball |
| Hiking | Figure skating | Track & field |
| Biking | Soccer | Spin class |
| Walking | Dodgeball | Pilates |
| Running | Yoga | Disc golf |
| Swimming | Jump rope | Golf |
| Weightlifting | Skiing | Dog walking |
| Rock climbing | Volleyball | Other: |
| Horse riding | Curling | Other: |
| Baseball/softball | Badminton | Other: |

Which 2 activities do you want to participate in this year?

What's your motivation to improve your physical/mental health?



What step(s) will you take to improve your physical/mental health?

Appendix C

Email Invitation

Subject: Presentation on Physical Activity and Mental Health

Dear 2022 MEd Counselling Cohort,

I hope you've been enjoying your practicum experiences! It would be great to see you online for my project presentation on physical activity and mental health. Please see below for more details.

Title: One Step at a Time: Physical Activity and Wellness in Post-Secondary Students

Supervisor: Dr. Danny Balderson

Committee Member: Dr. Elaine Greidanus

Date: March 25 Time: 12-noon Alberta Time (approx. 30 min) Platform: Microsoft Teams

Join us for an engaging presentation where Christine MacKay, an M.Ed. Counselling Student, will share valuable insights on the benefits of incorporating regular exercise into our daily lives. The presentation will cover topics such as the biological connections between physical activity and the stress response, how physical activity can reduce anxiety and depressive symptoms, and improve cognitive function.

Agenda:

- What is Physical Activity
- Benefits of Physical Activity
- Challenges to Becoming Active
- Physical Activity and Mental Health (i.e., anxiety and depression)
- Tips for Integrating Exercise into Your Life
- Q&A Session with Christine

This presentation is open to all students, faculty, and staff members. Whether you are looking to learn more about the mind-body connection or enhance your current physical activity routine, this event is designed to provide valuable information and inspiration for everyone.

All the best,

Christine MacKay

M.Ed. Counselling Psychology Student

University of Lethbridge

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