

Factors affecting the impact of general elective courses which include physical  
activity on post-secondary student mental health

by

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## Abstract

Post-secondary students are vulnerable to depression, anxiety and stress when faced with academic pressures. Physical activity can be beneficial in alleviating mental health symptoms, therefore, physical activity was built into curriculum of an Ontario Post-secondary general elective course. This thesis aim was to assess whether including physical activity would act as a protective barrier, mitigating further symptoms and lead to improved mental health in students.

The physical activity course did not lead to improvements in mental health scores over a single semester. This may be because students who selected the physical activity course showed lower rates of anxiety and stress at baseline, so they may be already benefitting from exercise.

Student answers to open ended questions indicated that tertiary administrators need to consider a wider variety of physical activity courses. This caters to a wider range of interests and abilities, leading to better outcomes by improving adherence, accessibility and self-efficacy.

**Keywords:** College, post-secondary, mental health, physical activity, general elective course

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## Chapter 1 Introduction

This thesis was completed in partial fulfilment of a Master of Health Science research project. This comparative observational research investigated the effects of the introduction of a general education elective course that has physical activity built into curriculum design when compared to other general elective courses. Study one investigated whether the physical activity course had any benefit on self-reported mental and physical health outcomes, physical activity levels, and barriers to self-efficacy when exercising. Study Two continued compared those who self-selected the physical activity general education course to three other general elective courses: a wellness course, a pre-health course, and a course that had no health related content. Outcome measures were the same as in Study One, with the addition of short answer questions that were asked to gain additional data to assess for baseline differences in participants that chose the various general education courses. Participants were full time students recruited from a mid-sized Ontario college.

The effects of mental health symptoms can be profound and detrimental to an individual's academic success while attending post-secondary education. Mental health concerns can affect individuals of any age group, however, the onset tends to peak between the ages of 15 and 24, just as academic pressures are becoming more demanding and students are adjusting to complex life changes (Thompson-Ebanks, 2017). Depression and other mental health disorders have been found to be a significant public health problem on post-secondary campuses (Mackenzie et al., 2011). It has been suggested that time spent throughout post-secondary can be an extremely difficult period of adjustment for some students with the introduction of new demands on their lives (Hicks & Heastie, 2008). Life transitions such as moving away for the first time, new academic pressures, renegotiation of family relationships, social or relational challenges, family life as well as financial strain can create vulnerabilities to becoming susceptible to mental health concerns (Hicks & Heastie, 2008).

These mental health problems may impede educational attainment, healthy development, relationships as well as quality of life (J.-H. Kim & McKenzie, 2014). According to the American College Health Association-National College Health Assessment Spring 2016 Canadian survey (ACHA, 2016) in the past twelve months 18.4% of students were diagnosed or treated by a professional for anxiety, 14.7% were diagnosed or treated for depression, and 46.2% reported that they experienced more than average level of stress. Research into the mental health and wellbeing of post-secondary students is an important issue as depression, anxiety and stress are reported as common problems, while this population is more likely to suffer from mental health concerns than other age groups (Tyson, Wilson, Crone, Brailsford, & Laws, 2010). Due to the numerous factors that place post-secondary students at an increased risk, it is imperative to identify protective factors for this population that can promote positive emotional and physical health (Downs & Ashton, 2011).

Engaging in regular physical activity is a modifiable health behaviour that has been identified repeatedly throughout current literature as beneficial to mental health symptoms (Lovell, Nash, Sharman, & Lane, 2015). Physical activity can be defined as bodily movements that are produced from skeletal muscles which result in energy expenditure, measured in kilocalories, and can be categorized as occupational, sports, conditioning, household as well as other activities (Caspersen, Powell, & Christenson, 1985). Beneficial effects of physical activity are said to last longer than the effects of medication, have relatively low cost, with benefits almost exclusively positive in regard to physical, cognitive and social functioning (Mailey et al., 2010). Research has been able to clearly indicate a positive association between physical activity and psychological health by enhancing positive emotional well-being; improvements in depressed moods, anxiety, stress, and self-esteem (Mackenzie et al., 2011). A study completed by Tyson et al. (2010) revealed that students who engage in high levels of physical activity demonstrate considerably lower levels of anxiety and

depression than their peers in lower activity categories, and as physical activity increased, self-reported levels of anxiety and depression decreased.

Research has shown that across depression, anxiety and stress, the percentage of students who do not meet health behaviour guidelines is higher in those students with symptoms (Lovell, Nash, Sharman, & Lane, 2015). While engaging in physical activity may help post-secondary students deal more efficiently with the stress that they perceive in their lives, literature suggests that post-secondary students are generally not meeting recommended guidelines for physical activity (Nguyen-Michel, Unger, Hamilton, & Spruijt-Metz, 2006).

Due to the multitude of transitional factors that a post-secondary student faces, it would be an optimal time to target this population for health enhancing interventions that could change potentially unhealthy established behaviours into lifelong healthy habits (Harbour, Behrens, Kim, & Kitchens, 2008).

Despite the immense volume of literature that demonstrates the multiple benefits that physical activity has on the holistic health of an individual, there is an apparent gap that exists when assessing Canadian post-secondary students. Furthermore, current literature lacks studies that have assessed physical activity in curriculum as a protective barrier (mechanism or behaviour put in place to mitigate developing mental health concerns) and possible alleviator of mental health concerns in the Canadian post-secondary system. Although there has been much research done in the area of physical activity and mental health, it appears deficient in this vulnerable population that is becoming increasingly affected by mental health conditions.

To the writer's knowledge, there has yet to be a study in Canada that assesses physical activity in post-secondary curriculum and the positive effects that it may produce on mental health. The aim of this study was to assess the effectiveness of a physical activity general education course to detect if the effects of physical activity can mitigate or provide potential protective factors for mental health outcomes. Therefore, this review of the literature includes: mental

health of post-secondary students, sedentary behaviours of post-secondary students, the effects of impaired mental health on academics and learning, the effects of physical activity on mental health and learning, as well as healthy campus initiatives.

## Chapter 2 Literature Review

### 2.1 The mental health of students in post-secondary academic institutions

When post-secondary mental health clinicians have been asked to discuss the prevalence of the mental health crisis on post-secondary campuses, they emphasize that demands on services have drastically outpaced the capacity and growth of available mental health support systems (Schwartz & Kay, 2009). Mental illness can be described as a biological condition of the brain that causes alterations in thinking, mood or behaviour, associated with significant distress and or impaired functioning (Canada, 2006). For the purpose of this paper, terms such as mental health concerns and mental health disorders can be applied as a variation of this definition of mental illness, indicating an alteration in functioning with cognitive, affective and or behavioural indications.

Students with mental health disorders often experience recurrent or lifelong symptoms that can contribute to increased morbidity of mental illness, as well as individual and healthcare system costs (Welle & Graf, 2011). ("Australian Government: Department of Health and Ageing: Therapeutic Goods Administration.<http://www.tga.gov.au/docs/about/publications.htm>,") . High levels of perceived stress are present in the post-secondary student population, with evidence suggesting that perceived stress is associated with physical and mental health disorders (Gerber, Brand, Elliot, Holsboer-Trachsler, & Puhse, 2014). Common areas that have been identified as stressful for students include feeling pressure by parents to do well in school, changes in living conditions, beginning their post-secondary education, making career choices and decisions, increased workload, coping with a lack of sleep and assignments/papers (Civitci, 2015). Increased academic workloads may lead to increased levels of stress, anxiety, sleep deprivation and eventual burnout that is commonly seen within this population, leading to less than optimal learning conditions and academic repercussions (Ghodasara, Davidson, Reich, Savoie, & Rodgers, 2011).

Students that experience anxiety may persistently feel worried or uneasy about the future due to an overestimation of risk and unrealistic beliefs (J. H. Kim, Yang, & Schroepel, 2013). One study looking at stress showed that 40% of students identified their coping efforts as either ineffective or only partially effective, with this same group describing stress as unpredictable and unmanageable. (Peer, Hillman, & Van Hoet, 2015). Greater perceived stress has been found to be related to less frequent physical activity; with negative health behaviours found to generally not occur in isolation from one another (Dodd, 2010). A concern with many of these stressors is that they are not or not easily, modified in an individual's life, whereas health behaviours generally are (Lovell et al., 2015).

Post-secondary aged individuals are more likely than the general population to suffer from mental health disorders or substance abuse issues, with the onset of most psychological disorders occurring in late adolescence and early adulthood (van der Westhuizen, Wyatt, Williams, Stein, Sorsdahl, 2014). Post-secondary students are 1.64 times more likely to experience the ill effects of mental health disorders than other young individuals (Tyson et al., 2010). It has been argued that post-secondary is the most difficult period of adjustment that a student may face due to life transitions, social challenges, academic pressures, renegotiation of family relationships as well as the student's continued growth to individuate (Hicks & Heastie, 2008). It has been reported by Mowbray et al. (2006) that many students experience their first psychiatric illness while attending post-secondary education, and that 12%-18% of post-secondary students have a diagnosable mental illness.

A sample of 43,499 post-secondary students aged 18-25 who completed the 2005 National College Health Assessment indicated that 65.4% reported feeling hopelessness, 46.1% stated that they felt so depressed that it was difficult to function one or more times during the past year, and 11% had seriously contemplated suicide (The American College Health Association, 2005). Subsequently in 2008, the same survey found that the percentage of students

reporting a diagnosis of depression in their lifetime was 14.9%, 32.0% reported being diagnosed in the past school year, 24.5% reported receiving therapy for their depression, and 35.6% reported currently taking medication for depression ("American College Health Association-National College Health Assessment Spring 2008 Reference Group Data Report (abridged): the American College Health Association," 2009).

More recently in Canada, the American College Health Association (ACHA, 2016) led a national college health assessment in the spring of 2016. This consortium of Canadian college students consisted of 43,780 respondents from 41 Canadian post-secondary institutions who self-selected to participate in this survey. Students were asked to report their mental health experience based on the past twelve months. A substantial percent of respondents, 59.6%, indicated that at some point in the past twelve months they felt hopeless, 89.5% felt overwhelmed by all that they had to do, 44.4% felt so depressed that it was difficult to function, and 64.5% felt overwhelming anxiety.

A study completed by Kawada, Katsumata, Suzuki, and Shimizu (2007) who surveyed 105 individuals that attended a medical clinical course found that 24.3% exhibited a mild depressive state, while 12.6% of the students exhibited a moderate depressive state. Furthermore Garlow et al. (2008) found that 53% of undergraduate students that were sampled reported moderate to severe depressive symptoms, and that 11% had considered suicide within a four week period. Depression in this age group can manifest itself through a negative affect experience, characteristic symptomology and a syndrome defined by operational criteria (Uglesic et al., 2014). The effects of negative presentation along with symptoms of illness can make it difficult for a student to be able to be successful in the various domains in their lives.

The median delay between the onset of mental health symptoms and accessing services is 11 years, despite having access on campuses (Mackenzie et al., 2011). It has been found that 37%-84% of students that did screen positive for depression or anxiety did not receive mental health services; those affected

may face deficits in their motivation shown as fatigue, indecisiveness, low self-esteem, loss of joy interest and pleasure as well as affected sleep hygiene (Blumenthal et al., 2012).

The mental health of post-secondary students is becoming an increasing issue for campus health resources in academia. Students are reporting heightened levels of mental health symptoms within this population as evidenced through current research and national questionnaire samples.

## 2.2 Sedentary behaviours of post-secondary students

Sedentary behaviours can be described as engaging in activities that do not include physical movements such as television or video watching, reading, studying and computer use (Buckworth & Nigg, 2004). Whereas physical inactivity is described as achieving less than the recommended guidelines for participation in physical activity with an increase in sedentary behaviours during occupational, domestic, social or transportation activities (WHO, 2017).

In a study of Canadian college students, researchers found that 66% of high school students report adequate levels of physical activity in their last two months of high school, while only 44% reported adequate levels in their first two months of post-secondary (Steven R Bray et al., 2011). (S. R. Bray & Born, 2004) While school days can have prolonged periods of sitting, small breaks via class interventions are said to have positive effects on metabolic markers and cognition, as well as increase physical activity (Laine, Araujo-Soares, Haukkala, & Hankonen, 2017).

It is thought that as physical activity levels decrease, computer use and television watching time increase, leading to further sedentary behaviours that are seemingly replacing time spent in physical activity (Buckworth & Nigg, 2004). Sedentary behaviours that are present in post-secondary students are said to largely be attributed to increased screen time, mainly computer and internet usage (Feng, Zhang, Du, Ye, & He, 2014). Furthermore, as more and more



courses and post-secondary programs are becoming available for online study, this may be further contributing to this cohort of individuals who are failing to meet physical activity guidelines. Although online delivery can help to achieve the greatest possible audience with the ease of accessibility, (Mailey et al., 2010) it may increase the amount of time that students spend sitting in front of their computers. This increase in computer and associated sedentary time largely contributes to inactivity and associated cardio-metabolic health and mental health concerns, as well as unfavourable blood lipids, backache and headache (Feng et al., 2014). A systemic review completed by Ekelund et al. (2016) included studies from 1 005 791 individuals, who were followed up for 2–18.1 years, examined the associations of sedentary behaviours and physical activity with all-cause mortality rates. This research indicates that roughly 60-75 minutes of physical activity seems to eliminate the increased risk of death that is associated with increased sitting time and low levels of physical activity. With the recent literature suggesting that 40%-50% of post-secondary students are not meeting the minimal physical activity requirements and tend to lead a sedentary lifestyle (Weinstock, 2010), it is proposed that the already vulnerable post-secondary student population is putting themselves at further risk for developing mental health concerns by not maximizing their protective measures.

Studies show that a high percentage of post-secondary students move from a normal weight to overweight as they progress throughout their years of study; with young overweight adults leaving post-secondary institutions creating an increased risk for obesity and other chronic disorders such as depression (Downs & Ashton, 2011). Obesity itself has been documented to increase the risk of mental health disorders through poor perceived health, low self-esteem, body image concerns, and weight related stigma; demonstrating a reciprocal mind and body interaction (J.-H. Kim & McKenzie, 2014).

Contemporary living, schooling, and working arrangements have reduced the demand for physical activity, creating a sedentary lifestyle and a high risk for poor health (Keating, Guan, Piñero, & Bridges, 2005).

### 2.3 Physiology of Depression

Neuroimaging studies from the brains of depressed individuals have shown that there are structural changes in specific anatomical regions within the temporal lobe that are involved in emotion and cognition (Kandel et al., 2012). The hippocampus is a medial temporal lobe structure that is critical for learning and the formation of stable declarative memory in humans (J. J. Kim, Song, Kim, Song, & Kosten, 2006). The thin organic layers that make up the hippocampal formation include the dentate gyrus, the hippocampal proper, and the cornu Ammonis which is divided into regions termed CA1-CA4 (Campbell, Marriott, Nahmias, & MacQueen, 2004). Substantial production of new neurons in the adult mammalian brain is restricted to two areas; the olfactory system, and the dentate gyrus of the hippocampal formation (Lee, Reif, & Schmitt, 2013). The hippocampus is said to be a classic example of neuroplasticity; it has the ability to adapt in response to intrinsic or extrinsic stimuli such as changes in the environment, development or lesions, and behaves in reciprocal interaction between neural structure and function (Kolb & Muhammad, 2014). The hippocampal region of the brain is thought to play a pivotal role in depression as hypotrophy of this region involves deficits in cognitive skills such as memory, learning, regulation of the hypothalamic-pituitary adrenal (HPA) axis, and mood (Krogh et al., 2014).

Neuroimaging studies indicate that the depressed brain shows a hippocampal volume reduction of 0.3-0.4 standard deviations compared to healthy controls, speculating that the reduction is due to decreased neurogenesis and neuroprogression (Krogh et al., 2014). Several meta-analyses confirm that individuals with depression have a 5-8% decrease in hippocampal volume in comparison to healthy controls (Cole, Costafreda, McGuffin, & Fu, 2011). Data suggests that a decrease in hippocampal volume is consistently found in depressed individuals that have suffered from the illness for over two years and who have had more than one depressive episode (Moylan, Maes, Wray, & Berk, 2013).

This chronic exposure to depression is said to result in stress induced alterations to the number as well as shape of new neurons with decreased proliferation of neural stem cells (Lopresti, Hood, & Drummond, 2013). The hippocampus is particularly vulnerable to structural, functional and neurogenic abnormalities in response to stress related diseases, such as depression (Park, Zoladz, Conrad, Fleshner, & Diamond, 2008)

Another popular theory regarding the mechanisms that underpin the pathophysiology of depression involve the activity of monoamines, mainly the deregulation of the activity of serotonin, norepinephrine and dopamine (Matta Mello Portugal et al., 2013). An alteration in the neural transmission of serotonin has been signaled out as the leading indicator to increase susceptibility of mood disorders such as depression and has been the most extensively studied (Lopresti et al., 2013). According to M. J. Owens and Nemeroff (1994) several studies have been able to demonstrate a significant reduction of serotonin concentrations in post-mortem tissue from a depressed patient's brain in the hypothalamus, amygdala as well as global regions. Serotonin is primarily an excitatory neurotransmitter that plays a role in emotion, cognition, sensory perceptions, and essential biological functions; depression and insomnia have been associated with decreased levels of serotonin (Stockmeier et al., 1998). A multitude of current research has looked at the effect of Selective Serotonin Reuptake Inhibitors (SSRIs) on depression, and their efficacy on relieving depressive symptoms has been widely accepted, further enhancing the theory that these levels are abnormal within the depressed brain.

Norepinephrine is related to a heightened state of arousal and alertness, activating the adrenal medulla which stimulates cardiovascular responses, blood perfusion and energy supply (Matta Mello Portugal et al., 2013). A lack of availability of this neurotransmitter therefore leads to a decrease in concentration, lethargy and dysphoric moods indicative of depressive symptomology.

Lacerda-Pinheiro et al. (2014) found that when 'normal' or undepressed volunteers took dopamine antagonists they developed a host of symptoms including: inattention; blunted emotions; clouded memory as well as memory dysfunction which is demonstrated through cognitive slowing and depressive symptomatology.

Depression is a multifactorial mental health illness with a variety of presenting symptoms. These symptoms can be derived from biological changes in the brain that impact learning and memory.

## 2.4 Physiology of Stress and Anxiety

Highly anxious students may see their academic tasks as potential catastrophic failures. This excessive worry can lead to chronic stress and disrupt retention of learned material, as well as over utilize mental resources toward coping which leads to poor task performance (Mok & Chan, 2016). Research has shown that roughly 60% of undergraduate students show an increase in anxiety levels when they begin college (Tyson et al., 2010).

In response to acute stress and anxious states, emotional signals shift the body into a state that enhances the detection, identification and response to a potential or perceived threat that prepares the body to act in an appropriate response to the threat through the release of neurotransmitters, neurotrophic factors, hormones, and cytokines (Russell, Zigmond, Dimatelis, Daniels, & Mabandla, 2014). Along with depression, a cardinal symptom of stress is rumination which is related to an exaggeration of the hypothalamic–pituitary–adrenal (HPA) axis stress response due to the chronic worry that is associated with negative thoughts, creating undesirable health outcomes (Gianferante et al., 2014).

The major physiological responses to stress and anxiety activate the neuroendocrine system, particularly through the initiation of the Hypothalamic-pituitary-adrenal (HPA) axis (Willner, Scheel-Krüger, & Belzung, 2014). Activation

of the HPA axis that is sustained, not balanced or counteracted by another system can put wear and tear on dependent bodily systems. This increases allostatic load and is thought to lead to poor health outcomes including psychiatric and neurodegenerative diseases due to the non-habituation and maladaptive nature of this response (Gianferante et al., 2014).

Transient increases in cortisol secretion can save energy by suppressing the immune system, shifting the body into a catabolic state, increasing energy levels, sharpening cognition, and increasing confidence (Kandel et al., 2012). The feedback mechanisms within the HPA axis normally permits cortisol to inhibit corticotrophin releasing factor (CRH) and adrenocorticotrophic hormone (ACTH) secretion, therefore suppressing additional cortisol synthesis and secretion.

Stressful events cause biochemical changes through the dysregulation and persistent activation of the HPA axis (Kandel et al., 2012). When the stress response is initiated, CRH is released from the hypothalamus stimulating the pituitary gland to produce ACTH which in turn stimulates the release of glucocorticoids (cortisol) from the adrenal cortex into the blood circulation. This employs the negative feedback effects on the pituitary and hypothalamus and limiting the degree of activation of the HPA axis (Gianferante et al., 2014). Emotional stimuli reach the HPA axis through the amygdala, which is responsible for exerting excitatory control over the hypothalamus to stimulate the HPA axis acting in a positive feedback loop to further potentiate the amygdala through increased cortisol levels that are released.

In opposition, the hippocampus exerts inhibitory controls on the HPA axis, inhibiting mechanisms through cortisol stimulation of the hippocampus which creates a negative feedback limiting the activity which is imperative to homeostatic balance (Gianferante et al., 2014). A disruption in the normal stress response is said to contribute to anxiety, stress as well as depression as the negative feedback loop is not being properly disinhibited, creating increased levels of cortisol in the body. Cortisol is said to be a useful psychobiological parameter for estimating maladjustment to both physiological and psychosocial

stressors (Kadooka, Matsutake, Sugo, & Araki, 2014) and can lead to an exaggerated stress response if levels remain heightened. Persistently elevated levels of glucocorticoids can damage mature neurons, inhibit proliferation of granule cell precursors and therefore suppress normal rates of neurogenesis in the hippocampus (Kandel et al., 2012).

Symptoms of stress and anxiety are known to impact a large portion of the post-secondary student population. These symptoms can cause a biological disturbance in neural functioning, resulting in decreased academic success if left unresolved. Although research is able to clearly indicate symptoms and manifestations of these disorders, there is no conclusive theory to date that can state a direct cause of depression, anxiety and stress on individuals. These conditions are said to have a multifactorial etiology that arise from a combination of environmental, psychological, genetic and physiological factors (Lopresti et al., 2013). The activation of various physiological systems that arise from chronic stress and depression can be damaging depending on the time, intensity as well as duration of the stressor (Russell et al., 2014).

## 2.5 The effects of impaired mental health on academics and learning

Depression and anxiety have been consistently listed among the top ten factors impairing self-reported health and academic functioning ("American College Health Association-National College Health Assessment Spring 2008 Reference Group Data Report (abridged): the American College Health Association," 2009). Physical activity has been proposed as an adjuvant to traditional treatment and has been shown to be effective as a monotherapy throughout a variety of studies with an assortment of interventions. Stress negatively affects the health and capacity of an individual to function effectively through physiological, biochemical and behavioural effects (Jones, Dean, & Lo, 2002). A college health assessment survey completed in 2000 reported that 22.5% of students that self-reported symptoms of depression or anxiety received

a lower grade on an exam or an important project, as well as received a lower grade in or had dropped a course (Kisch, Leino, & Silverman, 2005).

It has been explained that depression, stress and other mental health concerns not only change the way we see ourselves, but also the way in which we perceive our environment. These negative views of self, the world, and the future along with recurrent and uncontrollable negative thoughts are debilitating symptoms of depression (Gotlib & Joormann, 2010). Studies that have examined the role of cognitive processing in depression have found that those affected have a difficult time disengaging from negative material or thoughts and show a deficit in cognitive control when processing new information, manifesting as a high level of undesirable thoughts and pathological rumination (Gotlib & Joormann, 2010). Disturbances in both emotional and cognitive functions are key diagnostic features in depression (Korgaonkar, Grieve, Etkin, Koslow, & Williams, 2013). Due to the nature of pathological rumination, or unwanted past-centered thinking in depressed individuals (Gianferante et al., 2014), one may find it difficult to disengage from negative thoughts, unable to view life events as positive thus creating difficulties in multiple functioning domains including: family relationships, peer relationships, stress/ anxiety levels and school/ academics (Diagnostic and Statistical Manual of Mental Disorders, 1994).

Mood and anxiety disorders are the most common serious disorders of the brain and are often accompanied by major physiological, cognitive and behavioural abnormalities (Kandel, Schwartz, Jessell, Siegelbaum & Hudspeth, 2012). Stressful and adverse life events are thought to increase the risk of major depression, and an individual's genes may play a role in this in two distinct manners. Negative events and chronic psychological stress precedes the majority of episodes of clinical depression. The pathophysiology of stress associated depression is hypothesized to be associated with various neurobiological changes which are thought to be essential to the molecular mechanisms of memory, learning, and further depressive symptomology (Eyre, Stuart, & Baune, 2014). A report from Moylan et al. (2013) states that it is

probable that depressive episodes cause tissue damage that can alter physiologic functions through a variety of mechanisms that reinforce symptomology and functional decline over time. Academic performance has been reduced in individuals with anxiety and depression as a result of impending worry that negatively impacts working memory and executive processes (M. Owens, Stevenson, Hadwin, & Norgate, 2012).

Depression, anxiety, stress and their symptoms make it difficult for students to engage in what they are learning due to the aforementioned biological changes which can present themselves through decreased motivation, as well as changes in affect and behaviour. These alterations can make it difficult for students to be successful in their academic studies when coping with these emotions.

## 2.6 The effects of physical activity on mental health and learning

The post-secondary population is susceptible to increased risks of developing mental health concerns as well as developing a sedentary lifestyle. There is strong evidence that physical activity can produce positive effects on mental health (Adams, Moore, & Dye, 2007; Tyson et al., 2010; Uglesic et al., 2014; VanKim & Nelson, 2013), but these outcomes are said to be dependent on regular physical activity practice, making this difficult to achieve due to high rates of inactivity (Matta Mello Portugal et al., 2013). Introducing physical activity is a behavioural intervention that is associated with positive psychological health as well as an increase in perception of personal control (Biddle & Mutrie, 2008). Developmental, neurobiological and psychological factors may underlie or mediate the association of physical activity and mental health disorders in a multifactorial way (Strohle, 2009). Epidemiological research has demonstrated protective effects between physical activity and risk for chronic disease such as anxiety and depression (Pate et al., 1995).



Enhancing fitness levels in post-secondary students may provide a safeguard against or mitigate mental health symptoms which may compel individuals to pursue social and recreational physical activities (Jones et al., 2002). A study completed by Dodd, Al-Nakeeb, Nevill, and Forshaw (2010), found that students who reported consistently engaging in physical activity in their post-secondary years also reported better mental health, experienced significantly more positive affect, higher self-esteem and less stress than those who were not consistently active. There has been growing evidence to suggest that the actual process of engaging in physical activity, such as distracting oneself, rather the effects of the actual physical activity itself is also significant in promoting various mental health benefits (Faulkner & Sparkes, 1999).

Physical activity can help act as a protective agent against the development of mental health symptoms by reducing the amount of negative stress on an individual's emotional state, as negative affect has been thought to be an important predecessor to depression and anxiety (Mackenzie et al., 2011). Physical activity has been demonstrated throughout the literature to be beneficial in relieving depressive symptomology on physiological as well as behavioural models, and may protect against suicidality in youth (Taliaferro, Rienzo, Pigg, Miller, & Dodd, 2009).

Chronic physical activity appears to induce hippocampal neurogenesis, monoamine transmission and synaptic growth which are important for improving behavioural and cognitive function in patients with mental health disorders (Bentley, Pagalilauan, & Simpson, 2014; Toups et al., 2011). Physical activity increases distribution of cerebral blood flow to the hippocampus which has been shown to increase its functional abilities, such as memory (van Praag, Kempermann, & Gage, 1999).

The activation of the HPA axis, which is said to be deregulated in depressed, stressed and anxious individuals, changes in accordance with the type, duration and intensity of physical activity that an individual performs. Although physical activity is an acute stressor, it has been shown that chronic

physical activity can have neuroprotective effects (Matta Mello Portugal et al., 2013). Animal studies have shown that the expression levels of brain derived neurotrophic factor (BDNF), insulin-like growth factor (IGF-1), and vascular endothelial growth factor (VEGF) appear to increase in conjunction with physical activity interventions, acting on survival, proliferation and maturation factors in specific cells within the brain (Matta Mello Portugal et al., 2013). A study completed by Toups et al. (2011) found that the subjects with higher resting BDNF levels experienced more rapid improvements in their symptomology based on the Inventory of Depressive Symptomology, Clinician Rated Scale (IDS-C) encouraging their hypothesis that physical activity may work differently than other depression treatments and may be a superior augmentation to current treatment regimens.

Physical activity promotes an increase in the levels of numerous cytokines with anti-inflammatory properties which protect against chronic medical disorders associated with low-grade inflammation (Petersen & Pedersen, 2005). Research by Russell et al. (2014) reports that norepinephrine released during physical activity enhances learning as well as memory formation, which are known to be negatively impacted during depression.

Students are faced with increasing academic demands within post-secondary education which threatens their ability to participate in physical activity (Hawker, 2012). Students that are not meeting the physical activity recommendations experience more depressive symptoms than their counterparts meeting vigorous physical activity levels (Elliot, Kennedy, Morgan, Anderson, & Morris, 2012). It has been stated that the positive effects of physical activity are almost exclusively beneficial with marked enhancements to multiple bodily systems including cardiovascular, physical, cognitive and social functioning abilities with minimal associated costs (Mailey et al., 2010).

Although physical activity has shown to have a strong relationship with positive mental health indicators, it has not been able to demonstrate that one physical activity is better than another in regard to the benefits it may exert. For

example, Taliaferro et al. (2009) found that men who engaged in moderate levels of toning activities produced positive results on mental health indicators, while women demonstrated reduced suicide risk when engaged in toning activities at low to moderate levels. Meanwhile, Gerber, Brand, Elliot, Holsboer-Trachsler, and Puhse (2014) found that participation in ball sports and dancing lessened the association between perceived stress and depression, while aerobic activities did not. In one study, it was found that students who met the criteria for vigorous physical activity were less likely to self-report perceived stress and mental health concerns than students who did not meet those recommendations (VanKim & Nelson, 2013). Reports from Uglesic et al. (2014) found statistically lower depression scores in active sportsmen (5.5%) in comparison to recreational physical activity and those that were not active in sport (18%). While assessing post-secondary students, Elliot et al. (2012) found that those who reported a medium (3-4 days) to high (5-7 days) of physical activity also experienced fewer depressive symptoms. In comparison, Y. S. Kim et al. (2012) state that leisure time physical activity contributes to effective coping by augmenting problem-focused coping.

A study that was completed with Chinese college students found that those participants who had higher levels of physical activity and low levels of sedentary time reported lower odds of poor sleep quality and were 38% less likely to report symptoms of depression as compared to their peers (Feng et al., 2014). These results indicate that the effects of physical activity may stimulate a dynamic system which triggers a cascade of events that may result in higher resilience against stress related mental health disorders (Strohle, 2009).

Although these positive effects have been well documented, only 13-23% of post-secondary students globally are meeting the physical activity recommended guidelines for habitual physical activity behaviours (Dodd et al., 2010). The transitional nature of individuals attending post-secondary education represent a unique target for health enhancing interventions as unhealthy

behaviours could be established and ingrained during this period, lasting a lifetime (Harbour, Behrens, Kim, & Kitchens, 2008).

## 2.7 Healthy campus initiatives

Promoting activities as well as developing policies and procedures that encourage students' academic performance and retention is a priority for most colleges and universities (Rogers & Harpin, 2016). Traditionally, campus initiatives have focused on the reduction of harmful or risky behaviours such as smoking and alcohol use. Current findings suggest that the most prevalent health risk behaviours on post-secondary campuses are that students are not engaging in health promoting behaviours such as physical activity and adequate fruit and vegetable intake (Kwan, Arbour-Nicitopoulos, Duku, & Faulkner, 2016).

Post-secondary institutions are recognizing the need for further support to its student body in regard to the presence of mental health concerns. Campuses across North America are looking at ways in which individual academic institutions can promote healthy behaviours in order to enhance the student experience while attempting to create a supportive and healthy environment for individuals to thrive in.

The American College Health Association (ACHA, 2012) is leading the forefront in the United States with its Healthy Campus 2020 initiative. Through this program, post-secondary institutions are seen as physical and social environments which offer diverse opportunities to engage individuals to improve health and foster new cultural shifts which address current and future health care issues. Institutions that are wishing to participate are able to do so, and have access to online information that is free of charge and available to higher education professionals to utilize. The ACHA have created student objectives for its coalition to strive to meet in order to enhance the holistic health of this population. Student objective areas include: health impediments to academic performances, health communication, injury and violence prevention, mental

health and mental disorders, nutrition and weight status, physical activity and fitness, sexually transmitted diseases and HIV, family planning, substance abuse, tobacco use, and immunization and infectious disease (ACHA, 2012).

Despite efforts, it continues to be reported that students on post-secondary campuses engage in unhealthy behaviours including smoking, binge drinking, sedentary behaviours, and unhealthy views of self (Misra & McKean, 2000). The University of Connecticut developed a first year course entitled, "Introduction to Health", with a corresponding research study to evaluate the extent to which participation in the course had an influencing factor on participants' health behaviours. During the 15 week course, students participated in lectures, discussions, and small group activities; performed self-appraisals of aspects of their physical, spiritual, social, emotional, environmental, and sexual health; and conducted family risk assessments. It was found that the design of the course helped the students gain an increased awareness of potential risk factors, resources and barriers, as well as identification of their own health needs with associated strategies that could be implemented (Clemmens, Engler, & Chinn, 2004).

Participation in online courses and programs continues to be a rising trend that is present in post-secondary institutions. A study completed by Armstrong and Burcin (2016) questioned college health professionals at a variety of U.S. institutions about what type of health promotion strategies they use to engage the non-traditional online student. Results from 33 institutions indicate that the most utilized resources were mental health support, stress management, and physical activity/ fitness; however, most institutions were not offering interactive student health services to online students.

Interventions that focus on stress reduction before formal exams have also been assessed, in a variety of forms on different post-secondary campuses. Virginia Commonwealth University sponsored a campus wide event to allow students to interact with visiting therapy dogs a week before exams began. This study was able to show that perceived stress after a visit with a therapy dog

declined, although it is unknown how long the reduction in perceived stress actually lasted (Barker, Barker, McCain, & Schubert, 2016).

A recent study that was completed utilizing three university campuses in Spain used the Social Cognitive Theory, created by Bandura (1986) to assess official campus Facebook pages to study the relationship between the content of the pictures posted in relation to varying levels of physical activity the students were engaged in. Since this theory focuses on the premise that human behaviour is determined through reciprocal interactions with its personal environment and behavioural factors (Bandura, 1977), it is thought that the messages that these universities were displaying on their news feeds may be normalizing this behaviour to its audience. Results indicated that 40% of the pictures that were displayed in the University newsfeeds were displaying students engaged in sedentary or low activity behaviours (Martinez-Bello, Martinez-Rojas, & Molina-Garcia, 2017). This indicates that post-secondary social media networking sites may not be utilizing opportunities to their fullest to promote healthy behaviours to their communities.

Post-secondary academic campuses across Canada have been developing and instituting a variety of techniques to be able to respond to the mental health needs of its students. With further research and knowledge sharing of successful strategies within this area, post-secondary institutions can create and implement dynamic interventions and strategies in which they can best support their student population for success.

## 2.8 Summary

The literature indicates that mental health is a critical issue for post-secondary students, and that the sedentary lifestyle of the majority of students is a strong contributor to poor mental health outcomes. Poor mental health affects academic performance through its impact on memory, cognition, and motivation. Physical activity has important benefits for mental and physical health and can

mitigate some of the adverse effects of poor mental health. There are a number of healthy campus initiatives which target mental health, however to writer's knowledge there has yet to be a study that assesses physical activity in Canadian post-secondary general elective curriculum and the positive effects that it may produce on mental health.

## Chapter 3 Assessing post-secondary student mental health outcomes with introduction of physical activity in general elective course

### 3.1 Introduction

The mental health of post-secondary students is a growing concern for academic institutions. Youths aged 15-24 are individuals who are most likely to suffer from mental health disorders or substance abuse issues, with the onset of most psychological disorders occurring in late adolescence and early adulthood (van der Westhuizen, Wyatt, Williams, Stein, & Sorsdahl, 2014). This is the age that individuals typically attend post-secondary institutions, and students are more likely to suffer psychological distress than the general population (CMHA, 2004). It has been argued that attending post-secondary education is the most difficult period of adjustment that a student may face due to life transitions, social challenges, academic pressures, renegotiation of family relationships as well as the student's continued growth to individuate (Hicks & Heastie, 2008).

It has been reported from Gerber et al. (2014) that perceived stress is strongly and positively associated with depressive symptoms, and stress has been repeatedly reported as a major issue in reviews of post-secondary student mental health. Perceived stress is a predictor of depression among post-secondary students, especially women (Anastasiades, Kapoor, Wootten, & Lamis, 2017) with a recent French study indicating that 79% of students report being stressed (Saleh, Camart, & Romo, 2017). With the noted rise of mental health problems on post-secondary campuses, there has been a sharp increase in the demand that has been placed on campus counselling centers (Kitzrow, 2003). According to Mowbray et al. (2006), many students experience their first psychiatric episode while obtaining post-secondary education, and 12%-18% of students have a diagnosable mental illness. Kawada et al. (2007) surveyed 105 individuals attending a medical clinical practice course and found that 24.3%



exhibited a mild depressive state and 12.6% of the students exhibited a moderate depressive state.

An American sample of 43,499 post-secondary students aged 18-25 who completed the 2005 National College Health Assessment indicated that 65.4% reported feeling hopelessness, 46.1% stated that they felt so depressed that it was difficult to function one or more times during the past year, and 11% had seriously contemplated suicide (Taliaferro et al., 2009). Furthermore Garlow et al. (2008) found that 53% of undergraduate students that were sampled reported moderate to severe depressive symptoms, and that 11% had considered suicide within a four week period.

The consequences of mental health concerns within this age group are significant, and depression has long been associated with academic impairments (Mackenzie et al., 2011). A college health assessment survey in 2000 reported that 22.5% of students that self-reported symptoms of depression or anxiety received a lower grade on an exam or an important project, and received a lower grade in or had dropped a course (Kisch et al., 2005).

The pathophysiology of stress-associated depression is hypothesized to be associated with various neurobiological changes which are thought to be essential to the molecular mechanisms of memory, learning, and further depressive symptomology (Eyre et al., 2014). Depression and anxiety have been consistently listed among the top ten factors impairing self-reported health and academic functioning (The American College Health Association, 2008). There are numerous factors that place post-secondary students at an increased risk for mental health concerns and it is important to identify protective factors for this population that can promote positive emotional and physical health (Downs & Ashton, 2011).

The introduction of physical activity is an intervention that has been frequently associated with positive psychological health and an increase in perception of personal control and reduction in anxiety and depression (Biddle &

Mutrie, 2008). Physical activity has been shown to have effects similar to antidepressants as activity-induced increases in an individual's self-esteem can help to counterbalance the negative self-attitudes that are commonly seen in depressive disorders (Ryan, 2008). Current research clearly indicates a positive association between physical activity and psychological health by enhancing positive emotional well-being; improvements in depressed moods, anxiety, stress, and self-esteem (Mackenzie et al., 2011).

A study completed by Tyson et al. (2010) concluded that students who engage in high levels of physical activity demonstrated considerably lower levels of anxiety as well as depression when compared to their moderate and lower level physical activity counterparts. Physical activity can help act as a protective agent against the development of mental health symptoms by reducing the amount of negative stress on an individual's emotional state, as negative affect has been thought to be an important predecessor to depression and anxiety (Mackenzie et al., 2011). It has been stated that the effects of physical activity are mainly beneficial with demonstrated enhancements to multiple bodily systems including cardiovascular, physical, cognitive and social functioning abilities with minimal associated costs (Mailey et al., 2010).

With the recent literature suggesting that 40%-50% of post-secondary students are not meeting the minimal physical activity requirements and tend to lead a sedentary lifestyle (Weinstock, 2010) it is proposed that the already vulnerable post-secondary student population is putting themselves at further risk for developing mental health concerns by not maximizing their protective measures.

Research has shown that across depression, anxiety and stress the percentage of students who do not meet movement behaviour guidelines are higher than in those students with rather than without symptoms (Lovell et al., 2015). Due to the multitude of transitional factors that post-secondary students face, it proves as an optimal time to target this population for health enhancing

interventions that could change potentially unhealthy established behaviours into lifelong healthy habits (Harbour et al., 2008).

Despite the positive health benefits of physical activity, the literature lacks studies that have assessed the value of physical activity incorporated into the curriculum as a protective barrier and possible alleviator of mental health issues in the Canadian post-secondary system.

Post-secondary institutions are recognizing the need for further support to its student body in regard to the presence of mental health concerns. With physical activity showing promise as a protective mental health factor, physical activity has been added to the curriculum of a general education elective course to full time students of an Ontario College.

The aim of this study was to assess the potential benefits of the addition of physical activity (PA) into the curriculum of a general education elective course on self-reported symptoms of depression, anxiety, and stress, physical activity levels, barriers to physical activity as well as perception of physical and mental health. The study investigated group differences between two general elective courses that are accessible to students regardless of program or year of study. A physical activity elective course was compared to a wellness elective course that offers similar content on healthy active living but does not include the physical activity component. The results of self-report questionnaires were compared between the two classes. It was hypothesized that participants in the Find Your Fit course would demonstrate fewer mental health symptoms than their counterparts when assessed at the end of the semester, and would report healthier scores on the mental health outcome measures.

### 3.2 Methods

This was an exploratory observational study which measured health outcomes at baseline and at the end of a fourteen week academic semester (i.e. week 4 and week 14).

Two courses were selected for comparison: “Find Your Fit” (n=52) which has physical activity and wellness built into the curriculum of the course, and “Stress, Wellness and Nutrition” (n=36) which has a wellness component but no physical activity involvement.

The “Find your Fit” course description states:

*“Students in this course will learn about and gain awareness of different types of physical activity and the impact physical activity has on individual health and wellness. Students will gain a personal understanding of the importance of physical activity and of become increasingly aware that each individual is responsible for their own fitness and that there is a form of enjoyable physical activity for everyone and every body type. Students will learn the evolution of intentional exercise, the barriers to exercise and related solutions, exercise adherence, stages of change and the impact of technology on physical activity. Students will be assessed through a combination of online reflections, self and peer-evaluation, interviews, presentations, web quests and online quizzes.”*

Whereas the “SWN” states:

*“Stress can play a huge factor in our professional lives. Learning how to deal with it is vital to our long-term health. While stress alone doesn’t cause disease, it triggers molecular changes throughout the body that make us more susceptible to many illnesses. In this course, students will gain an understanding of the importance of how to deal with both positive and negative stress in their lives. By using wellness perspectives, each student will gain more insight into how he or she can control both internal and external stressors”.*

Institutional review board approval was obtained and all participants provided informed written consent prior to participation in the research study. Both professors of these classes agreed to let the principal investigator come to their classes and speak to their students regarding this research project and invite them to participate. Participants were recruited in person during class time

via a verbal script that was delivered to each class during the fourth week of the Fall 2015 semester (T1).

### 3.3 Participants

In total, there were 88 participants that were invited to participate in the research study. All participants were recruited from one of two classes; Find Your Fit (n=52) and Stress, Wellness and Nutrition (n=36). In order to be included in the data analysis, participants had to be present in class on both days that the questionnaires were administered.

### 3.4 Procedure

Packages were given during the fourth week (T1) of a fourteen week semester to each student that was present in class that day which included a written description of the research project, the consent form, and the questionnaires used in the study (described below). Students had not started the physical activity component of the course at this point in the semester, and were scheduled to begin the following class. Students were offered an incentive of a 2% bonus to their final grade if they were to complete both phases of the research study. Students who did not wish to participate in the study were given an alternate assignment of a four page paper to complete and be marked by the principal investigator. Participants were made aware that their professors would not know who completed the study until after the second phase of questionnaire administration was completed and scored at the end of their semester to reduce the potential for professor bias toward their students. Participants were given class time to fill out the consent form and the questionnaires should they wish to participate. Students who did not wish to participate in the research study were encouraged to not answer the questionnaire package, students who began to fill out the questionnaires but did not complete all of the surveys were omitted from the research study. The principal investigator returned to the same classes toward

the end of the semester in week 14 (T2) to administer the second set of the questionnaires to assess for any differences in individual and class outcome measures. Data were analyzed from those participants who completed both sets of the questionnaires; if any part of the research study was not completed, the participant's data were removed from the analysis and results.

### 3.5 Outcome Measures

#### ***Depression, Anxiety and Stress Scale (Dass-21)***

The Depression, Anxiety and Stress Scale (Lovibond & Lovibond, 1995) is a self-reported questionnaire that has been designed to assess for unrelated characteristics of depression, anxiety and stress that are related to the common features of depression and anxiety (Norton, 2007). It is the condensed version of the original 42- item DASS scale that was originally standardized with college students (Camacho, Cordero, & Perkins, 2016). Using an undergraduate sample, Lovibond and Lovibond (1995) validated the DASS against widely used measures of depression (Reynolds, MacPherson, Tull, Baruch, & Lejuez, 2011). The DASS-21 was created as a measure of the characteristic symptomology of depression and anxiety to be able to differentiate between the two conditions (Camacho et al., 2016). It is a reliable instrument that is frequently seen in clinical and non-clinical samples and has well established psychometric properties that reliably measure depression, anxiety and stress (Cheung et al., 2016). The instrument contains 21 questions that cover three domains (depression, anxiety and stress) and has seven questions that are addressed to assess for symptoms in each. Participants are asked to report their symptoms on a four point Likert scale indicating that the statement; did not apply over the past week (0), applied to some degree or some of the time (1), applied a considerable degree or a good part of the time (2), applied very much or most of the time (3). Scores for each domain are summed; higher scores are indicative of an increasing severity of symptoms. Participants were divided into four main groups, adapted from original DASS scoring, to categorize their reported symptomatology. These groups

included: normal/ mild, moderate, severe and extremely severe. The normal and mild category were condensed in this study as it has been reported that individuals who fall into the mild category are not likely to show symptoms that are severe enough to indicate clinical significance or disturbance in functioning (Norton, 2007). Scores and classifications for the categories of symptoms of the DASS-21 are listed in Table 1. See Appendix C for the Depression, Anxiety and Stress Scale Questionnaire.

*Table 1: Classification of DASS-21 scores for Depression, Anxiety and Stress (Lovibond & Lovibond, 1995)*

Severity	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

### ***International Physical Activity Questionnaire (IPAQ)***

Physical activity and sedentary behaviour were assessed using the Short Form Self-Administered International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003). This measurement tool has been shown to be reliable and valid in measurement properties that are consistent with other self-reported physical activity measures (Craig et al., 2003). The IPAQ has been shown to be a reliable and valid tool for measuring physical activity levels in college students (Dinger, Behrens, & Han, 2006). Each participant self-reported their level of physical activity over the previous one week period in regard to the amount of time spent engaged in vigorous, moderate, and walking activity. Scoring was completed and data categorized as per IPAQ standardized scoring methods of the self-administered short form. METs (physiological measure representing the energy cost of physical activity) (Arvidsson, Slinde, Larsson, & Hulthen, 2007)

were summed by a predetermined calculation of energy expenditure that is computed by multiplying the MET score of an activity by the minutes performed. Sedentary behaviour was established by the participant's response to how much time they spent sitting on a week day, over the last seven days. Once physical activity, according to time spent in walking, moderate-intensity, and vigorous-intensity activities were scored, participants were assigned a category based on their activity levels. Category 2 (moderate level) was assigned to those who either engaged in vigorous activity for at least 20 minutes per day for three days a week, or engaged in walking and moderate activity for at least 30 minutes a day five days a week, or had a MET expenditure between 600 and 2999. Participants were placed into Category 3 (high level of physical activity) if reported they engaged in vigorous activity at least three days a week while meeting a MET expenditure of 1500 or more, or engaged in walking and moderate level of physical activity for a total of seven days with a total MET expenditure of at least 3000 (Musselman & Rutledge, 2010). Those participants that did not report enough physical activity to place them into either previously noted category were classified into Category 1 (low activity level). Sedentary behaviours are reported by course means. See Table 2 for calculation of METs per week. See Table 3 for the International Physical Activity Questionnaire scoring and categories. See Appendix D for the Short Form Self-Administered International Physical Activity Questionnaire.

*Table 2: Calculation of METs used to determine METs/Week adopted from Craig et al. (2003)*

Walking MET minutes/ week	3.3 x walking mins x walking days
Moderate MET minutes/ week	4.0 x moderate-intensity activity mins x moderate days
Vigorous MET minutes/ week	8.0 vigorous-intensity activity mins x vigorous-intensity days
Total Physical Activity MET/Week	=Sum of Total Physical Activity MET/Week



Table 3: International Physical Activity Questionnaire Scoring and Categories (Craig et al., 2003)

Category 3	High	Vigorous-intensity activity on at least 3 days achieving a minimum Total physical activity of at least 1500 MET-minutes/week OR 7 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum Total physical activity of at least 3000 MET-minutes/week.
Category 2	Moderate	3 or more days of vigorous-intensity of at least 20 mins OR 5 or more days of moderate intensity and or walking of at least 30 mins / days OR 5 or more days of any combination of walking, moderate-intensity, or vigorous intensity activities achieving a minimum total physical activity of at least 600 MET –minutes/ week
Category 1	Low	Those individuals who not meet criteria for Categories 2 or 3 are considered to have a 'low' physical activity level.

**Barriers Self-Efficacy Scale (BARSE)**

The Barriers Self-Efficacy Scale (McAuley, 1992) is a physical activity focused self-efficacy measurement tool that is used to assess an individual's perceived capability to perform physical activity when faced with various barriers to participation (Weibull, Cumming, Cooley, Williams, & Burns, 2015). The measurement tool is a 13 item questionnaire that is based on an 11-point Likert scale. Responses assess the determination of participants to engage in physical activity through various barriers one may face when considering PA (boredom, disinterest, discomfort, transportation, self-consciousness, lack of social support)

(Mailey et al., 2010). Participants report their perceived confidence rating from 0 (not at all confident) to 100 (highly confident) depending on a common barrier that they may face, for example, “I was on vacation”, “I had to exercise alone”. See Appendix E for the Barriers Self-Efficacy Scale questionnaire. Scores that are under 50 are considered low efficacy, scores that are in the 50-70 range indicated moderate efficacy levels, while those above 70 are considered to be high in their self-efficacy. See Appendix E for the Barriers Self-Efficacy Scale questionnaire.

### ***Short Form-12 Health Survey (SF-12)***

The Short Form-12 Health Survey (Jenkinson et al., 1997) is a general quality of life survey that is a modified, shorter version of the 36-item Short-Form Health Survey with similar reliability and validity indicators (Schepis & Hakes, 2014). The SF-12 assessed the participants self-reported measures of both physical component summary scores (PCS) and mental component summary scores (MCS) using a Likert scale with varying ranges depending on the question that is being asked. The two scores that are obtained from this survey are composite scores representing both physical health and mental health according to question responses. Findings are computed using scores from the twelve questions and range from 0-100. Those participants that had a higher score represented better mental and/or physical health states in accordance with the country specific normal based score (Hjorth et al., 2016). In normative data, the mean scores is set to 50; scores >50 indicate better physical or mental health than the mean, and scores < 50 indicate perceived worse health (Jenkinson et al., 1997). See Appendix F for the Short Form-12 Health Survey Questionnaire.

## **3.6 Data Analysis**

Symptoms of depression, anxiety, and stress that the participants self-reported were categorized into four groups representing various degrees of

symptomology; normal/ mild, moderate, severe, and extremely severe according to the DASS-21 scoring and category criteria. All other questionnaires were scored and summed as described in above descriptions with mean class scores calculated. Descriptive statistics and repeated measures ANOVA were computed using SPSS. Independent t-tests were used to determine if there were baseline differences between the two groups for the stated outcome measures. If no differences were found, a Mixed Design (ie. two way) ANOVA comparing baseline and end of semester scores for the various questionnaires between the two types of classes. If differences were found, then an ANCOVA would be performed to take into account any baseline differences. Statistical significance was set at  $P \leq .05$ .

### 3.7 Results

The participants completed questionnaires during the fourth week (T1) of their semester in September, 2015 and completed the second set of questionnaires during week 14 (T2) of their semester in December, 2015. Table 4 shows the breakdown of the participants that completed both sets of questionnaire administration and were included in the data analysis.

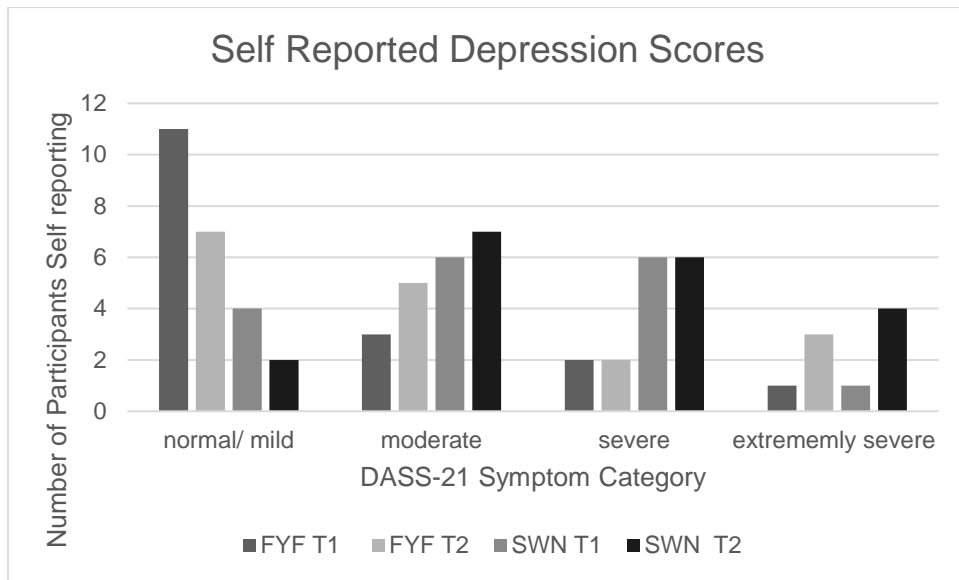
*Table 4: Participants included in study.*

Class	Total (n)	Male	Female
FYF	17	6	11
SWN	14	3	11

Students at T1 in the Find Your Fit class reported symptoms of depression as normal/mild 65% (n=11), moderate 18% (n=3), severe 12% (n=2), and extremely severe 6% (n=1). At the end of the semester after the participation of physical activity throughout the course participants reported their symptoms of depression as normal/mild 41% (n=7), moderate 29% (n=5), severe 12% (n=2)

and extremely severe 18% (n=3). Students in the Stress Wellness and Nutrition course reported symptoms of depression at T1 as normal/ mild 57% (n=8), moderate 43% (n=6), severe 0% (n=0), and extremely severe 0% (n=0). At the end of the semester at T2, students reported their symptoms of depression falling into the categories of normal/ mild 57% (n=8), moderate 21% (n=3), severe 7% (n=1) and extremely severe at 14% (n=2). Self-reported depression scores for FYF and SWN at T1 and T2 are depicted in Figure 1.

Figure 1: Participants Self-Reported Depression Scores in Find Your Fit (FYF) and Stress Wellness and Nutrition (SWN)

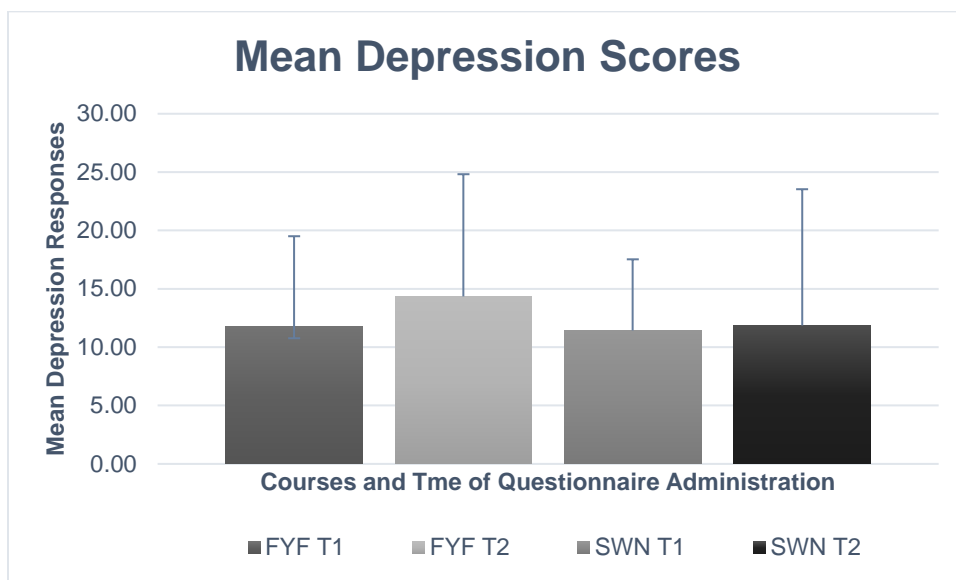


There were no differences in depression, anxiety or stress scores for the two classes, therefore the two way repeated Measures ANOVA was used for all group comparisons.

There were no significant differences in self-reported mean symptoms of depression between the two courses at T2 [ $F(1,30)=0.69 = p<0.41$ ]. Mean depression scores were compared throughout the intervals of questionnaire administration. In the Find Your Fit course, students at the beginning of the

semester (T1) rated their symptoms of depression at 11.76 (SD 7.74), which falls into the category of normal/mild symptomology. At the end of the semester (T2), the same group of participants reported the severity of their symptomology of depression as 14.35 (SD10.47) which falls into the moderate category. Students in the Stress Wellness and Nutrition course had similar reports of their mean depression scores at T1, 11.34 (SD 6.10) in the normal/mild category. The same group of participants reported at T2 no increase in self-reported symptomology at 11.86 (SD 11.67) which continues to be in the normal/mild category. Mean Depression scores are depicted in Figure 2.

Figure 2: Mean Depressive Scores for Find Your Fit (FYF) and Stress Wellness and Nutrition (SWN)

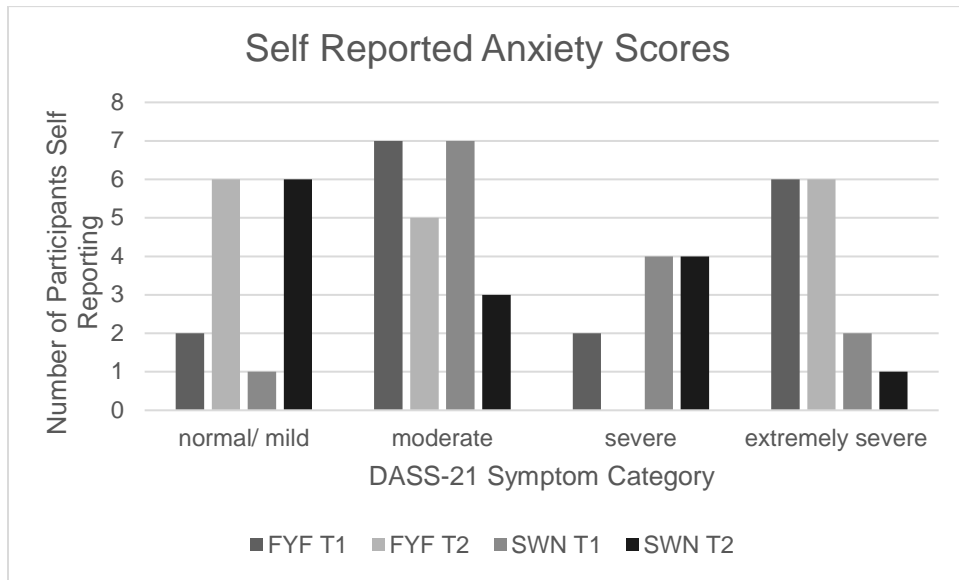


While assessing the participants anxiety scores, those in the Find Your Fit class reported their symptoms at T1 as normal/mild 12% (n=2), moderate 41% (n=7), severe 12% (n=2) and extremely severe 35% (n=6). At T2 the same participants reported their anxiety as normal/mild 35% (n=6), moderate 29% (n=5), severe 0% (n=0) and extremely severe 35% (n=6).

In the SWN course, participants reported their baseline anxiety symptoms at T1 as normal/mild 7% (n=1), moderate 50% (n=7), severe 29% (n=4) and extremely severe 14% (n=2). At the end of the semester at T2 the participants reported their symptomology scores as normal/mild 43% (n=6), moderate 21%

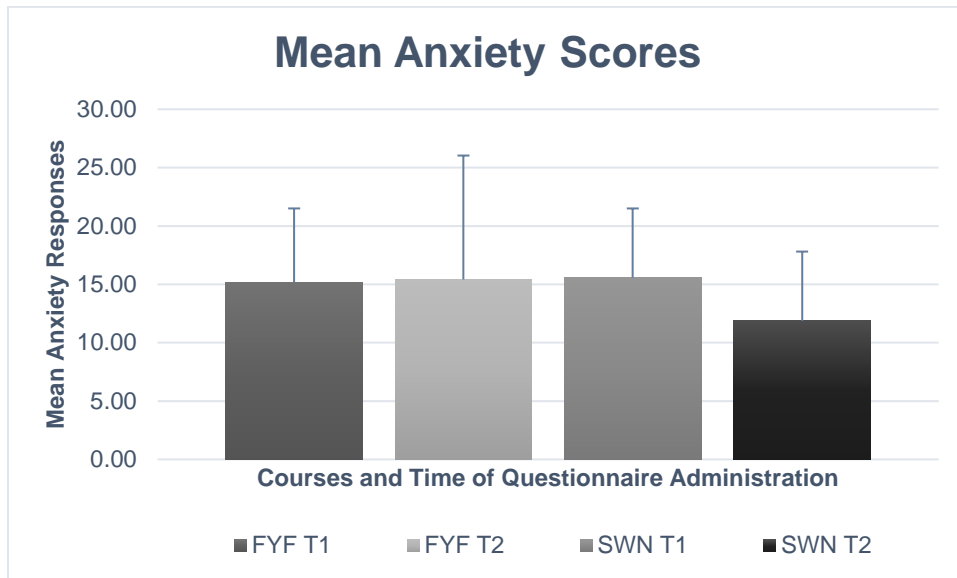
(n=3), severe 29% (n=4) and extremely severe 7% (n=1). See Figure 3 for self-reported anxiety scores.

Figure 3: Participants Self-Reported Anxiety Scores from Find Your Fit (FYF) and Stress Wellness and Nutrition (SWN)



There were no significant differences found between the two courses at T2 when assessing mean differences in anxiety scores [ $F(1,30)=2.82=p<0.09$ ]. Participants in the Find your Fit course reported their mean symptoms of anxiety at T1 to be 15.18 (SD 6.33) which falls into the severe category, and at T2 15.41 (SD 10.62) which remains in the severe category of symptoms. The participants in the Stress, Wellness and Nutrition course reported their mean symptoms of anxiety at T1 to be 15.57 (SD 5.93) which falls into the severe category; while at T2 participants reported their mean anxiety scores at 11.86 (SD 5.95) which decreases the severity category to moderate. See Figure 4 for mean anxiety scores.

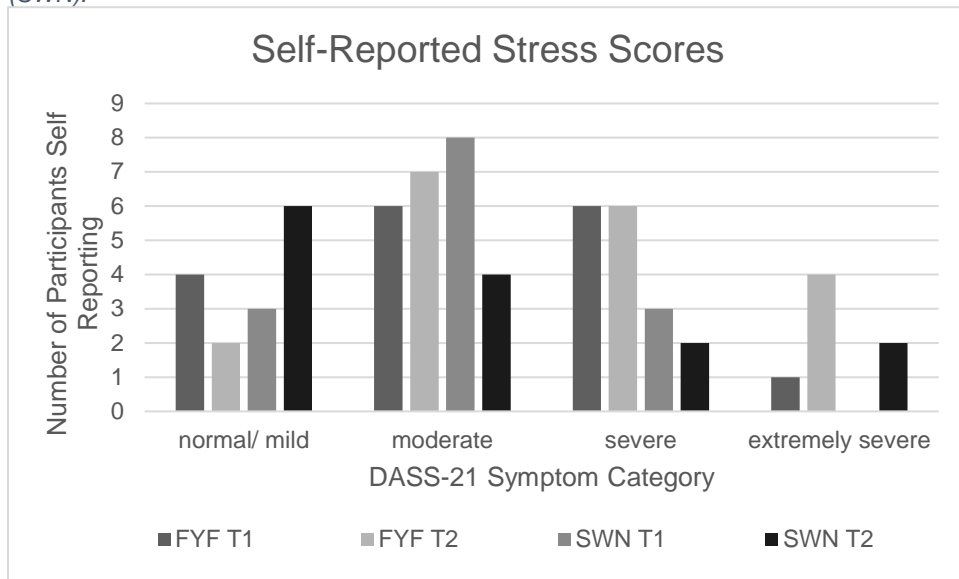
Figure 4: Participants Self-Reported Mean Anxiety Scores for Find Your Fit (FYF) and Stress Wellness and Nutrition (SWN)



The students in the Find your Fit class reported symptoms of stress at T1 as normal/mild 24% (n=4), moderate 35% (n=6), severe 35% (n=6) and extremely severe 6% (n=1). At T2 symptoms of stress were reported as normal/mild 12% (n=2), moderate 41% (n=7), severe 35% (n=6) and extremely severe 24% (n=4).

In SWN initial stress symptoms at T1 indicated that participants were categorized as normal/mild 21% (n=3), moderate 47% (n=8), severe 18% (n=3) and extremely severe at 0% (n=0). At T2 stress levels indicated symptomology reported as normal/mild 43% (n=6), moderate 29% (n=4), severe 14% (n=2) and extremely severe 14% (n=2). See Figure 5 for self-reported stress scores.

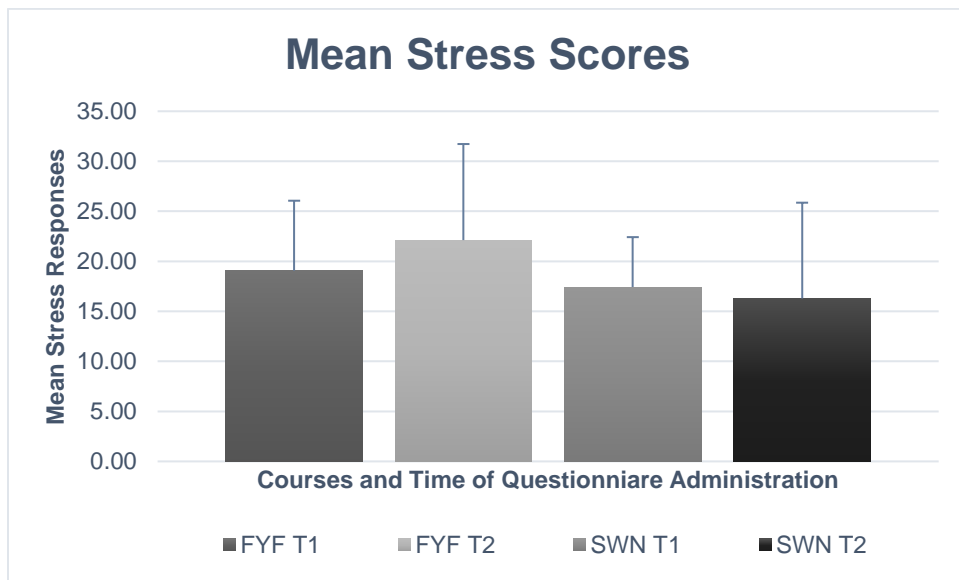
Figure 5: Participants self-Reported Stress Scores for Find Your Fit (FYF) and Stress Wellness and Nutrition (SWN).



There were no significant findings at T2 between the two courses when assessing self-reported mean stress scores [ $F(1,30)=0.60 = p<0.81$ ]. Mean stress scores reported from participants in the Find Your Fit course at T1 presented as 19.06 (SD 7.00) in the moderate category, and at T2 22.12 (SD 9.60) which continues to present in the moderate category. Participants in the Stress, Wellness and Nutrition course at T1 reported their mean symptoms of stress to be 17.43 (SD 4.99) placing them in the moderate category, and at T2 16.29 (SD 9.57) which continues to place them with moderate symptoms. See Figure 6 for mean stress scores.

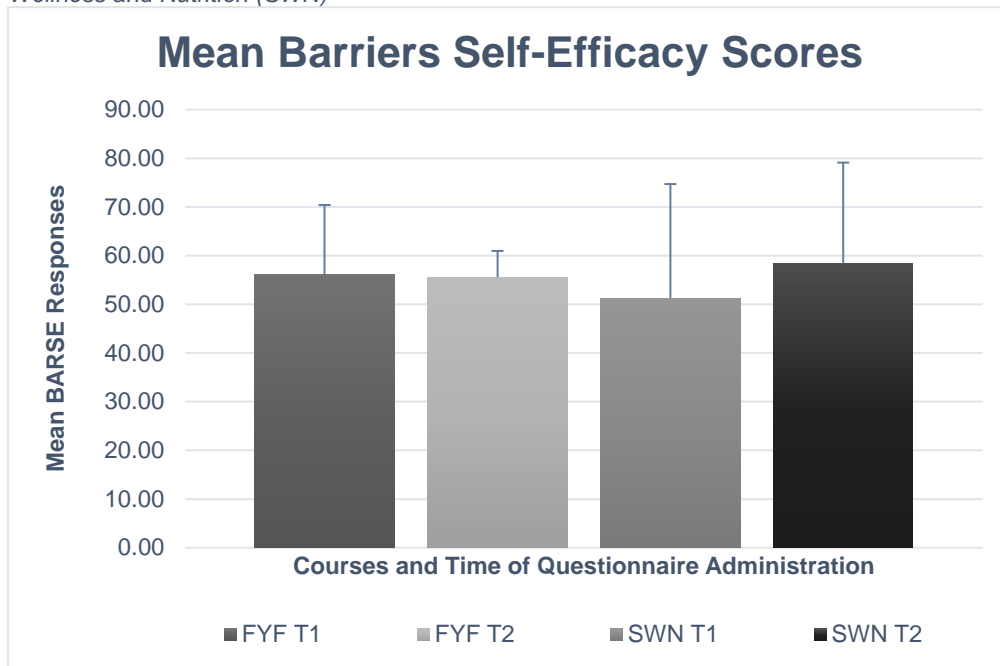


Figure 6: Participants Self-Reported Mean Stress Scores for Find Your Fit (FYF) and Stress Wellness and Nutrition (SWN)



There were no significant differences between the two courses in regards to changes in their reported efficacy toward physical activity [ $F(1,30)=1.05$ ,  $p=0.032$ ]. At T1 FYF reported their mean BARSE scores as 56.18 (SD 14.23) and at T2 55.59 (SD 5.37). At T1 SWN reported their mean BARSE scores as 51.29 (SD 23.42) and at T2 58.36 (SD 20.75). For mean Barriers Self Efficacy Scores for each course refer to Figure 7.

Figure 7: Participants Self-Reported Mean Barriers Self-Efficacy Scores for Find Your Fit (FYF) and Stress Wellness and Nutrition (SWN)



There were no significant differences between the two courses in regard to their reported mental component summary scores [ $F(1,30)=0.20$ ,  $p=0.66$ ] or their reported physical component summary scores [ $F(1,30)= 2.35$ ,  $p=0.14$ ]. For mean Short Form-12 physical component summary (PCS) scores and mental component summary scores (MCS) for FYF and SWN courses refer to Figures 8 and 9 respectively.

Figure 8: Mean participants Physical Component Summary (PCS) Scores for FYF and SWN

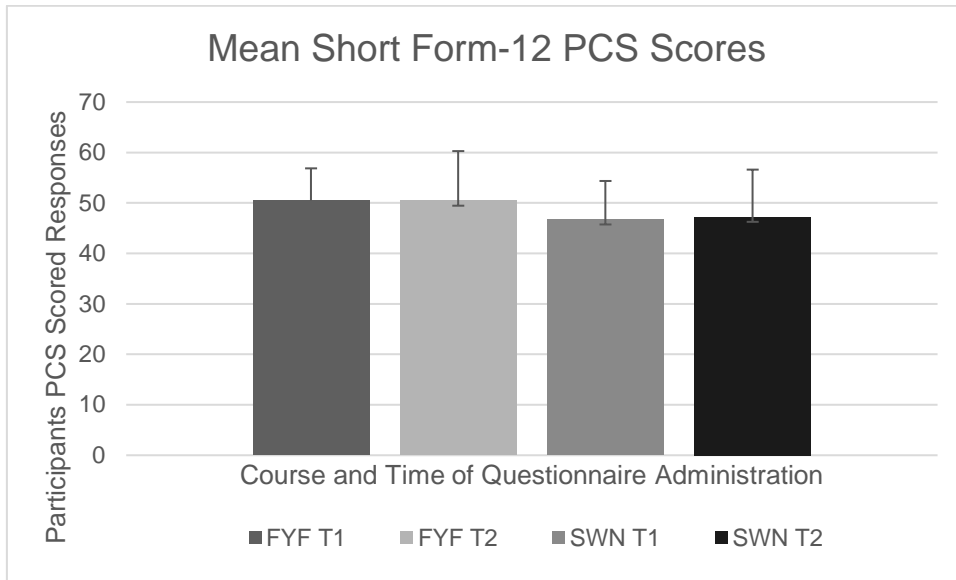
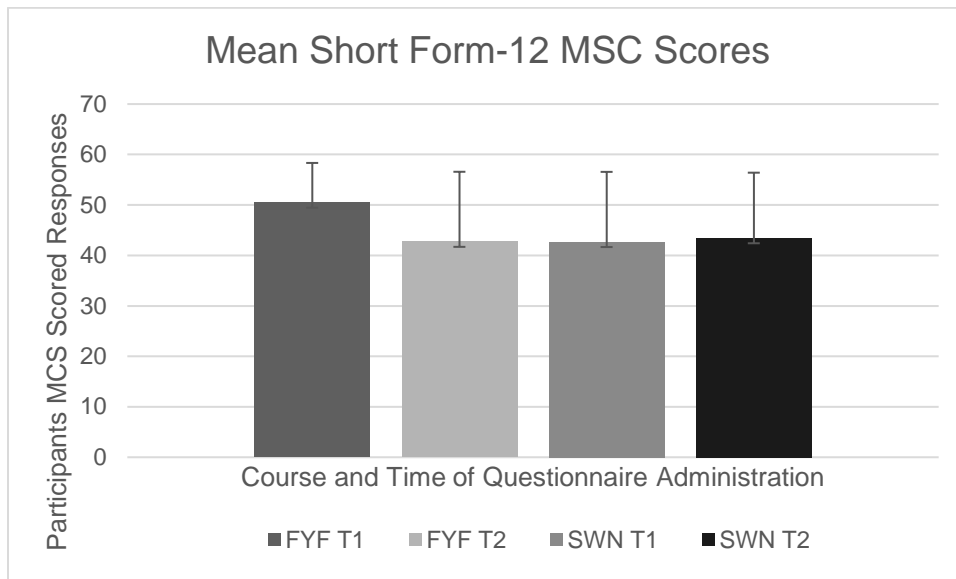


Figure 9: Mean participants Mental Component (MCS) Scores for FYF and SWN

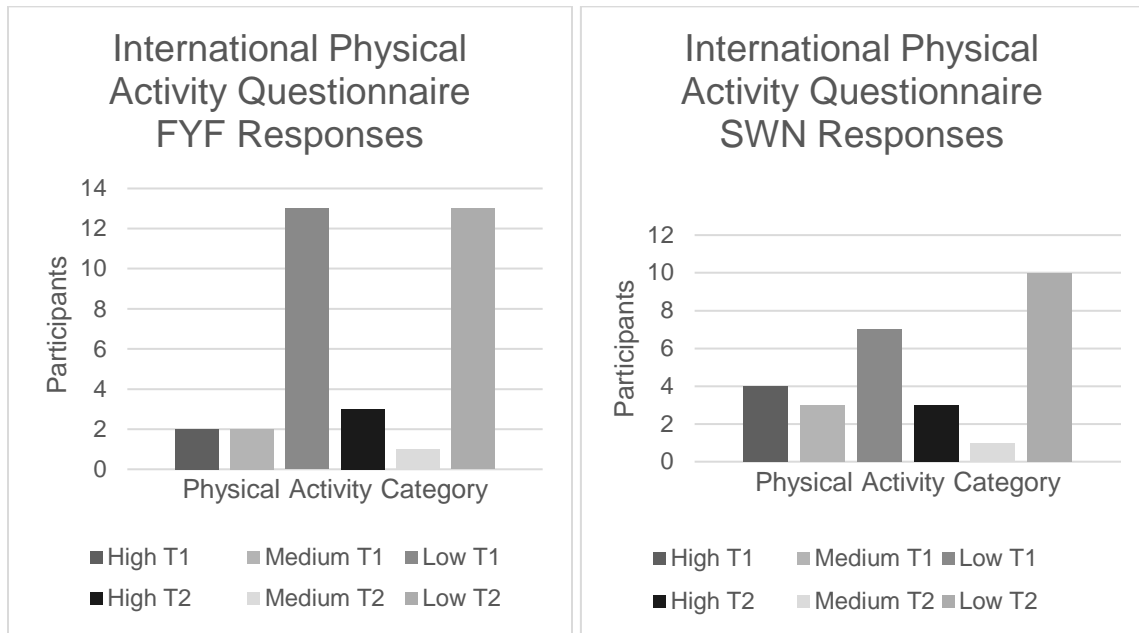


Participants in the FYF course reported their own PA levels through the use of the IPAQ tool. At T1 12% (n=2) reported that they were in the highest PA level in category 3, 12% (n=2) reported that their activity scores placed them into category 2, and 76% (n=13) reported minimal physical activity and fit into category 1. At T2 18% (n=3) reported that they met the criteria for category 3 PA

levels, 6% reported to be placed into category 2 (n=1) and 76% students remained in the lowest level of PA in category 1 (n=13).

Participants in the SWN course at T1 reported that 29% participated in a high amount of PA to place them into category 3 (n=4), 21% (n=3) fell into category 2, while 50% of the students reported minimal PA indicative of category 1 placement (n=7). At T2 21% (n=3) remained in category 3, 7% (n=1) reported PA for placement into category 2, and 71% (n=10) fell into category 1. For International Physical Activity Questionnaire results refer to Figure 10.

Figure 10: Find Your Fit (FYF) and Stress Wellness and Nutrition (SWN) Participants Self-Reported IPAQ scores



There were no significant differences between MET scores for the two courses when compared [ $F(1,30)=2.36, p=0.14$ ]. IPAQ mean MET scores for FYF at T1 were 4380.26 (SD 3185.74) and at T2 were reported as 6255.26 METs (SD 5755.92). IPAQ mean MET scores for SWN at T1 were 7094.89 (SD 8029.31) and at T2 were reports as 4823.54 METs (SD 4300.96).

There were no significant differences in the amount of time participants were engaged in sedentary behaviours throughout the semester [ $F(1,30) = 0.17$ ,  $p = 0.89$ ]. The average time that participants in the Find Your Fit course spent in sedentary behaviours was 6.4 hours (SD 2.69) at T1, and 6.21 hours (SD 2.25) at T2. Participants in Stress Wellness and Nutrition reported 6.6 hours (SD 2.4) of sedentary behaviours at T1 of the semester, and 6.45 hours (SD 2.5) at T2.

### 3.8 Discussion/ Comments

This study aligns with current research that highlights the prevalence of mental health symptoms that post-secondary students are affected by. Results from this small sample of Canadian post-secondary students reveal that at the time of baseline administration of questionnaires participants self-reported symptoms that fell into the moderate to extremely severe category according to DASS-21 scoring criteria for: depression 39%, anxiety 90% and stress 77%. These results coincide with similar findings from the Canadian ACHA survey completed in 2016 (ACHA, 2016) which found that 89.5% of students felt overwhelmed by all that they had to do, 44.4% felt so depressed that it was difficult to function, and 64.5% felt overwhelming anxiety. Although there were no significant differences in mental health outcomes between the two courses, an important finding is the large number of students who reported mental health symptoms in both classes. Despite this study's findings, current literature does indicate that involvement in physical activity can mitigate the effects of mental health symptoms (Garlow et al., 2008; Higgins, Middleton, Winner, & Janelle, 2014; Tyson et al., 2010; Uglesic et al., 2014). Although there were no significant differences found, trends were identified in participants' responses that show healthier scores are baseline testing in the FYF course in regard to their symptoms of depression, anxiety and health scores. This may indicate that those who selected into this type of physical activity based course may be engaging in health behaviours outside of school. If this is the case, these participants may

already be benefiting from the positive effects of physical exercise and would therefore not exhibit hypothesized changes in mental health outcomes.

The BARSE questionnaire did not show significant differences between courses in regard to participants' self-efficacy to continue to exercise in the face of common barriers. FYF as well as SWN reported that their self-efficacy was in the low normal range for both timing periods of questionnaire administration. This indicates that although wellness, coping mechanisms and healthy behaviours were discussed in both courses, it was not effective in creating a stronger sense of self efficacy toward physical activity. This lack of self efficacy could lead to students not continuing to engage in physical exercise outside of class time, and therefore not acquiring the mental health benefits that can be gained from continuous physical activity. Research has shown that antidepressant effects of physical activity are experienced by those who continue to engage in physical activity over a period of time as personal strategies to maintain a physical activity regime are crucial s to achieve the benefits that physical activity can offer to mental health (Blumenthal et al., 2012).

Find your Fit gave students the opportunity to engage in a variety of physical activity and sport related activities throughout the semester, however, it is not known if students were given enough time in each activity to feel confident in their abilities to complete the activity in an independent setting. The course spent a maximum of 30% of class time engaged in various physical activities, once per week. The intensity of the activity participants engaged in throughout class was not measured, but their self-reported weekly average energy expenditure was assessed and compared between groups. Physical activities that were self-reported using the IPAQ tool indicate that the majority of students were in the lowest category of physical activity levels at T2 in the semester. Although the participants may have been exposed to various activities, a lack of consistency may have led to non-habituation of this type of lifestyle, and therefore possible decreased positive mental health outcomes. Current literature tends to focus on one type of physical activity when assessing for mental health

outcome efficacy. For example, Taliaferro et al. (2009) found that men who engaged in moderate levels of toning activities produced optimal results, while women demonstrated reduced suicide risk when engaged in toning activities at low to moderate levels. Meanwhile, Gerber et al. (2014) found that participation in ball sports and dancing lessened the association between perceived stress and depression, while aerobic activities did not. In one study, it was found that students who met the criteria for vigorous physical activity were less likely to self-report perceived stress and mental health concerns than students who did not meet recommendations (VanKim & Nelson, 2013). A study completed by Uglesic et al. (2014) found statistically lower depression scores in active sportsmen (5.5%) in comparison to recreational physical activity and those that were not active in sport (18%). In comparison, Y. S. Kim et al. (2012) state that leisure time physical activity contributes to effective coping by augmenting problem-focused coping. Having one type of physical activity intervention throughout the course, or assessing the energy expenditure during each class may have been more beneficial in measuring and achieving desired mental and physical health outcomes throughout the semester.

Although physical exercise has been shown to be beneficial toward mental health symptoms, this study did not find significant differences between two general elective college courses that assessed the efficacy of physical exercise built into curriculum. Trends were identified that revealed participants who self-selected into the physical activity course may have seen themselves as healthier at baseline and did not develop as many mental health symptoms as their counterparts. These findings may indicate that those participants who were already feeling more physically healthy at the beginning of the semester were already engaging their protective mechanisms and saw themselves as healthy individuals. Other indicators that may be contributing to mental health concerns throughout the semester, such as other areas of stress in students' lives that are from non-academic pressures, can be fathomed but were not taken into account in this study.

Due to a low response rate and small sample of participants, further research is needed to identify if there are baseline differences in students who are choosing these general elective courses.

### 3.9 Recommendations

There have been several factors that have been associated with successfully implementing and maintaining a physical activity program such as social support, self-efficacy, motivation, having a variety of physical activity choices, personal goal setting, positive reinforcement and feedback (Weinstock, 2010). Although most individuals are not going to be able to compete at the post-secondary level, post-secondary institutions should consider expanding their repertoire of clubs and recreational teams that are currently available and encourage new ways to help more individuals be able to achieve a healthy lifestyle (Downs & Ashton, 2011). This would allow for students to have more choices to self-select into which sports or activities that they specifically enjoy or find useful and ensure that beneficial courses are being offered to those students who may have low confidence in their current ability.

One solution is that Canadian post-secondary institutions could introduce a mandatory physical health class focused on engagement in physical activity as well as a wellness component throughout class time to all students that are registered in full time programs. This will help to ensure that healthy behaviours are learned and students are taught how to incorporate physical activity into their lifestyles moving forward. Health behaviours that are formed during this time are said to have lasting implications for the future of individuals' health status and that when looking at these healthy behaviours, they should not be isolated from one another (Dodd et al., 2010). This type of health teaching and promotion should be provided to students in a way that is meaningful to them and poised in such a way that it will reach the largest portion of the student population possible. Use of online courses or mobile applications could promote changes to physical activity and health behaviours that could be easily embraced by post-secondary-aged participants as this delivery can minimize barriers, be personalized for



individual success and can offer self- monitoring and specific feedback (Mailey et al., 2010).

It is apparent that the post-secondary educational system may need to consider a wide variety of strategies that are focused on holistic student health. Students that are suffering from mental health concerns could find it challenging to maintain a regular physical activity regime due to their symptoms of depression, anxiety and stress. Those that are affected may face deficits in their motivation which can be manifested as fatigue, indecisiveness, low self-esteem, loss of joy interest and pleasure as well as affected sleep hygiene (Blumenthal et al., 2012). Students that are already feeling stressed by the demands of their lifestyle tend to make other things in their life more stressful, including physical activity (Gerber et al., 2014). These students may attempt to cram physical activity into their already busy lifestyle which may create more of a burden to themselves than a release. If there were more opportunities to participate in physical activity throughout their courses, they may not feel as though it is such a burden to fit it into their lives in their own free time. From these findings the literature indicates that it might be beneficial for post-secondary administration to institute general elective courses that are geared toward a variety of sport and physical activity based curriculum that include a wide range of choices from beginner to expert level to appeal to students at all ability levels.

To increase our understanding of the relationship between physical activity built into post-secondary curriculum, future research should include qualitative approaches in order to assess the perception of the importance and role of physical activity in the individual students' lives. It may also provide an understanding into the relationship between physical activity, coping and positive mental health benefits that are meaningful to the students, and what other aspects of their lives may be contributing to their reports of mental health symptomology. It is possible that students who are already physically active self-select into courses like Find Your Fit, making it difficult to compare changes in self-report scores. In order to address this possible bias, future work should

assess if there are any baseline differences in the mental and physical health scores of those students who are in other types of general education courses including those that do not have a wellness component. This will actually be further explored in Study Two.

One of the challenges with this pilot study was the low response rate as many students were not in class on the second day of questionnaire administration and were therefore excluded from the study. These sorts of logistics should be planned for at inception in future studies to ensure all participants have equal opportunities to complete all questionnaires.

### 3.10 Summary

This study compared if the introduction of physical activity into curriculum acted as a protective factor or was beneficial to mental health outcomes of post-secondary students enrolled in general education elective courses. This study found that the introduction of physical activity did not lead to improvements in symptoms of depression, anxiety and stress, but it may have been protective against developing moderate to severe levels of anxiety as evidenced by a lack of increased symptomology in this domain in the FYF course. Trends were identified that may show participants in the FYF course demonstrated better self-reported scores in regard to depression, anxiety and health scores. Low numbers and the possibility of self-selection make it difficult to generalize these findings. Suggestions have been made for future studies and ways to continue to improve curriculum design in order to offer protective factors that will benefit the student population, academic outcomes and retention rates for post-secondary institutions.

## Chapter 4: Baseline differences in post-secondary student mental health outcomes, coping, and stressors for general education courses with and without wellness and physical activity components

### 4.1 Introduction

The prevalence of mental health concerns in post-secondary students has increasingly become an area of focus and concern for academic institutions. It has been argued that the time spent throughout post-secondary can be an extremely difficult period of adjustment for some students with the introduction of new demands on their lives (Hicks & Heastie, 2008). Mental health concerns can affect individuals of any age group; however, the onset tends to peak between the ages of 15 and 24, just as academic pressures are becoming more demanding and students are adjusting to complex life changes (Thompson-Ebanks, 2017). Research into mental health and wellbeing of post-secondary students is an important public health issue as depression, anxiety and stress are reported as common problems, while this population is more likely to suffer from mental health concerns than other age groups (Tyson et al., 2010).

High levels of perceived stress have been found to be present in the post-secondary population, with evidence suggesting that stress is an associated risk for physical and mental health disorders (Gerber et al., 2014). One study showed that 40% of students identified their coping efforts as either ineffective or only partially effective in managing stress, with this same group describing stress as unpredictable and unmanageable. (Peer, Hillman, & Van Hoet, 2015).

There are numerous factors that may place post-secondary students at an increased risk for mental health concerns, and it is important that protective factors are identified that can promote positive emotional and physical health (Downs & Ashton, 2011). There have been numerous research studies

supporting the role that physical activity plays in benefiting mental health while negating the physiological impact of stress (J.-H. Kim & McKenzie, 2014).

Physical activity has been shown to be as effective as antidepressants in increasing an individual's self-esteem and can help to counterbalance the negative self-attitudes that are commonly seen in depressive disorders (Ryan, 2008). Current research indicates a positive association between physical activity and psychological health by enhancing positive emotional well-being by improving depressed moods, anxiety, stress levels, and self-esteem (Mackenzie et al., 2011). Enhancing fitness levels in post-secondary students may provide a safeguard or mitigate the risk of developing mental health symptoms, and may also encourage individuals to pursue other social and recreational physical activities (Jones et al., 2002). A study completed by Dodd et al. (2010), found that students who reported consistently engaging in physical activity in their post-secondary years also reported better mental health, experienced a significantly more positive affect, higher self-esteem and less stress than those who were not consistently active.

Although these positive effects have been well documented, only 13-23% of post-secondary students globally are meeting the physical activity recommended guidelines for habitual physical activity behaviours (Dodd et al., 2010). The transitional nature of individuals attending post-secondary education represent a unique target for health enhancing interventions as unhealthy behaviours could be established and ingrained during this period, lasting a lifetime (Harbour et al., 2008).

A recent pilot study completed by MacIntosh et al. (2017) investigated how the introduction of a course which included physical activity in addition to general health information offered as part of a Canadian college general elective course, would affect the mental health and well-being of students in the course. The study investigated whether participating in this course leads to changes in protective factors to developing mental health symptoms, or decreases in symptoms that may have already been present. The course that included

physical activity was compared to a course that included similar content on health and wellness, but did not include actual physical activity as part of the curriculum. The courses were evaluated at baseline in the beginning of the semester before students began participating in physical activity, and again at the end of the semester to assess for changes over the semester for participants in the two groups.

There were no significant differences between the two courses with respect to mental health outcome measures, with a large portion of students actually showing an increase in symptoms throughout the semester in both courses. Contrary to what was hypothesized, there were no increases in the participant's self-efficacy to physical activity in the face of common barriers or an increase in reported physical activity levels in the physical activity focused course. Of concern, it was identified through the population that was sampled at baseline that students were experiencing moderate to extremely severe symptoms of depression (39%) anxiety (90%), and stress (77%) (MacIntosh, 2017).

While there were no significant benefits shown on mean scores of mental health indicators as a result of the course and there were no statistically significant differences between the two groups at baseline, participants in the physical activity course did show a trend toward healthier reports for depression, anxiety and health scores at the beginning of the semester than the course that did not have this type of curriculum design. This may indicate that those who chose to participate in the course with physical activity also reported themselves as healthier individuals at baseline testing. Results from this study may have been because students who chose the physical activity course were already engaging in physical activity outside of class time and may have been reaping the positive mental health benefits when assessed.

Prior to a larger longitudinal study on the benefits of incorporating physical activity into post-secondary curriculum it is important to understand if there are differences in the baseline characteristics of mental and physical health scores of

students who self-select into different types of general education courses, as this would influence the outcomes of a longitudinal study. As MacIntosh et al (2017) concluded, although those in the physical activity course reported better wellbeing at baseline, they continued to experience an increase in mental health symptomology throughout the semester.

Given the well-established benefit of physical activity on mental health, these findings suggests that rising stress levels, perhaps related to academic, financial or personal stress, may mitigate the potential benefits of physical activity. In order to understand the possible role of these stressors on student mental health, more open ended questions should be asked to assess what their experience throughout the course was, as well as what other factors are contributing to their heightened level of stress. Therefore the goals of the current study were to assess students enrolled in four different general education electives including 1) a health and wellness elective 2) a health and wellness elective that includes a physical activity component 3) a non-health and wellness elective 4) a pre-health course with no wellness or physical activity component. Areas of comparison included a) baseline characteristics, b) self-report mental health outcomes c) self-efficacy toward physical activity, d) current levels of physical activity. Additionally, open ended questions were asked about: non-academic sources of stress that might be contributing to heightened levels of mental health symptoms and differences in coping behaviours to provide understanding into how students from various programs cope with the stressors in their life.

## 4.2 Methods

Students in four general education elective courses were invited to participate in this research study. The courses were included based on previous study results (Thomas et al. 2017) and involved two of the courses that were previously involved in Study 1; Find Your Fit (n=38), Stress Wellness and

Nutrition (n=31), with the addition of Pre-Health (n=31), and Children's Literature (n=30).

Course descriptions for each of the involved general education elective courses are listed below.

Find Your Fit:

*"Students in this course will learn about and gain awareness of different types of physical activity and the impact physical activity has on individual health and wellness. Students will gain a personal understanding of the importance of physical activity and of become increasingly aware that each individual is responsible for their own fitness and that there is a form of enjoyable physical activity for everyone and every body type. Students will learn the evolution of intentional exercise, the barriers to exercise and related solutions, exercise adherence, stages of change and the impact of technology on physical activity. Students will be assessed through a combination of online reflections, self and peer evaluation, interviews, presentations, web quests and online quizzes".*

Stress Wellness and Nutrition:

*"Stress can play a huge factor in our professional lives. Learning how to deal with it is vital to our long-term health. While stress alone doesn't cause disease, it triggers molecular changes throughout the body that make us more susceptible to many illnesses. In this course, students will gain an understanding of the importance of how to deal with both positive and negative stress in their lives. By using wellness perspectives, each student will gain more insight into how he or she can control both internal and external stressors".*

Pre-Health:

*"This course is designed to introduce students to the anatomy and physiology of the human body. Emphasis is placed on the organization and relationship*

*between cells, tissues, and organ systems. Several body systems are examined in detail including their connections to homeostasis”.*

Note that this course acted an additional control as it provided information about how the body worked but it was not in the context of wellness.

Children’s Literature:

*“Do you remember your favorite bedtime story when you were a kid? Did you curl up and read a special book that made you feel safe or unique or powerful? Did a certain book when you were 7 or 8 years old make you feel like you belonged and were understood? Students will develop an in depth knowledge of the trends in Children’s Literature and how children respond to them. Students will examine a global perspective on storytelling for children within different cultures. This course will give students a multi-faceted view of the stories that creates magic in the lives of children. Students will experience tests, journal writing, opinion processing and, oral presentations using written and verbal skills to analyze and evaluate course content”.*

The professors of these courses agreed for the principal investigator to come into their classes to recruit participants via a verbal script at the beginning of the fall semester in September, 2016. Interested students were given time in class to review the consent form and ask questions regarding the research project prior to providing written consent. Questionnaire packages were handed out with the consent form and the students were provided time in class to complete the surveys and short answer questions if they voluntarily agreed to do so. Questionnaires were scored and summed to calculate individual and course mean scores, the short answer questions were coded and themes identified to interpret the students’ reported experience in the outcome measures. Institutional review board approval was obtained and all participants provided informed written consent prior to initiation of the research study.



### 4.3 Participants

In total, 130 Canadian College students from one mid-sized Ontario College were invited to participate in this research study from the four identified courses. In order to be included in the data analysis, participants had to be full time students registered in a general elective course as well as be in attendance the day the questionnaire package was administered. All surveys needed to be completed in order to meet inclusion criteria.

### 4.4 Procedure

Research packages were given to each student that included a written description of the research project, the consent form, questionnaire package and short answer questions. Participants were given class time to read and fill out the consent form, as well as have any questions answered before initiating the research study. Questionnaires and short answer questions were filled out and completed in class if the students wished to participate. Students who did not wish to participate were encouraged to not answer the questionnaire package and leave them blank, students who did not complete all of the surveys were omitted from the research study and not involved in the data analysis and results. A portion of the students chose not to answer all of the short answer questions in the short answer section. These participants were still included if all of their questionnaires were complete as they provided valuable data that contributed to the experience of the participants and the analysis process.

### 4.5 Outcome Measures

#### **Depression, Anxiety and Stress Scale (DASS-21)**

The Depression, Anxiety and Stress Scale (Lovibond & Lovibond, 1995) is the condensed version of the original 42-item DASS that was created as a measure of the characteristic symptoms of depression, anxiety and stress (Camacho et al., 2016). This self-report tool was designed to assess features of

depression, anxiety and stress that are unrelated in order to be able to identify common symptoms as well as differentiate between these conditions (Norton, 2007). The DASS-21 has shown adequate reliability in the post-secondary student population (Camacho et al., 2016) and is frequently used in both clinical and non-clinical samples. Using an undergraduate sample, Lovibond and Lovibond (1995) validated the DASS against widely used measures of depression (Reynolds et al., 2011). The DASS 21 has well established psychometric properties that measure the stated mental health outcomes (Cheung et al., 2016). The instrument contains 21 questions that cover three domains of mental health; depression, anxiety and stress. Each domain contains seven questions that are summed, the higher the score the participant reported in each domain indicates the presence and severity of symptoms that are associated with that condition. Participants are asked to report their symptoms on a four point Likert scale indicating that the statement; did not apply over the past week (0), applied to some degree or some of the time (1), applied a considerable degree or a good part of the time (2), applied very much or most of the time (3). Participants were divided into four main groups, adapted from original DASS scoring, to categorize their reported symptomatology. These groups included: normal/ mild, moderate, severe and extremely severe. The normal and mild category were included together in this study as it has been reported that individuals who fall into the mild category are not likely to show symptoms that are severe enough to indicate clinical significance or disturbance in functioning (Norton, 2007).

Please refer to Table 5 for the scoring categories used for the Depression Anxiety and Stress Scale questionnaire. See Appendix C for the DASS-21 questionnaire.

Table 5: Classification of DASS-21 scores for Depression, Anxiety and Stress (Lovibond & Lovibond, 1995)

Severity	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

### **International Physical Activity Questionnaire (IPAQ)**

Physical activity and sedentary behaviour were assessed using the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003). This measurement tool has been shown as a reliable and valid in measurement properties that are consistent with other self-reported physical activity measures (Craig et al., 2003). The IPAQ has been shown to be a reliable and valid tool for measuring physical activity levels in post-secondary students (Dinger et al., 2006). Each participant self-reported weekly time that was spent in vigorous intensity, moderate intensity, and walking activity. Scoring was completed and data categorized as per IPAQ standardized scoring methods of the self-administered short form. METs (physiological measure representing the energy cost of physical activity) (Arvidsson et al., 2007) were summed by a predetermined calculation of energy expenditure that is computed by multiplying the MET score of an activity by the minutes performed. Sedentary behaviour was established by the participant's response to how much time they spent sitting on a week day, over the last seven days. Once physical activity, according to time spent in walking, moderate-intensity, and vigorous-intensity activities was scored, participants were assigned a category based on their activity levels. Participants were placed into Category 3 (high level of physical activity) if it was reported they engaged in vigorous activity at least three days a week and had a MET expenditure of 1500 or more, or engaged in walking and moderate level of

physical activity for a total of seven days with a total MET expenditure of at least 3000 (Musselman & Rutledge, 2010). Category 2 (moderate level) was assigned to those who either engaged in vigorous activity for at least 20 minutes per day for three days a week, or engaged in walking and moderate activity for at least 30 minutes a day five days a week, or had a MET expenditure between 600 and 2999 (Musselman & Rutledge, 2010). Those who did not meet the standards as set out in Category 3 or 2 were placed into Category 1 (low activity level) indicating that they did not meet the recommended physical activity guidelines for their age group (Musselman & Rutledge, 2010). See Table 6 for the calculation of participants' self-reported METs. See Table 6 for the scoring and categories of the International Physical Activity Questionnaire.

See Appendix D for the Short Self-Administered International Physical Activity Questionnaire.

*Table 6: Calculation to determine MET minutes/week (Craig et al., 2003)*

**METs Calculation**

Walking MET minutes/ week	3.3 x walking mins x walking days
Moderate MET minutes/ week	4.0 x moderate-intensity activity mins x moderate days
Vigorous MET minutes/ week	8.0 vigorous-intensity activity mins x vigorous-intensity days
Total Physical Activity MET/Week	=Sum of Total Physical Activity MET/Week

Table 6: International Physical Activity Questionnaire Scoring (Craig et al., 2003)

Category 3	High	Vigorous-intensity activity on at least 3 days achieving a minimum Total physical activity of at least 1500 MET-minutes/week OR 7 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum Total physical activity of at least 3000 MET-minutes/week.
Category 2	Moderate	3 or more days of vigorous-intensity of at least 20 mins OR 5 or more days of moderate intensity and or walking of at least 30 mins / days OR 5 or more days of any combination of walking, moderate-intensity, or vigorous intensity activities achieving a minimum total physical activity of at least 600 MET –minutes/ week
Category 1	Low	Those individuals who do not meet criteria for Categories 2 or 3 are considered to have a 'low' physical activity level.

### **Barriers Self Efficacy Scale (BARSE)**

The Barriers Self-Efficacy Scale (McAuley, 1992) is a physical activity focused self-efficacy measurement tool that is used to assess an individuals' perceived capability to perform physical activity when faced with various barriers to participation (Weibull et al., 2015). Participants report their perceived confidence rating from 0 (not at all confident) to 100 (highly confident) depending on a common barrier that they may face, for example, "I was on vacation", or "I had to exercise alone". The measurement tool is a 13 item questionnaire that is based on an 11-point Likert scale. Responses assess the determination of younger to middle aged participants to engage in physical activity through

various barriers one may face when considering physical activity (boredom, disinterest, discomfort, transportation, self-consciousness, lack of social support) (Mailey et al., 2010). Scores that are under 50 are considered low efficacy, scores that are in the 50-70 range indicated moderate efficacy levels, while those above 70 are considered to be high in their self-efficacy. See Appendix E for the Barriers Self-Efficacy Scale questionnaire.

### **Short Form-12 Health Survey (SF-12)**

The Short Form-12 Health Survey (Jenkinson et al., 1997) is a general quality of life survey that is a modified, shorter version of the 36-item Short-Form Health Survey with similar reliability and validity indicators (Schepis & Hakes, 2014). The SF-12 assessed the participants' self-reported measures of both physical component summary scores (PCS) and mental component summary scores (MCS) using a Likert scale with varying ranges depending on the question that is being asked. Findings are computed using scores from the twelve questions and range from 0-100. Those participants that had a higher score represented better mental and/or physical health states in accordance with the country specific normal based score (Hjorth et al., 2016). In normative data, the mean scores is set to 50; scores >50 indicate better physical or mental health than the mean, and scores < 50 indicate perceived worse health (Jenkinson et al., 1997). See Appendix F for the Short Form-12 Health Survey Questionnaire.

### **Short answer questions**

Short answer questions were developed in order to ensure additional information could be obtained that was not gathered from the standardized questionnaires. The inquiries were designed to elicit a response about personal motivation to take the current courses that were being evaluated as well as year of study. Participants were asked to disclose other areas of their life which may be sources of stress, and what their most common coping mechanisms were when feeling overwhelmed. Questions about employment and time spent working per week were asked to gain a fuller picture of the participants' various life

demands. Short answer questions included: 1) Please state your current semester or year at Durham College, as well as your program of study; 2) Why did you decide to enroll in this course? Please describe your motivation/ interest; 3) Do you have a part time job? If so, how many hours in a typical week do you spending working at your job? 4) What are your current coping mechanisms you use when feeling overwhelmed stressed out? 5) Are there other areas of your life beside school in which you experience stress? The participants in the Find Your Fit course were asked two additional questions that were specific to their participation and perception of the physical activity course that they were enrolled in. The questions asked included: 1) Do you feel that participating in exercise in class leads to more physical activity outside of class time?; 2) Please describe the positive and negative aspects of taking this course.

#### 4.6 Data Analysis

Descriptive statistics and one way univariate ANOVAs were computed using SPSS. To investigate and compare the mean differences in questionnaire scores, a one way ANOVA was used to compare scores between the four types of courses. Statistical significance was set at  $P=0.05$ . The short answer questions were interpreted using thematic analysis (Green et al., 2007) which categorizes commonly mentioned themes into groups when analyzing responses to the questions that were asked. Codes were given to each identified theme that was identified, overlapping themes were collapsed into one and are reported for each short answer question.

#### 4.7 Results

Completed questionnaire packages of 118 students enrolled in the four different general education elective courses during the fall of 2016 were included in the analysis (92% response rate). See Table 8 for the representation of participants that were involved in the study.

Table 7: Participants involved in study and response rates

Class	Total	Percent Completed	Students that did not participate
Find Your Fit (FYF)	38	84% (n=34)	n=4
Children's Literature (CL)	30	100% (n=30)	n=0
Stress Wellness and Nutrition (SWN)	31	81% (n=25)	n=6
Pre Health (PH)	31	94% (n=29)	n=2

According to the DASS-21, participants in the Find Your Fit (FYF) course reported mean depression scores that placed them in the normal/ mild category at 8.94 (SD = 9.54). Significant depressive symptoms that were rated in the severely extreme category were found in 12% of students (n=4). Moderate depressive symptoms were reported in 6% of the class (n=2), with no students falling into the severe category when assessed at their baseline. The majority of students at the time of assessment reported normal/ mild symptoms of depression, 85% (n=28), indicating they were not currently being affected by the characteristic symptoms of the disorder.

Participants in the Children's Literature (CL) course reported that their mean depressive scores categorized them into the moderate category at 13.76 (SD = 9.96). While assessing the individual participants it was found that 10% (n=3) of the students were experiencing extremely severe symptoms of depression. Approximately 3% (n=1) of the students in this course reported experiencing severe symptoms, and 30% (n=9) reported that their current symptoms of depression would place them into the moderate category. The majority of the class did not indicate that they had drastically elevated symptoms of depression, reporting that 57% (n=17) of the participants would fall into the normal/ mild category.

Similarly, the participants from Stress, Wellness and Nutrition (SWN) indicated that their mean depressive scores also placed them into the moderate

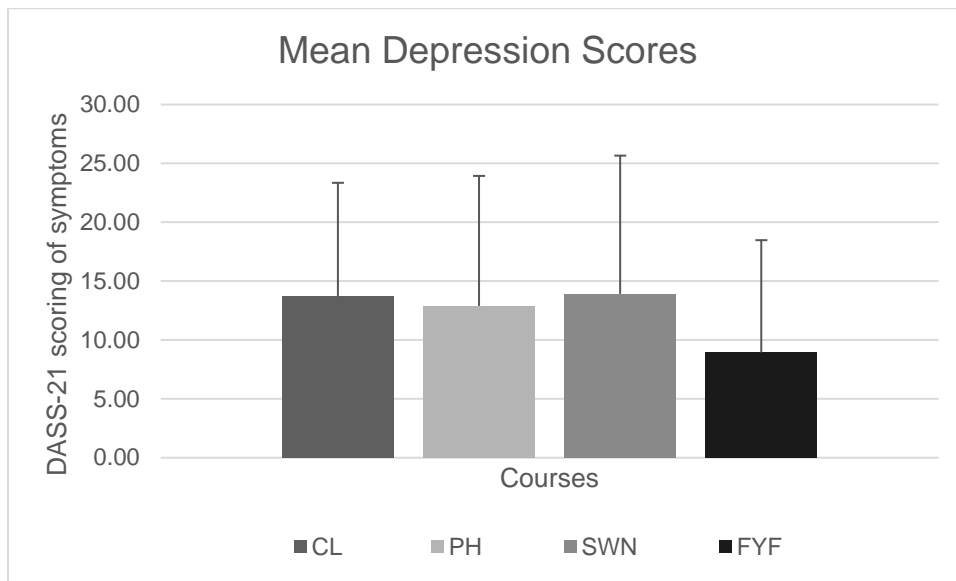


category when assessing the class as a whole at 13.92 (SD =11.74). Individually, those that reported heightened symptoms that correspond with the extremely severe category composed of 16% (n=4) of respondents. Those that fell into the category of severe symptoms of depression represent 12% (n=3) of the class, while 20% (n=5) reported moderate symptoms. The majority of the class indicated that they were not experiencing, or were experiencing to a mild degree, symptoms of depression 52% (n=13).

Overall, participants in the Pre Health (PH) course reported their mean depressive symptomology as 12.90 (SD =11.04); which would place the class into the moderate category of symptoms. Individuals that self-reported scores indicating that they were in the extremely severe category of symptoms represented 14% (n=4) of the participants. Those that were experiencing symptoms consistent with the severe category represented 7% (n=2), while 24% (n=7) comprised the portion of the class that encompassed the moderate category for symptoms of depression. As reported with all other courses, the majority of the students did not report a clinically significant level of symptoms of depression, placing 55% (n=16) of the participants in the normal/ mild category.

There were no statistically significant differences in mean baseline depression scores between the FYF, CL, SWN and PH reported [ $F(3,117)=1.57$ ,  $p=0.20$ ]. See Figure 11 as a representation for the mean depression scores for each of the courses involved in the study.

Figure 11: Self-reported mean depression scores for all courses involved in study



Symptoms of anxiety were also assessed using the DASS-21 tool to identify characteristic symptoms indicative of varying levels of this disorder.

The mean anxiety score for FYF placed this course into the normal/ mild range at 9.41 (SD=8.31) indicating that the majority of the class was not strongly affected by this category of symptoms. However, 12% (n=4) of the participants did self-report that they were experiencing symptoms consistent with placement into the extremely severe category. Those participants that reported symptomology consistent with a severe category placement represented 8% (n=3) of the class, while those that were consistent with a moderate placement accounted for roughly 18% (n=6). The majority of the class reported that they were not experiencing a significant amount of distressed characterized by the questions asked regarding symptoms of anxiety with 59% (n=20) falling into the normal/mild range.

The results gained from Children's Literature (CL) course indicate that their mean anxiety score placed this class into the moderate range of symptoms for anxiety at 14.87 (SD=9.42). A high proportion of the class indicated that they were experiencing distressing symptoms of anxiety that are consistent with

placement into the extremely severe category at 30% (n=9) of the class, while another 10% (n=3) stated that they were experiencing symptoms at a heightened level indicative of the severe category placement. Furthermore, 30% (n=9) of participants reported their symptomology of anxiety placed them into the moderate category, while the remainder of the class, 30% (n=9), self-reported that they were not experiencing symptoms of anxiety that were affecting their functioning, placing them into the normal/ mild category.

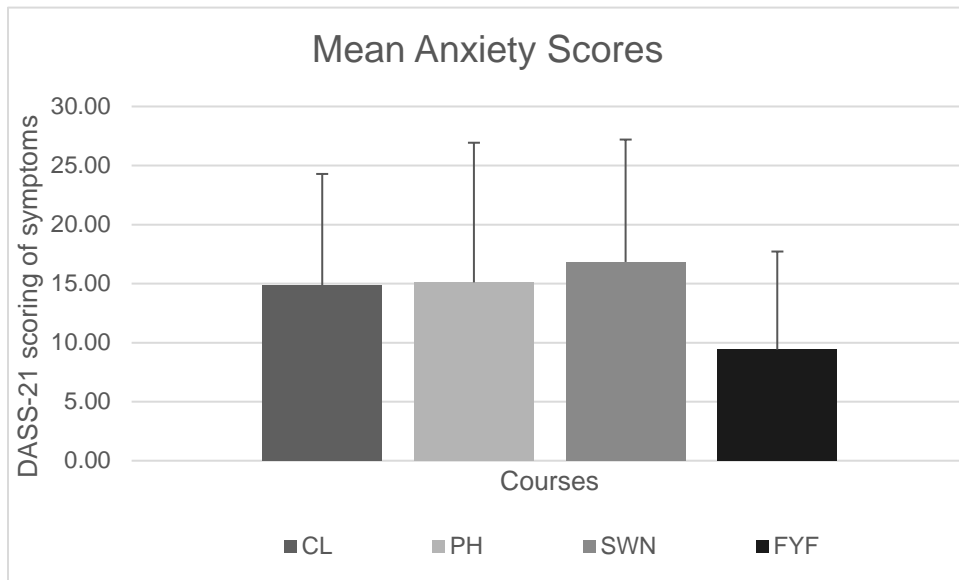
Participants in the Stress, Wellness and Nutrition (SWN) course showed the highest ranking of symptoms of anxiety, with their mean scores placing them in the moderate category at 16.83 (SD=10.37). Respondents in SWN also showed the highest percentage of students that were in the extremely severe category with 48% (n=12) disclosing that they were experiencing symptoms consistent with this ranking. Those that fell into the severe category for anxiety represented 10% (n=3) of the class, while 20% (n=5) reported symptoms that classified them into the moderate field. Participants that self-reported that they were not experiencing symptoms of heightened anxiety consisted of 20% (n=5) of the class.

Lastly, participants in the Pre Health (PH) course demonstrated through their results that their mean reported anxiety scores also placed them into the category of moderate symptomatology at 15.10 (SD=11.83). Those that fell into the extremely severe category from self-report indicate that 31% (n=9) of the class was experiencing intensified symptoms of anxiety, while roughly 7% (n=2) reported severe symptoms. Furthermore, participants who disclosed symptoms of anxiety that are consistent with a placement into the moderate category represented 24% of the course, while almost 38% reported that they were not experiencing symptoms of heightened anxiety and were placed into the normal/ mild category.

The Find Your Fit group had significantly lower mean anxiety scores than the other three General Education courses [ $F(3,117,36)=2.89, p=0.03$ ]. See

Figure 12 as a representation for the mean anxiety scores for each of the courses involved in the study.

Figure 12: Mean Anxiety Scores by course (Note: FYF had significantly lower anxiety scores at baseline)



Symptoms of stress were summed and calculated from participants self-reports using the DASS-21 tool. Students from Find Your Fit (FYF) disclosed that on average they were experiencing symptoms of anxiety that would place them into the normal/ mild range for this domain with their mean score at 11.12 (SD=7.49). Consequently, there were no students that fell into the extremely severe range for stress, while only about 6% (n=2) would be classified into the severe range. Participants' scores that were consistent with placement into the moderate category represented 9% (n=3), with the majority of the class not reporting heightened symptoms of stress at the time of testing at 85% (n=29).

The students that participated in the study from the Children's Literature (CL) course reported that their mean stress score was indicative of placement into the moderate category at 18.67 (SD=9.76). Participants who reported that their symptoms were in the extremely severe range represented almost 7% (n=2) of the class, while those that continued to report heightened symptoms in the severe category made up 23% (n=7) of respondents. Those that reported symptoms that are consistent with placement into the moderate category

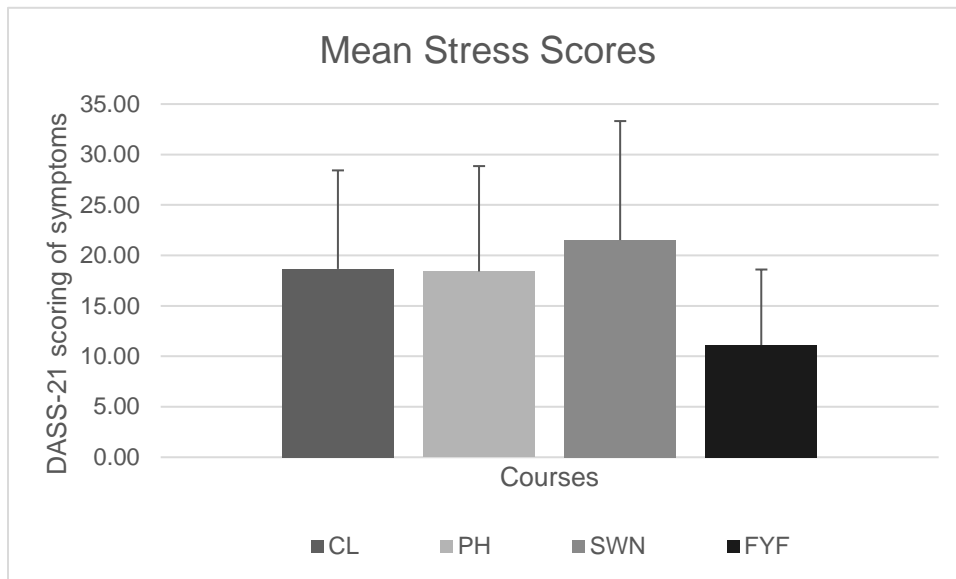
consisted of almost 17% (n=5) of the participants, while 53% (n=16) reported that they had minimal or no symptoms of stress at the time of the questionnaire administration.

The Stress Wellness and Nutrition (SWN) course had the highest reported mean stress scores, placing them into the severe category at 21.52 (SD=11.79). This course has the highest number of respondents stating that they were experiencing extremely severe symptoms of stress representing 20% (n=5) of those that participated in the study from this class. Those that fell into the severe category made up 28% of the participants, while another 20% indicated that they were experiencing symptoms of stress that are consistent with placement into the moderate category of classification. Although the majority of the class self-reported that they were experiencing high levels of stress, 32% (n=8) of the participants disclosed that they were not having symptoms of stress, or that they were mild in nature.

Lastly, the participants that were involved from the Pre-health (PH) course reported that their mean stress scores placed them into the moderate category as a whole, at 18.41 (SD=10.44). Those that fell into the category of the extremely severe range of symptoms represented 10% (n=3), while roughly 17% (n=5) indicated that they were experiencing levels of stress that classified them into the severe category. Participants that were categorized into the moderate group for symptoms of stress included almost 7% (n=2), with the majority of the class indicating that they were experiencing little to no characteristic symptoms of stress in the normal to mild range at almost 66% (n=19).

Find Your Fit showed a significant difference in mean stress scores when compared to the other three courses [ $F(3,117)=6.31$ ,  $p=0.001$ ]. See Figure 13 as a representation for the mean stress scores for each of the courses involved in the study.

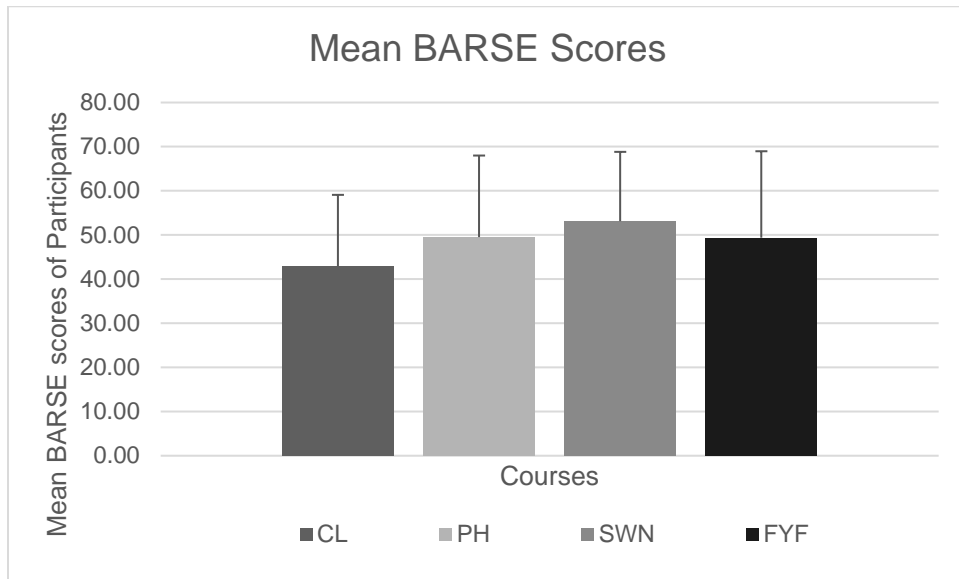
Figure 13: Mean Stress Scores by course (Note: FYF had significantly lower stress scores at baseline)



Common barriers to the participants' ability to continue to engage in physical activity in the face of adversary or situational circumstances was assessed using the Barriers Self-Efficacy Scale (Mailey et al., 2010). Participants in the Stress Wellness and Nutrition course responded with the highest levels of self-efficacy, with their mean scores calculated at 53.12 (SD=15.71). Pre-Health respondents reported the second highest rating of self-efficacy with their mean scores reported as 49.53 (SD=18.48). Participants in the Find Your Fit class placed third out of the courses included in the study, with their mean efficacy scores rating as 49.38 (SD=19.58). Lastly, those that participated from the Children's Literature showed the lowest levels of self-efficacy with their mean scores calculated as 42.92 (SD=16.17)

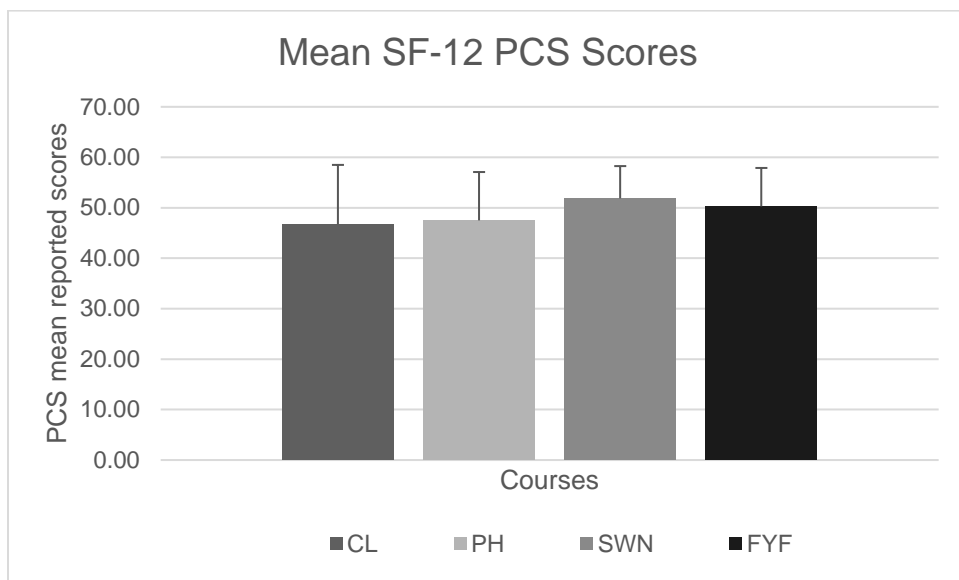
There was no significance found between the four courses that were being assessed in regard to their baseline differences in their barriers to self-efficacy toward physical activity, at the time of questionnaire administration [ $F(3,117)=1.62$ ,  $p=0.18$ ]. See Figure 14 as a representation for the mean BARSE scores for each of the courses involved in the study.

Figure 14: Mean Barriers Self Efficacy Scores by course



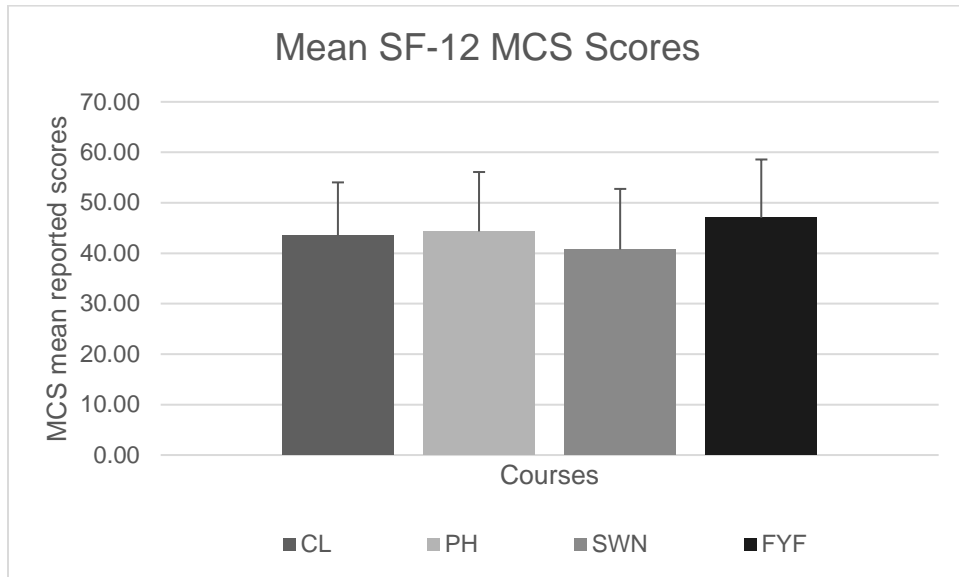
The Physical Component Summary (PCS) was calculated using the Short Form-12 Health Survey (Ware, Kosinski, & Keller, 1996). Please refer to Figure 15 for mean PCS scores for each course. There were no significant differences between the baseline PCS scores between the courses [ $F(3,117)=1.94$ , ( $p=0.13$ )].

Figure 15: Mean Physical Component Summary (PCS) Scores by course



The mental component summary (MCS) was calculated using the Short Form-12 Health Survey (Ware et al., 1996). Please refer to Figure 16 for mean MCS scores for each course. There were no statistically significant findings between the four courses in regard to their MSC scores at baseline [ $F(3,117)=1.48, (p=0.22)$ ].

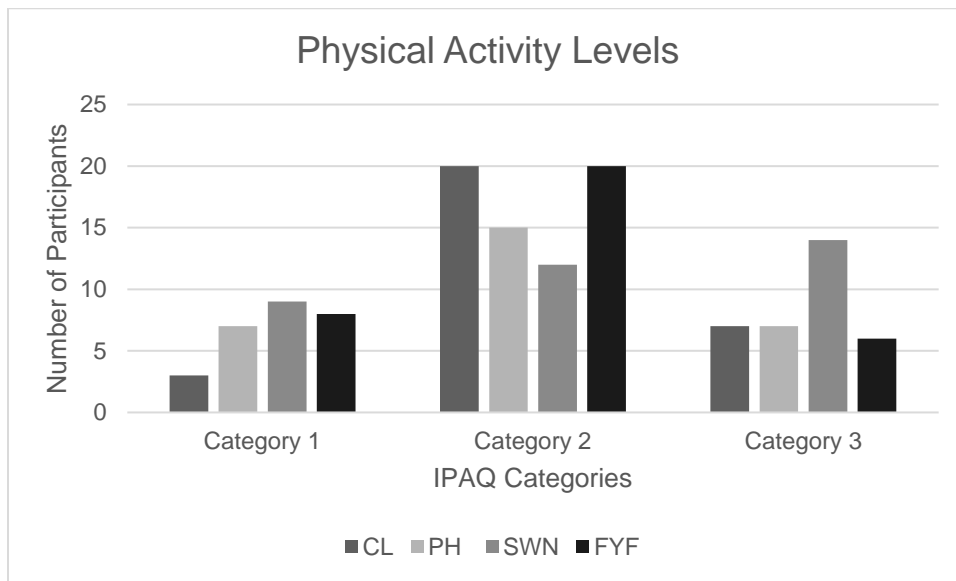
Figure 16: Mean Mental Component Summary (MCS) Scores by course



The participant's physical activity levels were self-reported using the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003). Physical activity levels are divided into three categories according to IPAQ scoring; Category 1 represents the lowest level of physical activity and is considered insufficiently active, Category 2 represents those who are considered minimally active, while Category 3 consists of those individuals who exceed the minimum public health physical activity recommendations and are accumulating enough activity for a healthy lifestyle (Hagströmer, Oja, & Sjöröström, 2006). Please refer Figure 17 for a representation of the self-reported physical activity levels of the participants.



Figure 17: Self-reported physical activity levels of participants from IPAQ responses



There were no statistically significant differences found in regard to the mean MET scores that were calculated from each course [(3,117) =1.99; p=0.12]. FYF reported that the courses mean MET scores were 2898.85 (SD 1755.19), SWN 3312.80 (SD 2715.79), PH 2809.14 (SD 1148.38), and CL 2578.67 (SD 1779.44).

There were no statistically significant differences found in sedentary time between the four courses [(3,117) =1.14; p=0.34]. Students in FYF had an average sitting time of 6.32 hours (SD 2.9), SWN 6.7 hours (SD 2.81), PH 6.9 hours (SD 2.85), and CL 6.1 hours (SD 2.79).

Participants were asked a series of questions after the administration of the questionnaires to determine if there were any characteristic differences between students who chose to pursue education in one type of general education over another. All participants were asked five questions regarding their current program of study, their motivation to take the course, if they have a part time job, what coping mechanisms they currently use, as well as stress in other areas of their lives. Those participants in Find Your Fit were asked an additional two questions to determine if they felt that the experience of participating in physical

activity in class leads to more physical activity outside of class, as well as the positives and negative of taking this course.

**Q1. Please state your current semester or year at Durham College, as well as your program of study.**

Please refer to Table 9 and Table 10 for the current program associated academic schools and year of study of participants included in the study, respectively.

*Table 9: Current school of program of study of participants*

Course	FYF (n=34)	CL (n=30)	SWN (n=25)	PH (n=29)
<b>Business IT and Management</b>	6% n=2	19% n=5	17% n=4	0%
<b>Interdisciplinary Studies</b>	13% n=4	12% n=3	26% n=6	0%
<b>Health and Community Services</b>	53% n=17	38% n=10	35% n=8	100% n=27
<b>Media Art and Design</b>	16% n=5	19% n=5	4% n=1	0%
<b>Engineering and Technology</b>	13% n=4	0%	0%	0%
<b>Justice and Emergency Services*</b>	0%	12% n=3	22% n=5	0%
<b>Did not respond</b>	n=2	n=4	n=1	n=2

Table 108: Current year of study of participants

Course	FYF (n=34)	CL (n=30)	SWN (n=25)	PH (n=29)
Year 1	41% n=14	63% n=19	76% n=19	93% n=27
Year 2	50% n=17	23% n=7	16% n=4	3% n=1
Year 3	3% n= 1	3% n=1	0%	0%
<b>Total participants</b>	n=32	n=26	n=23	n=28
<b>Did not respond</b>	n=2	n=3	n=2	n=1

**Q2. Why did you decide to enroll in this course? What was your motivation?**

If more than one theme was identified by a participant, both were taken into account and coded in separate themes that were identified. Participants' responses were coded and categorized into six different themes in the Find Your Fit course. The coding system outlined commonly mentioned responses for enrolling in this course and motivation, and was organized into 6 responses: 1. Get more physically active/ motivated and get into better shape (n=10), 2. Interested in learning how to get physically fit and learn the benefits of physical activity (n=5), 3. Want to help others (n=8), 4. Love fitness and is already a part of their life (n=3), 5. Wanted in class versus online delivery or wanted to upgrade their marks (n=3), 6. Other (n=3).

Responses in the Children's Literature course were coded and categorized into four main themes: 1. Interested in the course (n=7), 2. Want to help others (n=10), 3. Upgrade education/ change career path (n=10), 4. Other (n=4).

Similarly, participants that responded from the Stress Wellness and Nutrition course had similar themes identified, and were coded into four main

groups: 1. Upgrade education/ change career path (n=8), 2. Want to help others (n=9), 3. Learn different ways to cope from stress (n=2), 4. Interested in course content (n=5).

Lastly, the participants in the Pre Health course had similar responses to their rationale for choosing this course. After responses were coded, four main themes were identified: 1. Interested in the course (n=2), 2. Want to help others (n=2), 3. Upgrade education/ change career path (n=24), 4. Other (n=1)

**Q3. Do you have a part time job? If so, how many hours in a typical week do you spending working at your job?**

The majority of participants in the Find Your Fit course reported that they were employed at the time of questioning with almost 62% (n=21) of the class indicating yes to this question, and 38% (n=13) reporting they were not. The highest hours worked per week that was reported for this class was 35 hours. One student did not provide a response for how many hours they worked per week.

Similarly, participants in the Children's Literature course stated a high percentage of those that are employed with almost 63% (n=17) of the class indicating that they currently had a part time job, while 37% (n=10) did not. The highest reported hours worked per week for this course was 30 hours. One person did not report their numbers of hours worked per week.

Stress Wellness and Nutrition participants also indicated that the majority of the class was engaged in active employment, with 60% (n=15) stating that they had a part time job, while 40% (n=10) did not. The highest reported amount of hours worked per week by a participant in this course was 40 hours per week. One student did not report how many hours per week they work.

Furthermore, Pre Health had similar reporting to participants that also work part time on top of their academic responsibilities in the other courses. Of

those that participated in answering this question, almost 56% (n=15) of the course reported that they do have a part time job, while 44% (n=12) did not have work. The highest reported amount of hours worked per week by a participant in this course was 24 hours per week. See Table 11 for a comparison of the average hours worked per week for each course.

*Table 911: Participants average hours of work per week per course*

Hours	FYF	CL	SWN	PH
<8	14% (n=3)	29% (n=5)	0%	13% (n=2)
9-15	38% (n=8)	35% (n=6)	20% (n=3)	40% (n=6)
16-25	24% (n=5)	24% (n=4)	53% (n=8)	47% (n=7)
26+	19% (n=4)	6% (n=1)	20% (n=3)	0%

**Q4. What are your current coping mechanisms you use when feeling stressed out or overwhelmed?**

Participants from the included courses were asked to report on this measure in an open ended question. If more than one coping mechanism was listed in the participant's responses, a point was given to each technique that was identified. Responses were coded and common themes were identified between the various courses. See Table 12 for self-reported coping mechanisms for all participants.

Table 12: Self-reported coping mechanisms for FYF, CL, SWN and PH

<b>Self-Reported Coping Mechanisms</b>	<b>FYF Responses (n=33)</b>	<b>CL Responses (n=30)</b>	<b>SWN Responses (n=24)</b>	<b>PH Responses (n=29)</b>
1. Engaging in physical activity	n=15	n=9	n=13	n=7
2. Listening or playing music	n=12	n=7	n=5	n=4
3. Sleeping or taking a nap	n=8	n=5	n=2	n=4
4. Reaching out to social or community supports	n=7	n=8	n= 5	n=5
5. Leisure time activities	n=9	n=13	n=6	n=7
6. Unhealthy behaviours	n=6	n=6	n=4	n=4
7. Other	n=5	n=3	n=5	n=2

**Q5. Are there other areas of your life in which you experience stress?**

This question was asked to give insight into other areas of the participants' lives that may be contributing to the heightened reports of mental health symptoms. This open ended question allowed for multiple responses. If more than one area of stress in life was indicated, a point was given to each response and was coded and scored according to the themes that were identified through the various course responses.

See Table 13 for categories that were identified as stressful for participants in FYF, CL, SWN and PH.

Table 1310: Self-Reported stressors and responses from FYF, CL, SWN and PH

<b>Self-Reported Area of Stress</b>	<b>FYF Responses (n=32)</b>	<b>CL Responses (n=29)</b>	<b>SWN Responses (n=25)</b>	<b>PH Responses (n=25)</b>
1. Home life situations	n=16	n=12	n=13	n=0
2. Change in support circles	n=2	n=7	n=8	n=0
3. Work	n=2	n=3	n=4	n=4
4. Money or finances	n=2	n=3	n=6	n=3
5. Mental or physical health	n=3	n=2	n=4	n=4
6. Other	n=1	n=9	n=2	n=0
7. No other areas of stress	n=10	n=0	n=0	n=8

The last two questions were answered only by the participants in the Find Your Fit course as they are specific to the course's outcomes, measuring perceived efficacy and possible benefits of enrolling in this type of course.

**Q6. Do you think that participating in physical activity in class leads to more physical activity outside of class?**

Participants were asked to provide their response to this question, with extra space allotted for them to provide an explanation if they wished. The majority of the class indicated that they felt that by engaging in physical activity throughout the course, it would lead to more time engaged in this type of

behaviour with almost 74% (n=25) responding with this belief, seventeen participants did not provide a rationale for their response. However, there were some participants who felt as though they would not participate in more physical activity outside of class, representing almost 21% (n=7) of the class while another 6% (n=2) stated that they were undecided.

A portion of the students indicated that it increased their motivation to improve their health (n=4), while others enjoyed learning about new physical activities in class to try out further on their own time (n=2). Of the participants who did not indicate a positive result, one reported, “No, I would not feel comfortable with that or motivated” (Student 21, FYF). Another response stated, “No, I think people will say to themselves, I worked out in class so now I don’t need to outside” (Student 17, FYF). One student stated they would engage outside of class, “If there was more time” (Student 32, FYF) with some reporting no increased effect on their perspective (n=2).

**Q7. In your own words, please describe the positive and negative aspects of this course.**

Please refer to Table 14 for the positive and negative views as reported by the participants in the Find Your Fit course, regarding their experience in same thus far in the semester. For those that provided multiple responses, each response was coded and categorized into associated themes representing the general thoughts of the class in regard to the measured aspects of the course.



Table 14: Participants views regarding positive and negative aspects of Find Your Fit

<b>Positive Aspects</b>	<b>Participant Responses (n=34)</b>
Motivation to try new things and to work out becoming physically fit	n=14
Learn new information and how to apply it to yourself	n=19
Learning about barriers and how to overcome them to integrate physical activity into daily life	n=6
Realized changes that could be made to become healthier/ new life skills	n=3
Can be applied to professional career	n=2
<b>Negative Aspects</b>	<b>Participant Responses (n=30)</b>
Early class time	n=6
Only once a week, no consistency	n=5
No focus on nutrition	n=4
Not enough time working out	n=4
Unrelated to main studies/ increased workload	n=7
Shows you how unfit you are, feeling tired/ sore afterwards	n=6
Reported no negatives in course	n=12

#### 4.8 Discussion/ Comments

Participants were included from a wide variety of programs at a mid-sized Canadian college, with the exception of those enrolled in skilled trades programs as they attended class at a different campus. The majority of the students that were surveyed were first year students (n=79) who were enrolled in a program in the School of Health and Community Services (n=62), which could limit the generalizability to other students. However students from Business and IT Management (n=11), Interdisciplinary Studies (n=13), Media Art and Design (n=11), Engineering and Technology (n=4), and Justice and Emergency Services (n=8) also took part in the study.

The main finding from this study is that students enrolled in the Find Your Fit class reported similar mean scores for depression, and statistically lower

mean anxiety ( $p=0.03$ ) and mean stress ( $p=0.001$ ) scores at baseline when compared to the other courses. This may indicate that students who wish to participate in physical activity during class time see themselves as mentally healthier individuals and may not experience as many mental health symptoms as those that chose to enroll in other types of general elective courses. Although results do not indicate that Find Your Fit had a substantial percentage of students that were engaging in higher levels of physical activity at the beginning of the semester, a large percentage of the class was participating in at least moderate levels. This could mean that although individuals may not be obtaining as much vigorous activity as has been recommended, they may be engaging in more physically active leisure time activities which could be showing as a protective mechanism to mental health concerns.

There is emerging evidence to suggest that factors associated with the process of engaging in physical activity, such as distracting oneself, rather than effects of the actual physical activity itself is significant in promoting various mental health benefits (Faulkner & Sparkes, 1999). FYF participants may have self-selected into this course because they already had an interest in learning to become more active and were possibly already motivated toward healthy lifestyle behaviours. Students who regularly engage in health behaviours, such as maintaining physical health and engaging in healthy physical activity, show lower levels of depression, anxiety and stress than those who are not meeting health behaviour guidelines (Lovell et al., 2015).

This study found that only 20% of those sampled were achieving high levels of physical activity per week, while the majority of the participants reported that they were engaging in moderate levels, at 57% of those sampled. Of some concern is that 23% of participants in the study reported that they were inactive, or not meeting physical activity recommendations for their age. Past research has indicated that health participation behaviour, such as physical activity, tend to cluster in such a way that people who fail to meet guidelines for one health behaviour are more likely to fail guidelines for other behaviours (Lovell et al.,

2015). There were no significant differences in sedentary time between the courses that were included in the study. Having physical activity built into curriculum did not show that these students spent less time sitting than their counterparts.

It was noted, throughout all courses, that the BARSE scores are relatively low indicating that the majority of this sample of post-secondary students do not feel like they would be able to continue with a consistent physical activity routine when faced with common barriers. This may hinder the student's ability to experience the full beneficial effects that exercise can have on an individual's mental health if they are not going to be able to incorporate habitual physical activity to maintain an active lifestyle.

There were no significant differences between the various courses in regard to their physical and mental component summary scores. All of the scores for both of these measures were quite low in comparison to the mean for their age, indicating that all participants in the study showed low views of their holistic health.

Several themes were identified when looking at the different motivation that students have to enroll in the various types of general education courses that were being offered. Participants in the Find Your Fit course reported that they wanted to get more physically active and get into better shape. The majority of responses for this class referenced the fact that they enjoyed fitness and wanted to learn more about it to incorporate it into their lifestyle even more. Those in Children's Literature did not see the same motivational trends to enter into that class, with the focus of the themes indicating that these were individuals who wanted to help others, or upgrade the educations to change career paths. Participants from Stress Wellness and Nutrition also wanted to be able to help others while upgrading their education and career path, but also stated that they want to learn more about healthy behaviours to cope and are interested in the course content. Lastly, participants that responded from the Pre Health course provided their rationale for taking the course as wanting to help others, upgrade

the education and career path and found it interesting. The two courses that involved a wellness component seemed to have drawn students to enroll who wanted to learn more about the healthy aspects that the courses were offering. These findings suggest that those who self-select into these elective courses have an intrinsic motivation to learn or continue to experience personal growth in regard to healthy physical activity behaviours and coping mechanisms.

As more and more courses and post-secondary programs are available for study online, some participants from this study have chosen to enroll in specific courses that were offered with an in-class delivery. Although online courses can help to achieve the greatest possible audience with the ease of accessibility, (Mailey et al., 2010) it may increase the amount of sedentary time that students spend in front of their computers. This increase in computer and associated sedentary time largely contributes to inactivity, mental health concerns, unfavourable blood lipids as well as backache and headache (Feng et al., 2014). Although the effects of sedentary time can be counteracted when meeting physical activity behaviours guidelines (Ekelund et al., 2016) none of the student in Study Two were meeting these guidelines.

When the participants were asked whether they were employed at a part time job while attending school, almost 58% reported they worked every week. There were no significant differences between the courses in regard to what percentage of their students were actively employed. Of worthy note, 27% of these students reported that they worked more than 16 hours per week while attending school. This increase in demand on the student's workload should be taken into consideration when assessing the rising numbers of mental health symptoms that are present in this population. Increased workloads may lead to increased levels of stress, anxiety, sleep deprivation and eventual burnout that is commonly seen within this population, leading to less than optimal learning conditions and academic repercussions (Ghomasara et al., 2011).

Students were asked to report from an open ended question what current coping mechanisms they used when experiencing stress or feeling overwhelmed.

Similar themes were identified throughout all of the courses, however, various responses were provided from each course that fit into the different themes as well as the number of how many student reported that way. In Find Your Fit, there were more participants that stated that they use physical activity as a coping mechanism than in any other course (n=15). Stress Wellness and Nutrition also reported a high number of students who identified physical activity as a coping mechanisms (n=13). This may suggest that students who enroll in elective courses with a focus on personal wellness may already be living a healthier lifestyle than those who choose a different type of course without this same perspective built into curriculum. Other common themes that were identified include; listening to or playing music, sleeping or taking a nap, reaching out to social or community supports, leisure time activities, and goal setting or journaling. Although the majority of responses indicate that students are using appropriate measures to cope with stressors that they are experiencing, some did report that they turn to unhealthy behaviours when feeling overwhelmed. These types of behaviours include; smoking cigarettes or marijuana, drinking alcohol, as well as eating too much or too little. Students from all of the courses reported coping mechanisms such as these, indicating that even though education is being provided on healthy and adaptable ways to work through stress, some individuals will continue to behave in ways that might not be beneficial to their health despite what health promotion is being provided.

Lastly, all participants were asked if there were other areas in their lives in which they were experiencing heightened levels of stress. The themes identified were largely the same for each class that participated, without any significant differences between what was being reported. Current literature has found that common areas for students to experience stress include; feeling pressure by parents to do well in school, changes in living conditions, beginning their post-secondary education, making a career choices and decisions, increased workload, coping with a lack of sleep and assignments/papers (Civitci, 2015). Surprisingly, almost 25% of respondents stated that they did not experience

stress in any other areas of their lives, while the remaining 75% conveyed themes that are commonly identified throughout the literature for this population. The most common areas identified throughout all of the courses were family life, caring for an ill or dependent family member, a change in their support network, finances and work. Many students reported that they were a parent and listed this as an area of stress in their life. A concern with many of these stressors is that they are not or not easily, modified in an individual's life, whereas health behaviours generally are (Lovell et al., 2015).

These findings indicate that the 'typical' post-secondary student is quickly changing and post-secondary institutions are seeing more non-traditional students at a larger proportion than previous history. Non-traditional students are thought to have more time constraints and role conflicts than traditional students, with the possibility that they may cope with stressors in their lives different than their traditional peers (Hicks & Heastie, 2008).

When exploring if the participants felt as though physical activity in class would lead to more activity outside of class time, 74% felt that it would. Rationale for their responses included increased motivation and new knowledge to put this lifestyle into practice.

The introduction of physical activity is a behavioural intervention that is associated with positive psychological health as well as an increase in perception of personal control (Biddle & Mutrie, 2008). Although the majority of participants responded accordingly to this statement, some students did not feel as though it had the same effect on the way that they felt. It was reported that some may not feel comfortable engaging in physical activity outside of class time, and that since they complete some physical activity in class, they would not have to do any more outside of class time. This train of thought seemingly has created a barrier for those students who may not feel like they are competent in their abilities to engage in physical activity independently, and has given some reassurance that this course alone is offering enough activity to meet daily requirements. Find

Your Fit is only offered once per week, and there is a maximum of 30% class time in which time may be allotted to be engaged physical activity.

There were many positive aspects of the course that the participants reported that they enjoyed engaging in. It was stated the this course helps the students to feel more motivated to become physically fit, learn new information about fitness that they can apply to themselves, as well as learn about barriers and how to overcome them to ensure physical activity remains a part of the daily lives. Another positive finding was that some participants stated that it made them realize changes that could be made within their lives to make them healthier individuals while learning new life skills.

While some participants reported that there were no negatives about this course, it was identified that some felt as though there was not enough time actually spent engaging in physical activity, and that the class was only once per week and therefore had little consistency. This lack of reported consistency and minimal time spent engaged in physical activity could hinder the student from actually incorporating these physical activities into their lifestyles to make them a habit. Literature has shown that the antidepressant effects of physical activity are experienced by individuals who continue to engage in physical activity over a period of time, with personal strategies implemented to endure physical activity being a crucial element for students to achieve benefits that physical activity can offer to mental health (Blumenthal et al., 2012). A study completed by Tyson, Wilson, Crone, Brailsford, and Laws (2010) reported from their findings that students who engage in higher levels of physical activity demonstrate significantly lower levels of anxiety and depression when compared to counterparts who engaged in lower activity levels.

Some participants indicated that a negative aspect to them was feeling sore or tired afterward (n=6). This may indicate that the level of activity may have been too advanced for some of the class, and therefore the activities may not have been seen as enjoyable to them. This would create a barrier to those students from wanting to participate in physical activity if they were not feeling

good about themselves afterward. There are several factors that are associated with successfully implementing and maintaining a physical activity program such as social support, self-efficacy, motivation, having variety of physical activity choices, personal goal setting, as well as positive reinforcement and feedback (Weinstock, 2010). Elective courses should be offered at all levels of ability to ensure that students who are new to physical activity will not become discouraged and lose motivation to learn about and live a healthy lifestyle as these results indicate they can. Although individuals with depression tend to be less physically active than non-depressed individuals, those that engage in excessive physical activity for their own physical ability level may generate psychological problems that mimic depression (Paluska & Schwenk, 2000). Due to the reported low self-efficacy scores, lack of time spent engaged in physical activities, and possibility of not targeting activities for all fitness levels, this course may have been creating further barriers to students incorporating these health behaviours into the lifestyle.

#### 4.9 Summary

The purpose of this study was to broaden the body of research applying to Canadian College students' mental health and provide findings on how general elective course design can potentially help mitigate and cope with psychological health issues. With more consideration placed upon the types of courses that are offered, post-secondary administration and associated healthy campus task forces can look to add courses that have more physical activity and wellness content built into class time to enhance the psychological functioning, healthy behaviours, as well as the academic functioning of its learners. More time engaged in supervised physical activity could help to create greater improvements in functional capacity as well as greater energy expenditure that is associated with a larger reduction in mental health symptoms (Strohle, 2009).

Those designing courses should look at the minimum physical activity guidelines as a resource to integrate this recommended activity time into student life where possible and create this expectation within post-secondary culture.



Students that selected elective courses that had physical activity and wellness built into the design showed healthier scores at baseline and viewed themselves as healthier individuals. Due to this fact, academic institutions need to ensure that they are providing courses that are going to attract students from all age groups as well as stages of life in order to encourage them to participate in healthy behaviours such as physical activity and physically active leisure time activities to incorporate into their lives and promote self-efficacious behaviours. By having courses that are offered at varying athletic and participation levels, it may make these types of courses more accessible to the post-secondary population at large and not just to those that already view themselves as athletic or in shape.

Future research is needed to assess how much physical activity is needed in post-secondary courses to see changes within baseline mental health outcomes, and assess what intensity these activities need to reach for maximum benefits.

## Chapter 5 Overall Discussion and Recommendations

It is evident throughout literature, and through the research conducted for this thesis, that the prevalence of mental health symptoms in post-secondary students is a serious concern. Recently, there has been increased consideration of the mental health of post-secondary students by the mental health community, society, administrators and legislators, leading to public health and policy concerns (Schwartz & Kay, 2009). Depression, anxiety and stress can be chronic in nature while generating considerable individual distress, as well as increasing health care costs, and contributing to increased morbidity and mortality rates (Paluska & Schwenk, 2000). Canadians are the highest consumers of psychiatric medications, indicating the need for a greater variety of evidence based approaches for treatment and prevention of mental health conditions (Miller Jr & Frech III, 2000). Although there is evidence to suggest the beneficial use of traditional treatments such as pharmacology and therapy, there are limitations and an assortment of barriers to accessing these services (Mailey et al., 2010). Students who regularly engage in healthy behaviours, such as physical activity, show lower levels of depression, anxiety and stress as opposed to those that are not meeting health behaviour guidelines (Lovell et al., 2015). Health behaviours that are formed during this time are said to have lasting implications of the future of an individual's health status and that when looking at these healthy behaviours, they should not be isolated from one another (Dodd et al., 2010).

Students that are suffering from mental health issues could find it challenging to maintain a regular physical activity regime due to their symptoms of depression. Those that are affected may face deficits in their motivation which can be manifested as fatigue, indecisiveness, low self-esteem, loss of joy interest and pleasure as well as affected sleep hygiene (Blumenthal et al., 2012). Students that are already feeling stressed or overwhelmed by the demands of their lifestyle tend to find other things in their life more stressful, including physical activity (Gerber et al., 2014). Students may attempt to force physical activity into their already busy lifestyle which may create more of a stress and

burden to themselves than a release. If there were more opportunities to participate in physical activity as part of their coursework, they may not feel as though it is such a burden to fit it into their lives in their own free time.

This research investigated the mental health of post-secondary students, and if physical activity built into curriculum could have the potential to act as an alleviator or protector against mental health symptoms. The first pilot study (Chapter 3) compared mental health outcomes in post-secondary students over a single semester for a general education course that have a physical activity component built into curriculum to a general education course with similar wellness content but no physical activity component. There were no significant increases in mental health outcomes between the two courses however there seemed to be a difference in the type of students that chose to enrol in the course that was based on health, wellness, and physical activity.

This led to the second study which was aimed at determining whether there is a difference in students that choose to enrol in general education courses with a wellness and/or physical activity component and whether students choosing these courses had a higher level of perceived health, and coping abilities at baseline. It was determined that students that chose to enrol in the general elective course that offered physical activity saw themselves as healthier individuals as per their self-reported outcome measures. These students reported that they were motivated to learn more about incorporating a healthy lifestyle into their daily routine and become more physically fit individuals. Courses that did not have any wellness or physical activity components built into the curriculum showed the lowest self- efficacy toward physical activity. This highlights the need for post-secondary campuses to promote self-efficacious behaviours to their student body while on campus that focus on gaining or learning new skills for physical activity at all levels of ability.

There have been numerous elements that have been associated with effectively implementing and maintaining a physical activity program such as social support, self-efficacy, motivation, variety of physical activity choices,

personal goal setting, as well as positive reinforcement and feedback (Weinstock, 2010). This is important to consider as research has shown that antidepressant effects of physical activity are experienced by those who continue to engage in physical activity over time with personal strategies to endure physical activity to achieve the benefits that can be offered to their mental health (Blumenthal et al., 2012).

Suggestions for improving delivery of courses with a physical activity component include engaging in physical activity for at least one hour per week during class time to teach new strategies and techniques along with self-reported proof of meeting and adhering to the Canadian physical activity guidelines for adults. Peer mentoring from students in other courses with a larger focus on health, wellness and physical activity could be useful in providing mentorship and guidance through the learning and adherence process of maintaining lifestyle changes. Lastly, post-secondary institutions should ensure that they are offering a variety of activities and opportunities throughout their campuses that encourage students to engage in physical activity daily without making it another demand on their busy schedules. Such activities could include; bike sharing networks for transportation, beginner work out classes offered at a discounted rate for students, providing courses that are sport based to encourage physical activity during creditable hours, and providing an inclusive culture that is respectful and motivational toward all physical ability levels.

Study one found that the course that included physical activity during class time did not illicit the positive mental health outcomes on depression and stress that were hypothesized, it may have been due to the limited amount of time that the students spent actually engaging in physical activity. Since this course is only offered once a week with no more than 30% of class time actually spent exercising, it may not have been a sufficient amount to experience the known benefits that physical activity can promote on mental health symptoms. Giving students more time during class to participate in physical activity could help to increase their self-efficacy toward physical activity and therefore increase

the likelihood that they will incorporate these healthy behaviours into their lifestyles. Since many individuals discontinue physical activity regimes before they are able to reap the positive benefits, courses offering physical activity to students should also include basic information to promote ways in which they can continue to utilize these new skills outside of class time to increase their self-efficacy.

An important consideration in developing these types of courses is that extrinsic factors are said to be important while initiating physical activity, but intrinsic motivation is an important component in maintaining it (Weinstock, 2010). A commonly studied and poorly understood aspect of physical activity concerns the issue of maintained adherence to regimes once they have begun (McAuley, 1992). By teaching someone how to work out and incorporate physical activity into their lifestyle within the recommended guidelines for adults, it could help to foster lasting improvements in health behaviours and life satisfaction. Experienced exercisers may know how to arrange their physical activity programs to produce a positive emotional state, while unexperienced exercisers frequently lack the skill or intuition needed to make ideal choices in their activity regimes which may limit their benefits as well as adherence to a program (Kilpatrick, 2008).

Having courses that are available to students at all levels of experience in regard to physical activity can increase an individual's self-efficacy to promote adherence to a physical activity plan, and could help to make the time spent in these activities more enjoyable to the students. Research completed by Matta Mello Portugal et al. (2013) found that the greatest physical activity satisfaction comes from working at an individual's own comfort level, and that an individualized physical activity program would be beneficial to mental health. While post-secondary institutions may not be able to provide and supervise individual physical activity plans for all students, it should be a consideration to provide a variety of elective courses that incorporate physical activity at all levels of ability and confidence. An increase in supervised physical activity can result in

greater improvements in functional capacity with greater energy expenditure that is associated with a reduction in mental health symptoms (Strohle, 2009). Not only would the students benefit from the positive mental health benefits that could be experienced through habitual physical activity, but research indicates that physically active individuals display other behaviours that are linked with physical health such as healthier eating habits, and less engagement in sedentary behaviours (Downs & Ashton, 2011).

Differences in types of students selecting general education electives that include wellness and/or physical activity highlight the fact that those that show an interest in physical activity and wellness also tend to use these techniques to cope when feeling stressed or overwhelmed. These individuals tend to engage in various types of physical activity, seek out social support and engage in healthy distraction techniques that are aligned with healthy behaviours.

This study highlights that students attending post-secondary education have similar areas in their personal lives in which they experience stress, regardless of choice of general elective courses. The vast majority of students involved in this study reported coping in a manner which shows an attempt at healthy choices and adaptive measures. More supportive measures offered to all students, not just those that are reporting mental health concerns, could help to support a healthier post-secondary experience for all those attending.

Students that chose to participate in the course that had both wellness and physical activity built into curriculum showed better mental health scores at baseline for stress and anxiety than students choosing courses that did not include physical activity. These wellness programs may offer students insight into adaptive coping strategies that students who are not enrolled in these types of courses should have access to. Research indicates that health participation behaviour, such as physical activity, tend to cluster in such a way that people who meet guidelines for one health behaviour are more likely to meet guidelines for other behaviours (Lovell et al., 2015). A study completed by Y. S. Kim et al. (2012) found that levels of mental health differed significantly by an individual's

physical health status, indicating that healthier respondents had better mental health scores on average.

Finding new strategies on post-secondary campuses to encourage the initiation and maintenance of physical activity within the student population is paramount. Study two provides evidence that not all students would sign up for a general education elective which includes physical activity. Therefore, multi-pronged approaches to promote student engagement in movement behaviour should be considered at all levels of program and policy design. Future research into this field should assess ways in which students feel they could be best supported through the process of increasing physical activity with participation from peers, faculty, and specialized support staff.

Healthy campus initiatives are being instituted throughout Canadian post-secondary institutions; more research and information sharing between academic institutions could help to decrease the growing number of mental health concerns that are being seen throughout these educational systems. The inclusion of courses that include physical activity is one important strategy, but study two makes it clear that this is only part of the solution. In order to meet the needs of a broader range and larger numbers of students, other options such as subsidized training, on-line training guides, peer mentors, and access to places to store fitness clothing on campus, are all factors that should be considered in future studies of increasing participation in physical activity by post-secondary students.

## List of References

- Adams, T. B., Moore, M. T., & Dye, J. (2007). The relationship between physical activity and mental health in a national sample of college females. *Women & health, 45*(1), 69-85.
- American College Health Association-National College Health Assessment Spring 2008 Reference Group Data Report (abridged): the American College Health Association. (2009). *J Am Coll Health, 57*(5), 477-488. doi:10.3200/jach.57.5.477-488
- Anastasiades, M. H., Kapoor, S., Wootten, J., & Lamis, D. A. (2017). Perceived stress, depressive symptoms, and suicidal ideation in undergraduate women with varying levels of mindfulness. *Archives of Women's Mental Health, 20*(1), 129-138. doi:10.1007/s00737-016-0686-5
- Armstrong, S. N., & Burcin, M. M. (2016). Digital Health Education for the Fully Online College Student: An Exploratory Study. *American Journal of Health Education, 47*(6), 385-393. doi:10.1080/19325037.2016.1219285
- Arvidsson, D., Slinde, F., Larsson, S., & Hulthen, L. (2007). Energy cost of physical activities in children: validation of SenseWear Armband. *Med Sci Sports Exerc, 39*(11), 2076.
- Australian Government: Department of Health and Ageing: Therapeutic Goods Administration. <http://www.tga.gov.au/docs/about/publications.htm>.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191-215. doi:10.1037/0033-295X.84.2.191
- Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ, US: Prentice-Hall, Inc.
- Barker, S. B., Barker, R. T., McCain, N. L., & Schubert, C. M. (2016). A Randomized Cross-over Exploratory Study of the Effect of Visiting Therapy Dogs on College Student Stress Before Final Exams. *Anthrozoös, 29*(1), 35-46. doi:10.1080/08927936.2015.1069988
- Bentley, S. M., Pagalilauan, G. L., & Simpson, S. A. (2014). Major Depression. *Medical Clinics of North America, 98*(5), 981-1005. doi:<http://dx.doi.org/10.1016/j.mcna.2014.06.013>
- Biddle, S. J. H., & Mutrie, N. (2008). *Psychology of physical activity: determinants, well-being, and interventions*: Routledge.
- Blumenthal, J. A., Sherwood, A., Babyak, M. A., Watkins, L. L., Smith, P. J., Hoffman, B. M., . . . Hinderliter, A. L. (2012). Exercise and pharmacological treatment of depressive symptoms in patients with coronary heart disease: results from the UPBEAT (Understanding the Prognostic Benefits of Exercise and Antidepressant Therapy) study. *J Am Coll Cardiol, 60*(12), 1053-1063. doi:10.1016/j.jacc.2012.04.040
- Bray, S. R., Beauchamp, M. R., Latimer, A. E., Hoar, S. D., Shields, C. A., & Bruner, M. W. (2011). Effects of a print-mediated intervention on physical activity during transition to the first year of university. *Behavioral Medicine, 37*(2), 60-69.



- Bray, S. R., & Born, H. A. (2004). Transition to university and vigorous physical activity: implications for health and psychological well-being. *J Am Coll Health, 52*(4), 181-188. doi:10.3200/jach.52.4.181-188
- Buckworth, J., & Nigg, C. (2004). Physical activity, exercise, and sedentary behavior in college students. *J Am Coll Health, 53*(1), 28-34. doi:10.3200/jach.53.1.28-34
- Camacho, A., Cordero, E. D., & Perkins, T. (2016). Psychometric Properties of the DASS-21 Among Latina/o College Students by the US-Mexico Border. *J Immigr Minor Health, 18*(5), 1017-1023. doi:10.1007/s10903-016-0415-1
- Campbell, S., Marriott, M., Nahmias, C., & MacQueen, G. M. (2004). Lower Hippocampal Volume in Patients Suffering From Depression: A Meta-Analysis. *American Journal of Psychiatry, 161*(4), 598-607. doi:10.1176/appi.ajp.161.4.598
- Canada, G. o. (2006). The human face of mental health and mental illness in Canada, 2006: Public Health Agency of Canada Ottawa.
- Caspersen, C. J., Powell, K. E., & Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research. *Public health reports, 100*(2), 126.
- Cheung, T., Wong, S. Y., Wong, K. Y., Law, L. Y., Ng, K., Tong, M. T., . . . Yip, P. S. F. (2016). Depression, Anxiety and Symptoms of Stress among Baccalaureate Nursing Students in Hong Kong: A Cross-Sectional Study. *International Journal of Environmental Research and Public Health, 13*(8), 25. doi:10.3390/ijerph13080779
- Civitci, A. (2015). Perceived Stress and Life Satisfaction in College Students: Belonging and Extracurricular Participation as Moderators. *Procedia - Social and Behavioral Sciences, 205*, 271-281. doi:<http://dx.doi.org/10.1016/j.sbspro.2015.09.077>
- Clemmens, D., Engler, A., & Chinn, P. L. (2004). Learning and living health: college students' experiences with an introductory health course. *Journal of Nursing Education, 43*(7), 313-318.
- Cole, J., Costafreda, S. G., McGuffin, P., & Fu, C. H. Y. (2011). Hippocampal atrophy in first episode depression: A meta-analysis of magnetic resonance imaging studies. *J Affect Disord, 134*(1-3), 483-487. doi:<http://dx.doi.org/10.1016/j.jad.2011.05.057>
- Craig, C. L., Marshall, A. L., Sjostrom, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., . . . Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc, 35*(8), 1381-1395. doi:10.1249/01.mss.0000078924.61453.fb
- Diagnostic and Statistical Manual of Mental Disorders*. (1994). Washington DC: American Psychiatric Association.
- Dinger, M. K., Behrens, T. K., & Han, J. L. (2006). Validity and Reliability of the International Physical Activity Questionnaire in College Students. *American Journal of Health Education, 37*(6), 337-343. doi:10.1080/19325037.2006.10598924

- Dodd, L. J., Al-Nakeeb, Y., Nevill, A., & Forshaw, M. J. (2010). Lifestyle risk factors of students: a cluster analytical approach. *Prev Med, 51*(1), 73-77. doi:10.1016/j.yjmed.2010.04.005
- Downs, A., & Ashton, J. (2011). Vigorous physical activity, sports participation, and athletic identity: implications for mental and physical health in college students. *Journal of Sport Behavior, 34*(3), 228-249.
- Ekelund, U., Steene-Johannessen, J., Brown, W. J., Fagerland, M. W., Owen, N., Powell, K. E., . . . Group, L. S. B. W. (2016). Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. *The Lancet, 388*(10051), 1302-1310.
- Ekelund, U., Steene-Johannessen, J., Brown, W. J., Fagerland, M. W., Owen, N., Powell, K. E., . . . Lee, I. M. Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women. *The Lancet, 388*(10051), 1302-1310. doi:10.1016/S0140-6736(16)30370-1
- Elliot, C. A., Kennedy, C., Morgan, G., Anderson, S. K., & Morris, D. (2012). Undergraduate Physical Activity and Depressive Symptoms: A National Study. *American Journal of Health Behavior, 36*(2), 230-241.
- Eyre, H. A., Stuart, M. J., & Baune, B. T. (2014). A phase-specific neuroimmune model of clinical depression. *Progress in Neuro-Psychopharmacology & Biological Psychiatry, 54*, 265-274. doi:10.1016/j.pnpbp.2014.06.011
- Faulkner, G., & Sparkes, A. (1999). Exercise as therapy for schizophrenia: An ethnographic study. *Journal of Sport and Exercise Psychology, 21*(1), 52-69.
- Feng, Q., Zhang, Q. L., Du, Y., Ye, Y. L., & He, Q. Q. (2014). Associations of Physical Activity, Screen Time with Depression, Anxiety and Sleep Quality among Chinese College Freshmen. *Plos One, 9*(6), 5. doi:10.1371/journal.pone.0100914
- Garlow, S. J., Rosenberg, J., Moore, J. D., Haas, A. P., Koestner, B., Hendin, H., & Nemeroff, C. B. (2008). Depression, desperation, and suicidal ideation in college students: results from the American Foundation for Suicide Prevention College Screening Project at Emory University. *Depress Anxiety, 25*(6), 482-488. doi:10.1002/da.20321
- Gerber, M., Brand, S., Elliot, C., Holsboer-Trachsler, E., & Puhse, U. (2014). AEROBIC EXERCISE, BALL SPORTS, DANCING, AND WEIGHT LIFTING AS MODERATORS OF THE RELATIONSHIP BETWEEN STRESS AND DEPRESSIVE SYMPTOMS: AN EXPLORATORY CROSS-SECTIONAL STUDY WITH SWISS UNIVERSITY STUDENTS. *Perceptual and Motor Skills, 119*(3), 679-697. doi:10.2466/06.PMS.119c26z4
- Ghomasara, S. L., Davidson, M. A., Reich, M. S., Savoie, C. V., & Rodgers, S. M. (2011). Assessing student mental health at the Vanderbilt University School of Medicine. *Acad Med, 86*(1), 116-121. doi:10.1097/ACM.0b013e3181ffb056

- Gianferante, D., Thoma, M. V., Hanlin, L., Chen, X., Breines, J. G., Zoccola, P. M., & Rohleder, N. (2014). Post-stress rumination predicts HPA axis responses to repeated acute stress. *Psychoneuroendocrinology*, *49*(0), 244-252. doi:<http://dx.doi.org/10.1016/j.psyneuen.2014.07.021>
- Gotlib, I. H., & Joormann, J. (2010). Cognition and Depression: Current Status and Future Directions. In S. Nolen-Hoeksema, T. D. Cannon, & T. Widiger (Eds.), *Annual Review of Clinical Psychology, Vol 6* (Vol. 6, pp. 285-312). Palo Alto: Annual Reviews.
- Green, J., Willis, K., Hughes, E., Small, R., Welch, N., Gibbs, L., & Daly, J. (2007). Generating best evidence from qualitative research: the role of data analysis. *Australian and New Zealand journal of public health*, *31*(6), 545-550.
- Hagströmer, M., Oja, P., & Sjöström, M. (2006). The International Physical Activity Questionnaire (IPAQ): a study of concurrent and construct validity. *Public Health Nutrition*, *9*(6), 755-762. doi:10.1079/PHN2005898
- Harbour, V. J., Behrens, T. K., Kim, H. S., & Kitchens, C. L. (2008). Vigorous physical activity and depressive symptoms in college students. *J Phys Act Health*, *5*(4), 516-526.
- Hawker, C. L. (2012). Physical activity and mental well-being in student nurses. *Nurse Education Today*, *32*(3), 325-331. doi:10.1016/j.nedt.2011.07.013
- Hicks, T., & Heastie, S. (2008). High school to college transition: a profile of the stressors, physical and psychological health issues that affect the first-year on-campus college student. *J Cult Divers*, *15*(3), 143-147.
- Higgins, T. J., Middleton, K. R., Winner, L., & Janelle, C. M. (2014). Physical activity interventions differentially affect exercise task and barrier self-efficacy: A meta-analysis. *Health Psychology*, *33*(8), 891-903. doi:<http://dx.doi.org/10.1037/a0033864>
- Hjorth, C. F., Bilgrav, L., Frandsen, L. S., Overgaard, C., Torp-Pedersen, C., Nielsen, B., & Boggild, H. (2016). Mental health and school dropout across educational levels and genders: a 4.8-year follow-up study. *Bmc Public Health*, *16*, 12. doi:10.1186/s12889-016-3622-8
- Jenkinson, C., Layte, R., Jenkinson, D., Lawrence, K., Petersen, S., Paice, C., & Stradling, J. (1997). A shorter form health survey: can the SF-12 replicate results from the SF-36 in longitudinal studies? *J Public Health Med*, *19*(2), 179-186.
- Jones, A. Y., Dean, E., & Lo, S. K. (2002). Interrelationships between anxiety, lifestyle self-reports and fitness in a sample of Hong Kong University students. *Stress*, *5*(1), 65-71. doi:10.1080/102538902900012350
- Kadooka, S., Matsutake, T., Sugo, T., & Araki, M. (2014). Effects of depression on cortisol awakening responses in college athletes. *International Journal of Psychophysiology*, *94*(2), 261-261. doi:10.1016/j.ijpsycho.2014.08.983
- Kawada, T., Katsumata, M., Suzuki, H., & Shimizu, T. (2007). Actigraphic predictors of the depressive state in students with no psychiatric disorders. *J Affect Disord*, *98*(1-2), 117-120. doi:10.1016/j.jad.2006.07.004

- Keating, X. D., Guan, J., Piñero, J. C., & Bridges, D. M. (2005). A meta-analysis of college students' physical activity behaviors. *Journal of American College Health, 54*(2), 116-126.
- Kilpatrick, M. W. (2008). Exercise, mood, and psychological well-being: A practitioner's guide to theory, research, and application. *ACSM'S Health & Fitness Journal, 12*(5), 14-20.
- Kim, J.-H., & McKenzie, L. A. (2014). The Impacts of Physical Exercise on Stress Coping and Well-Being in University Students in the Context of Leisure. *Health, Vol.06No.19*, 11. doi:10.4236/health.2014.619296
- Kim, J. H., Yang, H., & Schroepel, S., 2nd. (2013). A pilot study examining the effects of Kouk Sun Do on university students with anxiety symptoms. *Stress Health, 29*(2), 99-107. doi:10.1002/smi.2431
- Kim, J. J., Song, E. Y., Kim, J. J., Song, E. Y., & Kosten, T. A. (2006). Stress effects in the hippocampus: Synaptic plasticity and memory. *Stress, 9*(1), 1-11. doi:10.1080/10253890600678004
- Kim, Y. S., Park, Y. S., Allegrante, J. P., Marks, R., Ok, H., Ok Cho, K., & Garber, C. E. (2012). Relationship between physical activity and general mental health. *Prev Med, 55*(5), 458-463. doi:10.1016/j.ypmed.2012.08.021
- Kisch, J., Leino, E. V., & Silverman, M. M. (2005). Aspects of suicidal behavior, depression, and treatment in college students: results from the spring 2000 national college health assessment survey. *Suicide Life Threat Behav, 35*(1), 3-13. doi:10.1521/suli.35.1.3.59263
- Kitzrow, M. A. (2003). The mental health needs of today's college students: Challenges and recommendations. *NASPA journal, 41*(1), 167-181.
- Kolb, B., & Muhammad, A. (2014). Harnessing the power of neuroplasticity for intervention.
- Korgaonkar, M. S., Grieve, S. M., Etkin, A., Koslow, S. H., & Williams, L. M. (2013). Using standardized fMRI protocols to identify patterns of prefrontal circuit dysregulation that are common and specific to cognitive and emotional tasks in major depressive disorder: first wave results from the iSPOT-D study. *Neuropsychopharmacology, 38*. doi:10.1038/npp.2012.252
- Krogh, J., Rostrup, E., Thomsen, C., Elfving, B., Videbech, P., & Nordentoft, M. (2014). The effect of exercise on hippocampal volume and neurotrophines in patients with major depression-A randomized clinical trial. *J Affect Disord, 165*, 24-30. doi:10.1016/j.jad.2014.04.041
- Kwan, M. Y., Arbour-Nicitopoulos, K. P., Duku, E., & Faulkner, G. (2016). Patterns of multiple health risk-behaviours in university students and their association with mental health: application of latent class analysis. *Health Promotion and Chronic Disease Prevention in Canada-Research Policy and Practice, 36*(8), 163-170.
- Lacerda-Pinheiro, S. F., Pinheiro Junior, R. F. F., Lima, M. A. P. d., Silva, C. G. L. d., Santos, M. d. S. V. d., Teixeira Júnior, A. G., . . . Bianco, B. A. V. (2014). Are there depression and anxiety genetic markers and mutations? A systematic review. *J Affect Disord, 168*(0), 387-398. doi:<http://dx.doi.org/10.1016/j.jad.2014.07.016>

- Laine, H., Araujo-Soares, V., Haukkala, A., & Hankonen, N. (2017). Acceptability of Strategies to Reduce Student Sitting: A Mixed-Methods Study With College Teachers. *Health Promotion Practice, 18*(1), 44-53. doi:10.1177/1524839916677209
- Lee, M. M., Reif, A., & Schmitt, A. G. (2013). Major depression: a role for hippocampal neurogenesis? *Curr Top Behav Neurosci, 14*, 153-179. doi:10.1007/7854\_2012\_226
- Lopresti, A. L., Hood, S. D., & Drummond, P. D. (2013). A review of lifestyle factors that contribute to important pathways associated with major depression: Diet, sleep and exercise. *J Affect Disord, 148*(1), 12-27. doi:10.1016/j.jad.2013.01.014
- Lovell, G. P., Nash, K., Sharman, R., & Lane, B. R. (2015). A cross-sectional investigation of depressive, anxiety, and stress symptoms and health-behavior participation in Australian university students. *Nursing & Health Sciences, 17*(1), 134-142. doi:10.1111/nhs.12147
- Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335-343. doi:[http://dx.doi.org/10.1016/0005-7967\(94\)00075-U](http://dx.doi.org/10.1016/0005-7967(94)00075-U)
- Mackenzie, S., Wiegel, J. R., Mundt, M., Brown, D., Saewyc, E., Heiligenstein, E., . . . Fleming, M. (2011). Depression and Suicide Ideation Among Students Accessing Campus Health Care. *American Journal of Orthopsychiatry, 81*(1), 101-107. doi:10.1111/j.1939-0025.2010.01077.x
- Mailey, E. L., Wojcicki, T. R., Motl, R. W., Hu, L., Strauser, D. R., Collins, K. D., & McAuley, E. (2010). Internet-delivered physical activity intervention for college students with mental health disorders: a randomized pilot trial. *Psychol Health Med, 15*(6), 646-659. doi:10.1080/13548506.2010.498894
- Martinez-Bello, V. E., Martinez-Rojas, A., & Molina-Garcia, J. (2017). Health-related messages about physical activity promotion: an analysis of photographs on social networking sites of universities. *Journal of Higher Education Policy and Management, 39*(1), 75-88. doi:10.1080/1360080x.2016.1254428
- Matta Mello Portugal, E., Cevada, T., Sobral Monteiro-Junior, R., Teixeira Guimaraes, T., da Cruz Rubini, E., Lattari, E., . . . Camaz Deslandes, A. (2013). Neuroscience of exercise: from neurobiology mechanisms to mental health. *Neuropsychobiology, 68*(1), 1-14. doi:10.1159/000350946
- McAuley, E. (1992). The role of efficacy cognitions in the prediction of exercise behavior in middle-aged adults. *Journal of behavioral medicine, 15*(1), 65-88.
- Miller Jr, R. D., & Frech III, H. (2000). Is there a link between pharmaceutical consumption and improved health in OECD countries? *Pharmacoeconomics, 18*(1), 33-45.
- Misra, R., & McKean, M. (2000). College students' academic stress and its relation to their anxiety, time management, and leisure satisfaction. *American Journal of Health Studies, 16*(1), 41.

- Mok, W. S. Y., & Chan, W. W. L. (2016). How do tests and summary writing tasks enhance long-term retention of students with different levels of test anxiety? *Instructional Science*, *44*(6), 567-581. doi:10.1007/s11251-016-9393-x
- Mowbray, C. T., Megivern, D., Mandiberg, J. M., Strauss, S., Stein, C. H., Collins, K., . . . Lett, R. (2006). Campus mental health services: Recommendations for change. *American Journal of Orthopsychiatry*, *76*(2), 226-237. doi:10.1037/0002-9432.76.2.226
- Moylan, S., Maes, M., Wray, N. R., & Berk, M. (2013). The neuroprogressive nature of major depressive disorder: pathways to disease evolution and resistance, and therapeutic implications. *Mol Psychiatry*, *18*(5), 595-606. doi:10.1038/mp.2012.33
- Musselman, J. R. B., & Rutledge, P. C. (2010). The incongruous alcohol-activity association: Physical activity and alcohol consumption in college students. *Psychology of Sport and Exercise*, *11*(6), 609-618. doi:10.1016/j.psychsport.2010.07.005
- Nguyen-Michel, S. T., Unger, J. B., Hamilton, J., & Spruijt-Metz, D. (2006). Associations between physical activity and perceived stress/hassles in college students. *Stress and Health*, *22*(3), 179-188. doi:10.1002/smi.1094
- Norton, P. J. (2007). Depression anxiety and stress scales (DASS-21): Psychometric analysis across four racial groups. *Anxiety Stress and Coping*, *20*(3), 253-265. doi:10.1080/10615800701309279
- Owens, M., Stevenson, J., Hadwin, J. A., & Norgate, R. (2012). Anxiety and depression in academic performance: An exploration of the mediating factors of worry and working memory. *School Psychology International*, *33*(4), 433-449.
- Owens, M. J., & Nemeroff, C. B. (1994). Role of serotonin in the pathophysiology of depression: focus on the serotonin transporter. *Clinical Chemistry*, *40*(2), 288-295.
- Paluska, S. A., & Schwenk, T. L. (2000). Physical activity and mental health - Current concepts. *Sports Medicine*, *29*(3), 167-180. doi:10.2165/00007256-200029030-00003
- Park, C. R., Zoladz, P. R., Conrad, C. D., Fleshner, M., & Diamond, D. M. (2008). Acute predator stress impairs the consolidation and retrieval of hippocampus-dependent memory in male and female rats. *Learning & memory*, *15*(4), 271-280.
- Pate, R. R., Pratt, M., Blair, S. N., Haskell, W. L., Macera, C. A., Bouchard, C., . . . King, A. C. (1995). Physical activity and public health: a recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA*, *273*(5), 402-407.
- Peer, J. W., Hillman, S. B., & Van Hoet, E. (2015). The Effects of Stress on the Lives of Emerging Adult College Students: An Exploratory Analysis. *Adultspan Journal*, *14*(2), 90-99. doi:10.1002/adsp.12007
- Petersen, A. M. W., & Pedersen, B. K. (2005). The anti-inflammatory effect of exercise. *Journal of Applied Physiology*, *98*(4), 1154-1162. doi:10.1152/jappphysiol.00164.2004

- Reynolds, E. K., MacPherson, L., Tull, M. T., Baruch, D. E., & Lejuez, C. W. (2011). Integration of the Brief Behavioral Activation Treatment for Depression (BATD) Into a College Orientation Program: Depression and Alcohol Outcomes. *Journal of Counseling Psychology, 58*(4), 555-564. doi:10.1037/a0024634
- Rogers, H. H., & Harpin, S. (2016). Improving Access to Preventative Health Services at a Small College. *Jnp-Journal for Nurse Practitioners, 12*(4), E163-E168. doi:10.1016/j.nurpra.2015.12.004
- Russell, V. A., Zigmond, M. J., Dimatelis, J. J., Daniels, W. M. U., & Mabandla, M. V. (2014). The interaction between stress and exercise, and its impact on brain function. *Metabolic Brain Disease, 29*(2), 255-260. doi:10.1007/s11011-013-9479-y
- Ryan, M. P. (2008). The antidepressant effects of physical activity: mediating self-esteem and self-efficacy mechanisms. *Psychol Health, 23*(3), 279-307. doi:10.1080/14768320601185502
- Saleh, D., Camart, N., & Romo, L. (2017). Predictors of Stress in College Students. *Frontiers in Psychology, 8*, 8. doi:10.3389/fpsyg.2017.00019
- Schepis, T. S., & Hakes, J. K. (2014). The association between nonmedical use of prescription medication status and change in health-related quality of life: Results from a Nationally Representative Survey. *Drug and Alcohol Dependence, 142*, 161-167. doi:10.1016/j.drugalcdep.2014.06.009
- Schwartz, V., & Kay, J. (2009, 2009/10//). The crisis in college and university mental health. *Psychiatric Times, 26*, 32.
- Stockmeier, C. A., Shapiro, L. A., Dilley, G. E., Kolli, T. N., Friedman, L., & Rajkowska, G. (1998). Increase in serotonin-1A autoreceptors in the midbrain of suicide victims with major depression—postmortem evidence for decreased serotonin activity. *Journal of Neuroscience, 18*(18), 7394-7401.
- Strohle, A. (2009). Physical activity, exercise, depression and anxiety disorders. *J Neural Transm (Vienna), 116*(6), 777-784. doi:10.1007/s00702-008-0092-x
- Taliaferro, L. A., Rienzo, B. A., Pigg, R. M., Miller, M. D., & Dodd, V. J. (2009). Associations Between Physical Activity and Reduced Rates of Hopelessness, Depression, and Suicidal Behavior Among College Students. *Journal of American College Health, 57*(4), 427-435.
- Thompson-Ebanks, V. (2017). Leaving College Prematurely: The Experiences of Nontraditional-Age College Students With Depression. *Journal of College Student Retention-Research Theory & Practice, 18*(4), 474-495. doi:10.1177/1521025115611395
- Toups, M. S. P., Greer, T. L., Kurian, B. T., Grannemann, B. D., Carmody, T. J., Huebinger, R., . . . Trivedi, M. H. (2011). Effects of serum Brain Derived Neurotrophic Factor on exercise augmentation treatment of depression. *J Psychiatr Res, 45*(10), 1301-1306. doi:10.1016/j.jpsychires.2011.05.002
- Tyson, P., Wilson, K., Crone, D., Brailsford, R., & Laws, K. (2010). Physical activity and mental health in a student population. *J Ment Health, 19*(6), 492-499. doi:10.3109/09638230902968308

- Uglesic, B., Lasic, D., Zuljan-Cvitanovic, M., Bukovic, D., Karelovic, D., Delic-Brkljacic, D., . . . Radan, M. (2014). Prevalence of depressive symptoms among college students and the influence of sport activity. *Coll Antropol*, 38(1), 235-239.
- van der Westhuizen, C., Wyatt, G., Williams, J. K., Stein, D. J., & Sorsdahl, K. (2014). Prevalence and predictors of mental disorders in intentionally and unintentionally injured emergency center patients. *J Nerv Ment Dis*, 202(9), 638-646. doi:10.1097/nmd.0000000000000176
- van Praag, H., Kempermann, G., & Gage, F. H. (1999). Running increases cell proliferation and neurogenesis in the adult mouse dentate gyrus. *Nat Neurosci*, 2(3), 266-270. doi:10.1038/6368
- VanKim, N. A., & Nelson, T. F. (2013). Vigorous Physical Activity, Mental Health, Perceived Stress, and Socializing Among College Students. *American Journal of Health Promotion*, 28(1), 7-15. doi:10.4278/ajhp.111101-QUAN-395
- Ware, J. E., Kosinski, M., & Keller, S. D. (1996). A 12-item short-form health survey - Construction of scales and preliminary tests of reliability and validity. *Medical Care*, 34(3), 220-233. doi:10.1097/00005650-199603000-00003
- Weibull, F., Cumming, J., Cooley, S. J., Williams, S. E., & Burns, V. E. (2015). Walk this Way: A Brief Exercise Imagery Intervention Increases Barrier Self-Efficacy in Women. *Current Psychology*, 34(2), 477-490. doi:10.1007/s12144-014-9271-0
- Weinstock, J. (2010). A Review of Exercise as Intervention for Sedentary Hazardous Drinking College Students: Rationale and Issues. *Journal of American College Health*, 58(6), 539-544. doi:10.1080/07448481003686034
- Welle, P. D., & Graf, H. M. (2011). Effective lifestyle habits and coping strategies for stress tolerance among college students. *American Journal of Health Education*, 42(2), 96-105.
- Willner, P., Scheel-Krüger, J., & Belzung, C. (2014). Resistance to antidepressant drugs: the case for a more predisposition-based and less hippocampocentric research paradigm. *Behavioural Pharmacology*, 25(5 and 6), 352-371. doi:10.1097/fbp.0000000000000066



## Appendix A: Consent form for Study One

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FACULTY OF HEALTH SCIENCES

### **Title of Research Study:**

Assessing college student mental health outcomes with introduction of physical activity in general elective course

### **Researcher(s):**

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If you have any questions about the study, please contact Lindsey Thomas at [lindsey.blakey@uoit.net](mailto:lindsey.blakey@uoit.net)

You are invited to participate in a research study at the University Of Ontario Institute Of Technology in the Faculty of Health Sciences. This study (REB File #15-014) has been reviewed by the University of Ontario Research Ethics Board and has been approved as of September 21<sup>st</sup>, 2015. Please read this form carefully, and feel free to ask any questions you might have before signing this form to ensure informed consent. If you have any questions about your rights as a participant in this study, please contact the Compliance Officer at 905 721 8668 ext 3693 or [compliance.uoit.ca](http://compliance.uoit.ca).

Before agreeing to participate in this study, it is important that you read and understand the following explanation of the proposed study procedures. The following information describes the purpose, procedures, benefits, and risks associated with this study. It also describes your right to refuse to participate or withdraw from the study at any time. In order to decide whether you wish to participate in this research study, you should understand enough about its risks and benefits to be able to make an informed decision; this is known as the informed consent process. Please read through this document carefully and ask the principal investigator to explain anything that you don't understand before signing this consent form. Make sure all your questions have been answered to your satisfaction before signing this document.

**Purpose and Procedure:**

College can be a stressful time for students due to a variety of lifestyle and transitional factors. Durham College is looking at new ways in which we can best support your success while enhancing the entire student experience. The college has a number of courses designed to help students become aware of ways to enhance their physical and mental health.

We are looking at the effects on health outcomes of two courses that will be running in the winter of 2016. These courses will be assessed based on their differences in the curriculum design and content.

You will be asked at the beginning and the end of the semester to fill out four questionnaires that will assess: your physical and mental health, your current amount of exercise, and your self-efficacy with respect to exercise.

You will be asked to fill out the Barriers Self Efficacy Scale, the International Physical Activity Questionnaire, The Short Form 12 Health Survey and the Depression, Anxiety, and Stress Scale.

The principal investigator may ask you at the end of the study to participate in an interview or focus group to discuss your personal learning experiences that you may have gained from taking the course. This is a voluntary option that can be accepted or declined; it will have no personal implications on your previous information provided and there is no consequence should you not want to participate in this aspect of the research. The interview will be transcribed by the principal investigator. By signing this consent form, you are agreeing to the terms that you may be contacted for an interview which will be documented by written note and audio recording, if the principal investigator invites you to do so. You can withdraw from the study at any point in time by contacting Lindsey Thomas at [lindsey.blakey@uoit.net](mailto:lindsey.blakey@uoit.net).

**Time commitment:**

Class time will be provided for you to fill out the questionnaire package which should take about 20 minutes to complete.

The interview or focus group will take place on Durham College North Oshawa Campus in a room that will be booked by the PI. You will be asked to participate in a 1 hour discussion with guided questions from the principal investigator.

You will be expected to complete this aspect of the study outside of class time.

You have the right not to participate in any aspect of the study.

**Potential Benefits:**

Through enrollment in the courses that are being assessed, you will learn the positive effects that exercise has on both physical and mental health, and how you can continue these practices throughout your lifetime to ensure optimal health.

The interview will give you an opportunity to share your experiences throughout taking the course and have a guided discussion on what you felt was meaningful to you and your health.

**Potential Risk or Discomforts:**

When asking individuals about their mental health, it may trigger an unpleasant personal response or you may be concerned about being stigmatized. We want to assure you that confidentiality will be maintained. The principal investigator for this study is a mental health clinician who will ensure a safe, non-judgemental and unbiased environment that will be accepting of all responses that are provided.

If you realize at any time during the study or your time at Durham College, that you are experiencing any distress or emotional concerns, please do not hesitate to contact the Campus Health Centre to receive support; this information will be kept confidential and neither the principal investigator nor study supervisor will be aware of same. All students have 24/7 access to mental health support via Aspiria (905) 415-0500.

**Storage of Data:**

All data will be kept on a secure password protected UOIT network Google Drive account which the UOIT IT Department has assisted with. The Primary Investigator and the Faculty Supervisor will have sole access to the data; there will be no personal identification that is stored online. The signed consent forms will be kept in case there are any serious risks that have been identified which would merit professional intervention from the principal investigator. The consent forms will be kept in a locked filing cabinet in the secure office of the principal investigator at Durham College.

Please return all copies of the signed consent forms to Lindsey Thomas's office #S1178 if same were not submitted in class.

**Confidentiality:**

The principal investigator will not share any personal information that you provide. Your data will be coded and stored electronically without any personal identifiers. The interview will be documented via an audio recording of the conversation. Names will not be spoken during the recording time to maintain your anonymity. The principal investigator will be taking hand written notes throughout the discussion to highlight key topics and themes that may be identified. These notes will be kept in a locked filing cabinet in the principal investigator's office. The audio recording will be stored on a password protected Durham College laptop. Your professor will not know if you have or have not participated in the study until the end of the semester when your grades have already been calculated, this will not impact your academic standing in any other way.

If you do disclose to the PI through the questionnaires that you are in any imminent danger of harming yourself or anyone else, the above confidentiality agreement will have to be broken to ensure your personal safety and the safety of our community.

**Anonymity:**

The data will be de-identified; therefore it will be anonymous to the research team. Implementation of a Study ID will ensure that the anonymity of you is maintained and your identity will not be shared.

**Right to Withdraw:**

Your participation in this study is completely voluntary and will not affect your standing within this course. You are free to withdraw at any point in time. If you do not wish to take part in the study, you do not need to complete the consent form. If you wish to withdraw after giving informed consent but before submitting the questionnaire, you may do so by leaving the questionnaires blank or putting a line through responses. If you choose to withdraw by not completing the second administration of the questionnaires, the results from their first administration will be maintained to analyze participation bias and differences between responders and non-responders.

**Compensation for Participation:**

By agreeing to participate and completing both sets of questionnaires at the beginning and the end of the semester, you are eligible to receive an extra 2% added on to your final grade. For those who do not wish to participate in the study, you still have the opportunity for the bonus 2% by writing a 4 page paper discussing the benefits of physical activity on mental health. The paper must be of a sufficient standard; formatted, not plagiarized. Your professors will not know until the end of the course if you decide to include yourself in either choice offered, therefore you do not need to worry that it will affect their perception of you.

The extra credit summary will be maintained by the principal investigator and the results sent to the course instructor once all other marks have been calculated. You do not have to partake in either option.

**Secondary Use of Data**

The information collected from this research may be used for secondary analysis in the future.

No personal information will be attached to your responses.

**Debriefing and Dissemination of Results:**

If you desire to receive information regarding the results of this study, please contact the researchers at (905) 721-2000 Ext 5338 or by email at [lindsey.blakey@uoit.net](mailto:lindsey.blakey@uoit.net). Results from the study can be expected by May, 2017.

Results of the study will be shared with the Healthy Campus Task Force at Durham College, no personal identification or personal data will be shared with them.

**Participant Concerns and Reporting:**

This research study is part of a Master’s thesis project and has been approved by the University Of Ontario Institute Of Technology Research Ethics Board on September 21<sup>st</sup>, 2015.

If you have any questions concerning the research study, or experience any discomfort related to the study please contact the researcher(s) at 905 721-2000 Ext 5338 or by email at [lindsey.blakey@uoit.net](mailto:lindsey.blakey@uoit.net)

Any questions regarding your rights as a participant, complaints or adverse events may be addressed to Research Ethics Board through the Compliance Office (905) 721 8668 ext 3693.

Please return this form to Lindsey Thomas in office S1178 Simcoe Building, Durham College, or scan and email back to [lindsey.blakey@uoit.net](mailto:lindsey.blakey@uoit.net)

**Consent to Participate:**

I consent to take part in all aspects the study with the understanding I may withdraw at any time. I have received a copy of this consent form. I voluntarily consent to participate in this study.

_____	_____	_____
Participant’s Name (Please Print)	Participant’s Signature	Date

I confirm that I have explained the nature and purpose of the study to the participant named above. I have answered all questions.

_____	_____	_____
Name of Person Obtaining Consent	Signature	Date

## Appendix B: Consent form for Study Two



FACULTY OF HEALTH SCIENCES

ETHICS BOARD  
OFFICE OF RESEARCH  
SERVICES

**Title of Research Study:**

Baseline differences in college student mental health outcomes, coping, and stressors based upon course selection

**Researcher(s):**

Lindsey Thomas, RN, BScN, CPMHN(C), Bernadette Murphy, DC, PhD, Paul Yielder PhD

Faculty of Health Sciences

University of Ontario Institute of Technology

Contact number: (905) 721-2000 Ext 5338

Email: [lindsey.blakey@uoit.net](mailto:lindsey.blakey@uoit.net) ; [bernadette.murphy@uoit.ca](mailto:bernadette.murphy@uoit.ca);

[paul.yielder@uoit.ca](mailto:paul.yielder@uoit.ca)

If you have any questions about the study, please contact Lindsey Thomas at [lindsey.blakey@uoit.net](mailto:lindsey.blakey@uoit.net)

You are invited to participate in a research study at the University Of Ontario Institute Of Technology in the Faculty of Health Sciences. This study (REB File #15-014) has been reviewed by the University of Ontario Research Ethics Board and has been approved as of September 21<sup>st</sup>, 2015. Please read this form carefully, and feel free to ask any questions you might have before signing this form to ensure informed consent. If you have any questions about your rights as a participant in this study, please contact the Compliance Officer at 905 721 8668 ext 3693 or [compliance.uoit.ca](mailto:compliance.uoit.ca).

Before agreeing to participate in this study, it is important that you read and understand the following explanation of the proposed study procedures. The following information describes the purpose, procedures, benefits, and risks associated with this study. It also describes your right to refuse to participate or withdraw from the study at any time. In order to decide whether you wish to participate in this research study, you should understand enough about its risks and benefits to be able to make an informed decision; this is known as the informed consent process. Please read through this document carefully and ask the

principal investigator to explain anything that you don't understand before signing this consent form. Make sure all your questions have been answered to your satisfaction before signing this document.

**Purpose and Procedure:**

College can be a stressful time for students due to a variety of lifestyle and transitional factors. Durham College is looking at new ways in which we can best support your success while enhancing the entire student experience. The college has a number of courses designed to help students become aware of ways to enhance their physical and mental health.

We are looking at the effects on health outcomes of four courses that will be running in the fall of 2016. These courses will be assessed based on their differences in curriculum design and content.

You will be asked at the beginning of the semester to fill out four questionnaires and five short answer questions that will assess: your physical and mental health, your current amount of exercise, and your self-efficacy with respect to exercise. You will be asked to fill out the Barriers Self Efficacy Scale, the International Physical Activity Questionnaire, The 12 Item Short Form Health Assessment and the Depression, Anxiety, and Stress Scale.

By signing this consent form, you are agreeing to the terms as stated in the above document. You can withdraw your data from the study at any point in time by contacting Lindsey Thomas at [lindsey.blakey@uoit.net](mailto:lindsey.blakey@uoit.net).

**Time commitment:**

The questionnaires and short answer questions will be administered during your regularly scheduled class time and should take on average fifteen minutes to complete.

**Potential Benefits:**

The questionnaires and short answer questions will help to share your experiences throughout this course at Durham College. Your responses will provide quantitative and qualitative data on what you feel has been meaningful to you as well as your health to influence future college policies and decision making.

**Potential Risk or Discomforts:**

When asking individuals about their mental health, it may trigger an unpleasant personal response or you may be concerned about being stigmatized. We want to assure you that confidentiality will be maintained. The principal investigator for this study is a mental health clinician who will ensure a safe, non-judgemental and unbiased environment that will be accepting of all responses that are provided.

If you realize at any time during the study or your time at Durham College, that you are experiencing any distress or emotional concerns, please do not hesitate to contact the Campus Health Centre to receive support; this information will be kept confidential and neither the principal investigator nor study supervisor will be aware of same. All students have 24/7 access to mental health support via Aspiria (905) 415-0500.

**Storage of Data:**

The Primary Investigator and the Faculty Supervisor will have sole access to the data; there will be no personal identification that is stored online. The signed consent forms will be kept in case there are any serious risks that have been identified which would permit professional intervention from the principal investigator. The consent forms will be kept in a locked filing cabinet in the secure office of the principal investigator at Durham College.

**Confidentiality:**

The principal investigator will not share any personal information that you provide. Your professor will not know if you have or have not participated in the study, and will not be made aware of any responses that you may have provided, whether you choose to participate or not will have no impact on your academic standing

If you do disclose to the PI through the questionnaires that you are in any imminent danger of harming yourself or anyone else, the above confidentiality agreement will have to be broken to ensure your personal safety and the safety of our community.

**Anonymity:**

The data will be de-identified; therefore it will be anonymous to the research team outside of the principal investigator and research project supervisor. Your name will not be included in the data input process and is kept solely for safety purposes.

**Right to Withdraw:**

Your participation in this study is completely voluntary and will not affect your standing within this course. You are free to withdraw at any point in time. If you do not wish to take part in the study, you do not need to complete the consent form. If you wish to withdraw after giving informed consent but before submitting the questionnaire, you may do so by leaving the questionnaires or short answer questions blank.

**Secondary Use of Data**



The information collected from this research may be used for secondary analysis in the future.

No personal information will be attached to your responses.

**Debriefing and Dissemination of Results:**

If you desire to receive information regarding the results of this study, please contact the researchers at (905) 721-2000 Ext 5338 or by email at [lindsey.blakey@uoit.net](mailto:lindsey.blakey@uoit.net). Results from the study can be expected by April, 2017.

**Participant Concerns and Reporting:**

This research study is part of a Master's thesis project and has been approved by the University Of Ontario Institute Of Technology Research Ethics Board on September 21<sup>st</sup>, 2015.

If you have any questions concerning the research study, or experience any discomfort related to the study please contact the researcher(s) at 905 721-2000 Ext 5338 or by email at [lindsey.blakey@uoit.net](mailto:lindsey.blakey@uoit.net).

Any questions regarding your rights as a participant, complaints or adverse events may be addressed to Research Ethics Board through the Compliance Office (905) 721 8668 ext 3693.

**Consent to Participate:**

I consent to take part in the study with the understanding I may withdraw at any time. I voluntarily consent to participate in this study.

\_\_\_\_\_

Participant's Name (Please Print)	Participant's Signature	Date
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I confirm that I have explained the nature and purpose of the study to the participant named above. I have answered all questions.

\_\_\_\_\_

Name of Person Obtaining Consent	Signature	Date
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## Appendix C: Depression Anxiety and Stress Scale -21

# DASS21

Name:

Date:

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

- 0 Did not apply to me at all
- 1 Applied to me to some degree, or some of the time
- 2 Applied to me to a considerable degree or a good part of time
- 3 Applied to me very much or most of the time

1 (s)	I found it hard to wind down	0	1	2	3
2 (a)	I was aware of dryness of my mouth	0	1	2	3
3 (d)	I couldn't seem to experience any positive feeling at all	0	1	2	3
4 (a)	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5 (d)	I found it difficult to work up the initiative to do things	0	1	2	3
6 (s)	I tended to over-react to situations	0	1	2	3
7 (a)	I experienced trembling (e.g. in the hands)	0	1	2	3
8 (s)	I felt that I was using a lot of nervous energy	0	1	2	3
9 (a)	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10 (d)	I felt that I had nothing to look forward to	0	1	2	3
11 (s)	I found myself getting agitated	0	1	2	3

12 (s)	I found it difficult to relax	0	1	2	3
13 (d)	I felt down-hearted and blue	0	1	2	3
14 (s)	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15 (a)	I felt I was close to panic	0	1	2	3
16 (d)	I was unable to become enthusiastic about anything	0	1	2	3
17 (d)	I felt I wasn't worth much as a person	0	1	2	3
18 (s)	I felt that I was rather touchy	0	1	2	3
19 (a)	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20 (a)	I felt scared without any good reason	0	1	2	3
21 (d)	I felt that life was meaningless	0	1	2	3

## Appendix D: International Physical Activity Questionnaire

### INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

\_\_\_\_\_ **days per week**

No vigorous physical activities → **Skip to question 3**

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or double tennis? Do not include walking.

\_\_\_\_\_ **days per week**

No moderate physical activities → ***Skip to question 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

\_\_\_\_\_ **days per week**

No walking → **Skip to question 7**

6. How much time did you usually spend **walking** on one of those days?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

\_\_\_\_\_ **hours per day**

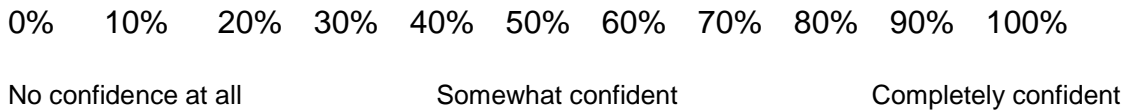
\_\_\_\_\_ **minutes per day**

Don't know/Not sure

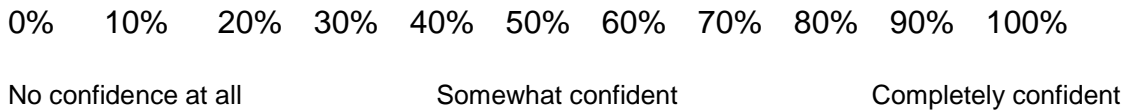
**This is the end of the questionnaire, thank you for participating.**



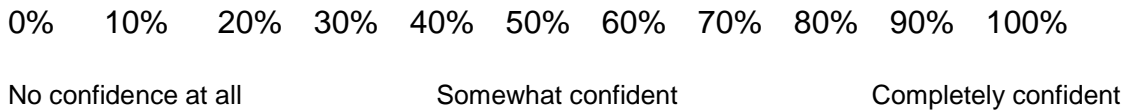
- I was on vacation.



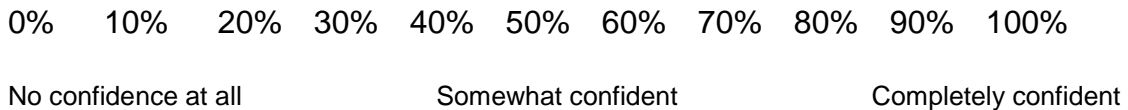
- I felt pain or discomfort when exercising.



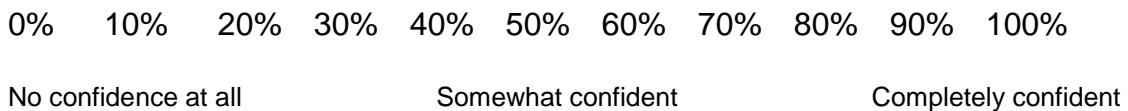
- I had to exercise alone.



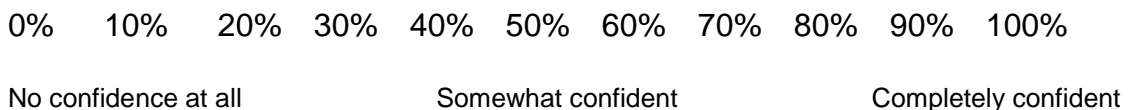
- Exercise was not enjoyable or fun.



- It became difficult to get to the exercise location.



- I didn't like the particular activity program that I was involved in.





- My work schedule conflicted with my exercise session.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

No confidence at all                      Somewhat confident                      Completely confident

- I felt self-conscious about my appearance when I exercised.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

No confidence at all                      Somewhat confident                      Completely confident

- The instructor did not offer me any encouragement.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

No confidence at all                      Somewhat confident                      Completely confident

- I was under personal stress of some kind.

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

No confidence at all                      Somewhat confident                      Completely confident

## Appendix F: Short Form 12 Health Survey

### SF-12® Patient Questionnaire

This information will help your doctors keep track of how you feel and how well you are able to do your usual activities. Answer every question by placing a check mark on the line in front of the appropriate answer. It is not specific for arthritis. If you are unsure about how to answer a question, please give the best answer you can and make a written comment beside your answer.

1. In general, would you say your health is:

- Excellent (1)
- Very Good (2)
- Good (3)
- Fair (4)
- Poor (5)

The following two questions are about activities you might do during a typical day. Does YOUR HEALTH NOW LIMIT YOU in these activities? If so, how much?

2. MODERATE ACTIVITIES, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf:

- Yes, Limited A Lot (1)
- Yes, Limited A Little (2)
- No, Not Limited At All (3)

3. Climbing SEVERAL flights of stairs:

- Yes, Limited A Lot (1)
- Yes, Limited A Little (2)
- No, Not Limited At All (3)

During the PAST 4 WEEKS have you had any of the following problems with your work or other regular activities AS A RESULT OF YOUR PHYSICAL HEALTH?

4. ACCOMPLISHED LESS than you would like:

\_\_\_\_\_ Yes (1)  
\_\_\_\_\_ No (2)

5. Were limited in the KIND of work or other activities:

\_\_\_\_\_ Yes (1)  
\_\_\_\_\_ No (2)

During the PAST 4 WEEKS, were you limited in the kind of work you do or other regular activities ASA RESULT OF ANY EMOTIONAL PROBLEMS (such as feeling depressed or anxious)?

6. ACCOMPLISHED LESS than you would like:

\_\_\_\_\_ Yes (1)  
\_\_\_\_\_ No (2)

7. Didn't do work or other activities as CAREFULLY as usual:

\_\_\_\_\_ Yes (1)  
\_\_\_\_\_ No (2)

8. During the PAST 4 WEEKS, how much did PAIN interfere with your normal work (including both work outside the home and housework)?

\_\_\_\_\_ Not At All (1)  
\_\_\_\_\_ A Little Bit (2)  
\_\_\_\_\_ Moderately (3)  
\_\_\_\_\_ Quite A Bit (4)  
\_\_\_\_\_ Extremely (5)

The next three questions are about how you feel and how things have been DURING THE PAST 4 WEEKS. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the PAST 4 WEEKS

9. Have you felt calm and peaceful?  
\_\_\_\_\_ All of the Time (1)  
\_\_\_\_\_ Most of the Time (2)  
\_\_\_\_\_ A Good Bit of the Time (3)  
\_\_\_\_\_ Some of the Time (4)  
\_\_\_\_\_ A Little of the Time (5)  
\_\_\_\_\_ None of the Time (6)

10. Did you have a lot of energy?  
\_\_\_\_\_ All of the Time (1)  
\_\_\_\_\_ Most of the Time (2)  
\_\_\_\_\_ A Good Bit of the Time (3)  
\_\_\_\_\_ Some of the Time (4)  
\_\_\_\_\_ A Little of the Time (5)  
\_\_\_\_\_ None of the Time (6)

11. Have you felt downhearted and blue?  
\_\_\_\_\_ All of the Time (1)  
\_\_\_\_\_ Most of the Time (2)  
\_\_\_\_\_ A Good Bit of the Time (3)  
\_\_\_\_\_ Some of the Time (4)  
\_\_\_\_\_ A Little of the Time (5)  
\_\_\_\_\_ None of the Time (6)

12. During the PAST 4 WEEKS, how much of the time has your  
PHYSICAL HEALTH OREMOTIONAL PROBLEMS interfered with  
your social activities (like visiting with friends, relatives, etc.)?  
\_\_\_\_\_ All of the Time (1)  
\_\_\_\_\_ Most of the Time (2)  
\_\_\_\_\_ A Good Bit of the Time (3)  
\_\_\_\_\_ Some of the Time (4)  
\_\_\_\_\_ A Little of the Time (5)  
\_\_\_\_\_ None of the Time (6)