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INVESTIGATING THE EFFECTIVENESS OF A SIX-WEEK EXERCISE PROGRAM FOR
MENTAL HEALTH OUTCOMES AMONG UNIVERSITY STUDENTS

by

Kieran G. Hawksley

A Thesis

Submitted to the Faculty of Graduate Studies
through the Faculty of Human Kinetics
in Partial Fulfillment of the Requirements for
the Degree of Master of Human Kinetics at the
University of Windsor

Windsor, Ontario, Canada

2019

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Investigating the Effectiveness of a Six-Week Exercise Program for Mental Health Outcomes

Among University Students

by

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April 15th, 2019

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ABSTRACT

The purpose of this study was to examine the influence of a six-week exercise program on university students' mental health outcomes. The participants included 10 individuals enrolled at a Canadian university, representative of a range of educational programs (e.g., education, engineering, science) and varying year of study (first year to graduate studies). Using the Mental Health Inventory-38 (MHI-38) as a measure of Psychological Distress, Psychological Well-Being, and overall mental health (Mental Health Index), paired samples t test demonstrated a nonsignificant change in the Mental Health Index scores, $t(9) = 0.75, p > .05$ and Psychological Well-Being, $t(9) = -0.55, p > .05$ from pre to post intervention. Due to violations of normality, a Wilcoxon Signed Rank test was used to assess the median scores of Psychological Distress at two time points resulting in a nonsignificant decrease in Psychological Distress $z(9) = -1.23, p > .05$. Due to a small sample size, low statistical power may have decreased the chances of finding a true effect if in fact present. The length of the program (six weeks), subjective reporting of completion of additional physical activity and intensity, and the time frame in which the program took place may have been factors that lead to the nonsignificant findings. Future researchers should test the effects of longer exercise programs, with a bigger sample, and at varying periods within an academic schedule. Despite the nonsignificant improvements in students' mental health, it is important to note that their health did not significantly decline over the course of the intervention.

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RESEARCH ARTICLE

Introduction

Adults across the nation are struggling with mental health issues (Government of Canada, 2016) including young adults transitioning into post-secondary education (Ibrahim, Kelly, Adams, & Glazebrook, 2013). In fact, up to 36% of post-secondary students report symptoms of at least one mental illness (Sontag-Padilla et al., 2018), and in a 12-month period 18.4% and 14.7% of Canadian students receive treatment for anxiety and depression, respectively (American College Health Association [ACHA], 2016).

Mental health is a state of well-being in which an individual is able to realize his or her own potential, deal with normal stressors, work productively, and contribute to society (World Health Organization [WHO], 2014). As illustrated previously, this high prevalence of mental illness negatively affects young adults' opportunities to be mentally healthy, which threatens future fruitful societal development. Mental disorders or illnesses are disturbances in cognitions, emotion regulation, and behaviors that can lead to dysfunction in mental functioning (American Psychiatric Association [APA], 2013). Anxiety and depression are two of the most commonly faced mental issues among post-secondary students (Huang, Nigatu, Smail-Crevier, Zhang, & Wang, 2018; Ibrahim et al., 2013), and both of which negatively influence the mood and feelings of individuals to a higher degree and consistency than everyday sadness, stress, and fear (WHO, 2017). Anxiety disorders are characterized by excessive fear or stress that persists beyond regular stressors of life and are often persistent for six months or more (APA, 2013). Depressive disorders are feelings of sadness, emptiness, and irritability that are accompanied by cognitive and somatic changes that negatively influence one's ability to function in social, occupational, or domestic endeavors (APA, 2013). These mental illnesses threaten a student's ability to thrive

academically (Hysenbegasi, Hass, & Rowland, 2005), hold positive relationships (Whitton & Whisman, 2010), and achieve occupational success (Harvey et al., 2011).

Mental health was once exclusively thought of as the absence of mental illness (Antaramian, Huebner, Hills, & Valois, 2010). It is now recognized that well-being is also a component of mental health, which includes positive affect (e.g., joy and excitement), positive appraisal of one's own quality of life, and few negative emotions (Antaramian et al., 2010). Well-being is crucial in the mental health of post-secondary students and is often threatened due to changes in lifestyle (Ibrahim et al., 2013)

The high prevalence of post-secondary students experiencing mental health issues (ACHA, 2016; Sontag-Padilla et al., 2018) has led to increased demand in campus mental health services. Across post-secondary institutions in the United States, there was recently a 28% spike in resources devoted to counselling services over six years (Center for Collegiate Mental Health, 2016). Canadian universities are facing similar increases in the demand for services (Council of Ontario Universities, 2017) and often have to refer students to external agencies such as local and private clinicians (Samson, 2014). Young adults transitioning to post-secondary education face many changes and adversities such as missing home, lack of support, lack of sleep, poor nutrition, and academic and financial stressors that contribute to their heightened risk of mental illness (Ibrahim et al., 2013). Graduate students, who face their own set of stressors, also demonstrate high rates of mental illness. In a survey of over 2,000 graduate students, 39% reported moderate to severe depression scores (Evans, Bira, Gastelum, Weiss, & Vandford, 2018).

The high rates and detrimental effects of mental illness among post-secondary students, as well as the addition of increasing demands of campus mental health services, indicate a crisis.

Despite psychotherapy and pharmacology being used in the successful treatment of anxiety and depression (Huang et al., 2018), the availability of a broad range of services for the protection and treatment of mental health issues for students is critical across post-secondary education campuses (Conley, Durlak, & Dickson, 2013; Fenton, White, Hamilton-Hinch, & Gilbert, 2018). Physical activity is an evidence based alternative therapy, effective in both the prevention and treatment of mental illness (Harvey et al., 2018; Martinsen, 2008; Rosenbaum, Tiedemann, Sherrington, Curtis, & Ward, 2014; Stubbs et al., 2017) and is now recommended as front and second-line treatments in moderate to severe depression (Malhi et al., 2015; Ravindran et al., 2009). Physical activity is any bodily movement by skeletal muscle that results in energy expenditure (Caspersen, Powell, & Christenson, 1985). Physical activity has an inverse relationship with depression (Mammen & Faulkner, 2013) and is considered a useful tool in treating anxiety (Stubbs et al., 2017). Moreover, physical activity is correlated with mental health, such that a lack of physical activity among adults is correlated with an 83% increased risk of developing depression (Paulo et al., 2016). The benefits of physical activity on mental health have been highlighted in numerous reviews and meta-analyses (Mikkelsen, Stojanovska, Polenakovic, Bosevski, & Apostolopoulos, 2017; Rosenbaum et al., 2014; Schuch et al., 2016; Stubbs et al., 2017). In a meta-analysis of physical activity interventions for adults with a mental illness (Rosenbaum et al., 2014), which included aerobic exercise, resistance training, group-based exercise, walking, dance therapy, tai chi, exercise counselling, and yoga, a significant effect on depression was found with a large effect size (.84).

Exercise, a subset of physical activity, is defined as any regular and planned activity that has a final or intermediate goal of improving fitness (Caspersen et al., 1985). Different types of exercise that fall under the broader category of physical activity have been shown to improve

mental health including aquatic exercise (Da et al., 2018), aerobic exercise, (Gaudlitz, Plag, Dimeo, & Ströhle, 2015; Toups et al., 2017), and resistance training (Gordon, McDowell, Lyons, & Herring, 2017; Rosenbaum et al., 2014). More specifically, in a meta-analysis investigating exercise interventions for adults with diagnosed depression, Schuch et al. (2016) concluded that exercise had a moderate effect on enhanced psychological quality of life (medium effect size of .53). Moreover, in his editorial for the *American Journal of Psychiatry*, Simon (2017) concluded that exercise is a “...safe and moderately effective broad-spectrum antidepressant prescription...” (p. 1). Additionally, in a meta-analysis investigating the anxiolytic effects of exercise for adults with anxiety or a stress related disorder, exercise significantly decreased anxiety symptoms with a medium effect size (-.58; Stubbs et al., 2017).

Notwithstanding the benefits of exercise on mental health highlighted above, young adulthood and the transition into post-secondary education is often associated with a decrease of physical activity, and subsequently exercise (Bray & Born, 2004; Han et al., 2008; Kwan, Cairney, Faulkner, & Pullenayegum 2012). In a study of Canadian undergraduate students, 44% of students met physical activity guidelines (150 minutes of moderate to vigorous physical activity per week; Canadian Society for Exercise Physiology, 2018), in comparison to the same cohort a year prior, 66% of whom met national physical activity guidelines while in high school (Bray & Born, 2004). Additionally, this decline in physical activity participation may worsen with age and years spent in post-secondary education. In a review of physical activity, exercise, and sedentary behaviour of post-secondary students, researchers found that older students spent more time sedentary than did the younger students (Buckworth & Nigg, 2004). Moreover, younger students spent more time participating in vigorous exercise and stretching (Buckworth & Nigg, 2004).

Despite the known benefits of physical activity and, in particular, exercise on mental health and overall well-being, exercise interventions for the purposes of improving mental health are rare across post-secondary campuses (Fenton et al., 2018; Huang et al., 2018). In a meta-analysis of interventions implemented for mental health issues among university students, a small percentage were exercise based (Huang et al., 2018). Specifically, only one exercise protocol (Smits et al., 2008) was included in this review. In it, the researchers found that a two-week program with three 20-minute sessions per week at 70% of the participant's maximal heart rate resulted in significant decreases in anxiety and depression among students (with a large effect size of 2.15; Smits et al., 2008). Despite the low prevalence, when compared to other interventions included in the review, exercise along with art and peer support interventions showed the highest efficacy for treating depression and anxiety (Huang et al., 2018). In another review of 21 recreational programs implemented in post-secondary institutions to mitigate the development of mental health issues, only one was exclusively exercise-based. Specifically, Demers (2013) reported that 150 minutes of self-supervised moderate aerobic exercise per week resulted in significant decreases in anxiety and depression among post-secondary students. Although exercise interventions are rare, the positive benefits among post-secondary students suggest a need to further this area of research and investigate the effects of a campus wide exercise intervention on university students' mental health.

The purpose of the present study was to investigate the effects of exercise on mental illness and well-being in university students referred to the program by campus counselling services. Prescribed and supervised exercise is recommended and often associated with positive mental health benefits and higher levels of exercise adherence than self-supervised exercise (Stanton & Reaburn, 2014; Stubbs et al., 2017). Fitness trainers and exercise specialists provide

the technical information necessary to succeed, serve as a motivator to the client (Maguire, 2001), and provide social support (Barefield & McCallister, 1997), all of which can positively impact a participant's experience with exercise. Social support is critical as it is a main predictor of university student's participation in physical activity (Scarapicchia, Sabiston, Pila, Arbour-Nicitopoulos, & Faulkner, 2017). The current study assessed the effects of the UWorkitOut UWin program at the University of Windsor; a six-week one-on-one exercise program with a student trainer. The student counselling center (SCC) at the University of Windsor has experienced a surge in students seeking assistance, which is consistent with the demands faced by most post-secondary campuses (Center for Collegiate Mental Health, 2016; Council of Ontario Universities, 2017). The high prevalence of students seeking counselling has resulted in long wait periods before a student is able to meet with a counsellor. The UWorkitOut UWin program is a free program, devoted to enhancing mental health among post-secondary students. The UWorkitOut UWin program includes supervised and prescribed exercise for six weeks, including two sessions with a student trainer per week of 45-50 minutes implementing a variety of exercise types (resistance training, cardiovascular, and flexibility). The program also includes an additional 60 minutes of unsupervised exercise, totaling 150 minutes per week of exercise. Positive effects on mental health through exercise have been demonstrated in interventions lasting as few as five weeks (Rosenbaum et al., 2014; Tkachuk & Martin, 1999), as well as through consistent exercise of 20-60 minutes, three to five days per week (Chekroud et al., 2018; Rosenbaum et al., 2014). Although aerobic exercise is more commonly prescribed, especially for anxiety (Stubbs et al., 2017), many types of exercise (e.g., resistance training, mindful exercise, flexibility training) are associated with a decline in mental illness symptoms (Chekroud et al., 2018; Mikkelsen et al., 2017).

Drawing on the dual factor model of mental health, which posits that mental health is an integration of the inter-related yet separate constructs of mental illness and well-being (Greenspoon & Saklofske, 2001), the current study aimed to assess the influence of supervised exercise on both constructs. Researchers of the dual factor model (Greenspoon & Saklofske, 2001) suggest that an increase in mental illness does not inevitably lead to a decrease in well-being, or alternatively an increase in well-being does not inherently lead to a decrease in mental illness. The two constructs being viewed as inter-related, yet distinct, highlight the dynamic and complicated nature of mental health and illness. The Mental Health Inventory-38 (MHI-38) utilizes 38 standardized items to measure Psychological Distress and Psychological Well-Being in general populations, including positive and negative items which address both distinct dimensions of mental health (Veit & Ware, 1983). It was hypothesized that participants would report an increase on the overall mental health score (Mental Health Index) after the completion of the exercise program. Additionally, it was hypothesized that there would be an increase in the global scale of Psychological Well-Being, and a decrease in the other global scale of Psychological Distress post-exercise.

Method

Participants

Participants included 10 “low risk” (see definition below) students enrolled in an exercise intervention program (UWorkItOut UWin) at a Canadian university during the Fall semester of 2017. Participants included both male ($n = 3$) and female ($n = 7$) students with an average age of 26.6 ($SD = 8.63$) years. Participants self-reported as Caucasian ($n = 5$), Arab ($n = 2$), South-Asian ($n = 1$), African-Canadian ($n = 1$), and other ($n = 1$). Participants were full time students at various stages in their academic careers (1st year to graduate) and from a variety of academic

programs (e.g., engineering, science, education, business). There was no participant dropout at any point during the program.

Procedure

Recruitment. Given the students had already completed the exercise program and therefore ethics clearance was granted to run the program, secondary data were used. To enroll in the program, participants were recruited through the University of Windsor's SCC. Counsellors at the SCC referred low risk students to the exercise program. The SCC defines low risk as those who are struggling with symptoms of anxiety and depression but seeing minimal impact on their day-to-day function. Although these individuals are able to participate in everyday activities such as attending classes and going to work, they experience symptoms that are upsetting/distressing and that negatively impact their quality of life. These individuals do not present any suicidal ideation or intent and are seeking to improve their mood and want to reach optimal functioning. For these reasons, SCC counsellors referred low risk students to participate in the exercise program while they were waiting for consistent access to counselling services.

The counsellors at the SCC provided eligible students (currently sedentary, low risk) information regarding the program. Students who indicated interest were then asked permission for a researcher from the UWorkItOut UWin program to contact the student (via phone or email) with more program information. Once contacted, the participant and researcher arranged a time to meet at which point the researcher sought consent of the participant. In this initial meeting, the participants also completed an online self-report questionnaire package including personal demographics (age, gender, education, employment, living arrangements, alcohol and drug use, medical diagnosis; see Appendix A for personal demographics) most of which are not reported in the current study due to privacy. Participants also completed the Physical Activity Readiness

Questionnaire (see Appendix B for PAR-Q; Canadian Society for Exercise Physiology, 2002), which measures an individual's readiness to participate in physical activity through a series of "yes" or "no" questions pertaining to the individual's current health state. All participants answered "no" to all of the questions in the PAR-Q, thus allowing them clearance to exercise (Canadian Society for Exercise Physiology, 2002). Lastly, the participants completed all pre-intervention measurements (described in the *measurement* section) online, during their initial meeting with the researcher. The small number of participants ($N = 10$) were recruited due to a limited amount of private training space available and access to student trainers.

Program. Upon completion of the PAR-Q, participants took part in two supervised exercise sessions per week for six weeks with a qualified student trainer in a private exercise room within a public fitness facility on campus. Student trainers were upper year students enrolled at the University of Windsor. All student trainers had prior experience training others and/or certifications (e.g., Canfitpro). All student trainers attended a workshop held by the UWorkItOut UWin research team, reviewing proper exercise technique, coaching/mentoring, communication, as well as signs and symptoms of mental distress and how to properly assist a student in need. Participants were able to request the preferred gender of their trainer. Additionally, the lead investigator for this study did act as a student trainer for one ($n = 1$) participant in the program. The exercise sessions lasted 45-50 minutes and included light cardiovascular fitness training (e.g., stationary bicycle), weight lifting (e.g., machines, dumbbell, kettle-bell), body weight resistance training (e.g., plank), and flexibility training (e.g., hamstring stretch). In order to remain in the program, the participants were required to exercise 60 additional minutes per week without any supervision in order to reach the Canadian guidelines of 150 minutes of moderate to vigorous physical activity (Canadian Society for Exercise

Physiology, 2018). Participants were required to track additional exercise using a self-report measure assessing the type, intensity, and duration of exercise (see Appendix C for Self-Report Physical Activity Measure). Participants rated their perceived level of exertion after each supervised and individual session, using Borg's Rate of Perceived Exhaustion scale, which measures an individual's exertion from 1 (*nothing at all*) to 10 (*very, very strong*; Borg, 1982; see Appendix D for the Borg Scale). Each participant completed 18 exercise sessions (roughly 900 minutes) in six weeks; progress was tracked by the student trainer through their recording of repetitions, weight, and in some cases time (e.g., plank hold) through the TeamBuildr™ app.

Measurement

Given the current study is part of a larger scale study in which participants completed a battery of measures (e.g., International Physical Activity Questionnaire, Craig et al., 2003; Quality of Life Enjoyment and Satisfaction Questionnaire, Endicott, Nee, Harrison, & Blumenthal, 1993; Feelings Scale, Hardy & Rejeski, 1989), the Mental Health Inventory-38 (MHI-38; Veit & Ware, 1983) is the only inventory used in the current and therefore was the focus for the current research.

Participants completed the MHI-38 prior to as well as after the completion of the six-week exercise intervention (see Appendix E for MHI-38). The MHI-38 is a standardized 38 item Likert-type self-report measure that assesses mental health within the last month. Researchers can use the scores from one overall scale (Mental Health Index), two global scales (Psychological Distress and Psychological Well-Being), and/or six subscales (Veit & Ware, 1983). The MHI-38 includes positive and negative items in order to assess both well-being and psychopathology (Veit & Ware, 1983). All items, save for items 9 and 28 from Appendix E (scored from 1-5), measure an individual's reported frequency or intensity of a component of

mental health scored on a six-point scale ranging from 1-6. An example item measuring depression is, “Did you feel depressed during the past month?”, where a 1 equals “*Yes, to the point I did not care about anything for days at a time*” and 6 equals “*No, never felt depressed at all*”. The six subscales are: (a) Anxiety (9 items), sum of scores ranging from 9-54 with higher scores reflective of greater anxiety; (b) Depression (4 items), sum of scores ranging from 4-23 with higher scores reflective of greater depression; (c) Loss of Behavioral/Emotional Control (9 items), sum of scores ranging from 9-53 with higher scores reflective of greater loss of behavioral control; (d) General Positive Affect (10 items), sum of scores ranging from 10-60, with higher scores reflective of greater positive affect; (e) Emotional Ties (2 items), sum of scores ranging from 2-12, with higher scores reflective of stronger emotional ties; and (f) Life Satisfaction (1 item), sum of scores ranging from 1-6 with higher scores reflective of greater life satisfaction (Davies, Sherbourne, Peterson, & Ware, 1988; Veit & Ware, 1983).

The two global scales which were used in the current study, include: (a) Psychological Distress, sum of scores ranging from 24-142, with higher scores reflective of greater psychological distress (b) Psychological Well-Being, sum of scores ranging from 14-84, with higher scores reflective of greater psychological well-being. The global scale of Psychological Distress includes the following three subscales: Anxiety, Depression, and Loss of Behavioral/Emotional Control. While the global scale of Psychological Well-Being includes the following three subscales: General Positive Affect, Emotional Ties, and Life Satisfaction. The two global scales, Psychological Distress and Psychological Well-Being, have shown strong internal consistencies of .94 and .92, respectively (Veit & Ware, 1983) and are commonly used to measure mental health outcomes (Al Mutair et al., 2018; Heubeck & Neill, 2000; Ostroff, Woolverton, Berry, & Lesko, 1996; Veit & Ware, 1983).

The overall scale (i.e., Mental Health Index) was also used in the current study. The sum of the overall scale scores range from 38-226, with higher scores reflective of greater psychological well-being experienced with relatively less psychological distress. The Mental Health Index consists of the combination of both global scales and as such each of the six subscales, measured through all 38 items of the MHI-38. There is support for using the Mental Health Index to measure mental health outcomes (Canetti, Bachar, & Bonne, 2016; Moxham et al., 2018; Veit & Ware, 1983) and has shown good construct and external validity (Al Mutair et al., 2018; Heubeck & Neill, 2000; Liang, Wu, Krause, Chiang, & Wu, 1992; Manne & Schnoll, 2001; Veit & Ware, 1983).

Data Analysis

Prior to the start of data analysis, approval was obtained from the University of Windsor's Research Ethics Board for use of secondary data. The data were tested for normal distribution, specifically skewness and kurtosis, missing values, and outliers. To determine whether the exercise intervention had an effect on the mental health outcomes of students (MHI-38), one tailed paired-samples *t* tests were conducted on the two global scales as well as the Mental Health Index; an upper tail test was conducted for the overall scale as well as for the global scale of Psychological Well-Being, a lower tail test was conducted for the global scale of Psychological Distress. The paired-samples *t* tests compared the sample of participants at two time points, pre- and post- exercise intervention on their mean scores on the MHI-38 (Mental Health Index and global scales). A positive *t*-value indicates that the intervention played a beneficial role in enhancing overall mental health (Mental Health Index) and Psychological Well-Being, whereas a negative *t* value indicates the opposite effect. Alternatively, a negative *t* value indicates that the intervention played a beneficial role in improving (i.e., decrease) the

mental health outcome of Psychological Distress, a positive t value would represent a worsening (i.e., increase) in Psychological Distress. A result of $p < .05$ indicates the exercise intervention had a statistically significant effect on participants' mental health outcomes.

Results

Means and standard deviations were calculated for the two global scales and one overall score of mental health at baseline as well as post-intervention. See Table 1 for means and standard deviations. Additionally, Pearson correlations were run for each scale to assess the strength and direction of the relationships. See Table 2 for a summary of the relationships.

Mental Health Index

The Mental Health Index, consisting of 38 items, had a Cronbach's alpha of .96. A one-tailed paired-samples t test was used to determine whether there was a statistically significant change in the Mental Health Index scores of participants' pre- and post- six-week exercise intervention. There were no significant outliers in the data, as assessed by inspection of a boxplot for values greater than 1.5 box-lengths from the edge of the box. The Mental Health Index scores were normally distributed as assessed by Shapiro-Wilk's test for both baseline ($p = .06$) and post-intervention ($p = .41$). There was no statistically significant change in mental health between the pre-intervention measures (133.90 ± 30.32) and the post-intervention measures (141.90 ± 26.65). There was a nonstatistically significant mean increase of 8.00 (90% CI, -11.54 to 27.54) $t(9) = .75, p > .05$ with a small effect size ($d = .17$). See Table 3 for a review of the paired samples t tests.

Psychological Distress

The global scale of Psychological Distress, consisting of 24 items, had a Cronbach's alpha of .91. Upon inspection of a box-plot of the baseline data, two outliers were detected that

were more than 1.5 box-lengths from the edge of the box. The assumption of normality was violated as assessed by Shapiro-Wilk's test ($p = .02$). Given the data for Psychological Distress included outliers and violated assumptions of normality, a Wilcoxon Signed-Rank test (nonparametric) was utilized. The differences of scores were approximately symmetrical, as assessed by a histogram. The exercise intervention elicited decreases in Psychological Distress in seven participants compared to three participants who experienced an increase. The median decrease in Psychological Distress (-10.00) from pre-intervention (75.50) and post-intervention Psychological Distress scores (68.00), $z = -1.23$, was not statistically significant ($p > .05$) with a moderate effect size ($r = -.39$).

Psychological Well-Being

The global scale of Psychological Well-Being, consisting of 14 items, had a Cronbach's alpha of .95. To determine the effects of the exercise intervention on Psychological Well-Being scores, a one tailed paired-samples t test was conducted. No significant outliers were present in the data, as assessed by inspection of a boxplot. The Psychological Well-Being Scores were normally distributed for both baseline ($p = .28$) and post-intervention ($p = .22$), as assessed by Shapiro-Wilk's test of normality. No statistically significant changes were demonstrated between the pre-intervention (49.70 ± 15.19) and the post-intervention (47.30 ± 13.60) measures of Psychological Well-Being scores. There was a nonstatistically significant mean change of -2.40 (90% CI, -10.35 to 5.55) $t(9) = -.55$, $p > .05$ with a moderate effect size ($d = .54$). See Table 3 for review of paired samples t test.

Discussion

The current study assessed the effectiveness of a six-week exercise intervention on post-secondary students' overall mental health, as well as the inter-related constructs of Psychological

Distress and Psychological Well-Being. It was hypothesized that upon completion of the six-week exercise intervention, participants would report lower Psychological Distress than at baseline. Additionally, it was hypothesized that they would report higher Psychological Well-Being, and overall mental health (as measured by the Mental Health Index). The results did not support this hypothesis. Paired-samples *t* tests and a Wilcoxon Signed Rank test indicated that there was no statistically significant difference in the two global scales of Psychological Distress and Psychological Well-Being, as well as the overall mental health score (Mental Health Index) from pre- to post-intervention. These results are contradictory to the consistent findings that exercise positively influences mental health, distress, and well-being among a host of populations (Chekroud et al., 2018; Stubbs et al., 2017) including post-secondary students (Demers, 2013; Smits et al., 2008). Despite the nonsignificant findings, there are several factors that must be considered when interpreting the results of the current study.

The MHI-38, which was used to measure mental health outcomes, was designed as an assessment tool rather than a diagnostic tool and therefore has no cutoff score to diagnose someone as “mentally healthy” or “unhealthy” (Australian Mental Health Outcomes and Classifications Network, n.d.; Veit & Ware, 1983). As such, it is important to compare the current baseline scores of the two global scales and one overall index to normative data. Veit and Ware (1983) originally tested the MHI-38 for its use among general populations, sampling from six different states in the United States. In their assessment of the general population, the mean scores were as follows: 177.56 ($SD = 25.46$) for the Mental Health Index; 59.16 ($SD = 12.16$) for Psychological Well-Being; and 47.54 ($SD = 15.39$) for Psychological Distress (Veit & Ware, 1983). The current study’s baselines scores for both global scales and the overall index do not align with those of a general population described in Veit and Ware’s study. These differences

suggest that the participants in the current study had poorer overall mental health, higher psychological distress and lower well-being when compared to a general population. However, these normative data are dated and may not have direct applicability to the mental health of today's society.

Over a decade later than Veit and Ware, Ostroff et al. (1996) assessed the MHI-38 among a normative adolescent population. The means for females between 17 and 19 years of age were as follows: 168.13 ($SD = 27.94$) for the Mental Health Index; 64.82 ($SD = 14.54$) for Psychological Well-Being; and 39.52 ($SD = 13.90$) for Psychological Distress. When compared to the sample from the current study, the current participants had lower overall mental health and well-being, and higher psychological distress. However, these normative adolescent population data are also dated.

More recently, Moxham et al. (2018) utilized the MHI-38 as an assessment tool for a general sample of nursing students across five campuses in Australia. The scores for this population were as follows: 155.44 ($SD = 28.60$) for the Mental Health Index; 51.42 ($SD = 12.07$) for Psychological Well-Being; and 64.98 ($SD = 18.76$) for Psychological Distress. Although their study represents a specific sample of university students from another country, their scores can be considered moderately representative of the mental health of the participants in the current study. The current participants' baseline mean scores of the Mental Health Index and Psychological Distress scale (see Table 1) do not closely align with those scores from Moxham et al.'s study. The differences between these samples suggest that at baseline, the participants in the current study had poorer overall mental health and higher psychological distress relative to the normative data. Although the scores of Psychological Well-Being for the participants in the current study are poorer than those in the Moxham et al. study, the differences

are not quite as dramatic. Taken together, these deviations rule out any ceiling (Mental Health Index, Psychological Well-Being) or floor effects (Psychological Distress) that may suggest the participants were already mentally healthy and free of significant distress, thus not able to experience significant changes. As such, it is important to delve deeper into why the participants in the current study did not experience any significant effects from the exercise program.

The dual factor model of mental health states that mental health is comprised of two distinct yet related constructs: well-being and mental illness (Greenspoon & Saklofske, 2001). With consideration to this model, the participants in the current study had scores similar to the general population for Psychological Well-Being yet higher scores for Psychological Distress: a measure of mental illness, which is possibly contributing to low Mental Health Index scores at baseline. The high presence of distress at baseline, compared to the scores of Psychological Well-Being that more closely align to scores of normative samples (especially those of the post-secondary population represented in the Moxham et al. (2018) study) may suggest that psychological distress plays more of an influential role in determining overall mental health than does psychological well-being for these post-secondary students. It is now recognized that one may experience high rates of psychopathology (e.g., distress, depression, anxiety), yet experience significant mental well-being (Greenspoon & Saklofske, 2001). Despite this consideration, one construct may be more influential than the other for the perception of overall mental health of post-secondary students. Further studies should investigate the variance of mental health accounted for by the two constructs of mental health in a post-secondary population.

Another possible reason for the nonsignificant findings from pre- to post- intervention, may be the results of small sample size. In order to achieve a power of .81 with a moderate effect

size (.50), a sample size of $N = 27$ would be required. Due to limited access to training facilities and student trainers, only a small number of participants ($N = 10$) were included in the current study. This small sample results in low statistical power; studies with low statistical power have an increased risk of committing a Type II error, or failing to reject the null hypothesis (Button et al., 2013). However, it is important to note that a small effect size for the Mental Health Index and moderate effect size for both Psychological Distress and Psychological Well-Being were found, which may suggest the presence of an effect, undetected due to the small sample size. Therefore, if replicated in the future with a larger sample size, significant changes in mental health outcomes may be present.

Aside from a small sample size, specific factors related to the program and population may have influenced the results. Exercise interventions as few as five weeks have resulted in positive influences on mental health outcomes (Tkachuk & Martin, 1999). Yet, clinical exercise guidelines for depression have a minimum length of nine weeks (Ravindran et al., 2009) and many interventions are 12 weeks in length (Rosenbaum et al., 2014). Due to the fact that the exercise intervention in the current study spanned six weeks, it may be worthwhile to compare six-week programs to the more frequently used 12-week programs. Herring, Jacob, Suveg, and O'Connor (2011) investigated the effects of aerobic exercise as well as resistance training for six weeks on sedentary women aged 18-37 diagnosed with generalized anxiety disorder. The researchers found medium effect sizes for both aerobic exercise and resistance training on trait anxiety (aerobic, $d = .52$, resistance, $d = .54$) and a medium effect size for resistance training on depression ($d = .54$). Although few in numbers, other interventions (Abt, 2006) spanning six weeks have shown similar results (i.e., aerobic exercise had an effect on depression, $r = .46$). Interventions spanning 12 weeks, however, have much more empirical support. Marzolini,

Jensen, and Melville (2009) found a 12-week group-based aerobic and resistance training program to be effective in reducing depression ($r = -.90$) and improving overall mental health ($r = .80$) among schizophrenic patients. Armstrong and Edwards (2004) found that postnatal women in a 12-week walking program improved depressive symptomology when compared with a control group (see Rosenbaum et al., 2014, Stanton & Reaburn, 2014, and Tkachuk & Martin, 1999 for reviews of exercise interventions of varying lengths). Of the few exercise interventions designed to enhance mental health of post-secondary students, programs have spanned two weeks (Smits et al., 2008) to 10 weeks (Demers, 2013). Given the larger effect sizes and more frequent use of a 12-week exercise program, future research should investigate exercise interventions delivered to post-secondary students that span 12 weeks.

Although a 12-week program may be most suitable for an exercise intervention for mental health outcomes, it is also important to consider the content and the delivery during that time. As noted earlier, Chekroud et al. (2018) found the strongest association of mental health benefits with an exercise prescription of 30 to 60 minutes, three to five times per week. There is also support for a dose-response relationship, which suggests that a larger amount of exercise and subsequent energy expenditure is more effective than a lower dose (lower energy expenditure) for treatment of mental illness (Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005). The current study included two supervised training sessions of 45-50 minutes per week, with a required unsupervised exercise session of 60 additional minutes for a total of 150-160 minutes of exercise per week. Although all participants in the current study reported having completed the additional 60 minutes of physical activity through a self-reported survey (see Appendix C for Self-Report Physical Activity Measure), there remains the possibility that participants reported completing the additional exercise when they did not, in order to remain in

the program. If this were the case, it could partially explain the nonsignificant results of the exercise protocol as the participants would not have received the adequate amount of exercise, in turn receiving fewer mental health benefits.

A lack of social support may play a role in the possibility that participants misrepresented their additional exercise sessions. As previously highlighted, social support is a correlate of physical activity participation (Troost, Owen, Bauman, Sallis, & Brown, 2002), specifically among women (70% of the current participants were women; Phongsavan, McLean, & Bauman, 2007). Although fitness trainers act as motivators and provide social support (Barefield & McCalister, 1997; Maguire, 2001), there is limited time in which individuals can spend with their student trainer. Researchers have suggested that social support from friends and family has a primary influence on physical activity behaviors of post-secondary students and physical activity programming could be enhanced through a focus on social support (Scarapicchia et al., 2017). If participants were indeed misrepresenting their unsupervised exercise sessions, perhaps a “buddy system” in which participants completed their additional exercise with friends or likeminded participants, would be efficacious in increasing mental health outcomes. Moreover, social support can be present in one-on-one training with a fitness trainer (Barefield & McCalister, 1997; Maguire, 2001) as well as exercise groups (Courneya & McAuley, 1995). Recent research indicates that online social networks can play an influential role in physical activity promotion (Zhang, Brackbill, Yang, & Centola, 2015). Researchers investigating exercise programs for students’ mental health should consider evaluating the differences between one-on-one exercise with a student trainer, group-based exercise, and online group-exercise networks.

Although the effects of exercise on mental health have widely been accepted as overwhelmingly positive, there are some adverse effects to consider. In years prior, researchers

have suggested with some empirical support (Petruzello, Landers, Hatfield, Kubitz, & Salazar, 1991) that resistance training could result in slight increases in anxiety among inexperienced exercisers. Researchers proposed that an inexperienced individual may mistake increased heart rate for symptoms of anxiety (Lox, Martin Ginis, & Petruzzello, 2010). Resistance training was a primary component of the exercise intervention in the present study and all participants were currently sedentary with varying experience in exercise. Although the aforementioned findings have been heavily outweighed by empirical evidence supporting the anxiolytic effects of both resistance training and aerobic exercise (Chekroud et al., 2018; Gaudlitz et al., 2015; Powers et al., 2015; Rosenbaum, Sherrington, & Tiedemann, 2015), an effect of this nature could have influenced the nonsignificant change in distress, well-being, or mental health in the current study. Qualitative measures such as semi-structured interviews or focus groups could provide insight as to how post-secondary students perceive their anxiety when resistance training.

Post-secondary students are seeking counselling services at increasing rates (Center for Collegiate Mental Health, 2016; Council of Ontario Universities, 2017). Relationship difficulties, anxiety and stress, depression and grief, and academic concerns are among the main reasons post-secondary students seek counselling (Cairns, Massfeller, & Deeth, 2010). Given the period of time in which the current intervention occurred, academic stressors may have been a prevalent concern among the participants. Cairns et al. (2010) found that low grades, procrastination, and test anxiety were the main academic concerns that lead students to seek counselling. The intervention in the current study spanned six weeks from early October to mid-November in the Fall of 2017. This period of time is one in which students are both receiving grades from previously written mid-term exams and preparing for final exams and papers. It is possible that these academic factors had an additive influence on psychological distress and/or decreased well-

being due to the stress of managing time to schedule in study, attending classes, as well as partaking in the exercise intervention. It is possible that these stressors could result in a significant decrease in mental health outcomes. Despite this, no significant change in mental health outcomes (positive or negative) was evident in the current study. Given these considerations, it is possible that the current six-week exercise program may be effective for the maintenance of mental health, well-being, and distress rather than the enhancement of mental health outcomes. Future studies that implement exercise interventions for this population should account for these time variables and include a control group for comparison.

The current study is not without limitation. As noted earlier, limited resources resulted in a small sample size, thus decreasing statistical power. This small sample size and subsequent low power reduced the chances of detecting a true effect of the exercise intervention (Button et al., 2013). With such a small sample, generalization of the results should be done with caution. A much larger sample should be considered before making inferences regarding the applicability of a six-week exercise intervention for post-secondary students. Additionally, the lack of a control group by which to compare intervention effects is also a limitation of the current study. Given the exercise program was a service provided to students struggling with mental health issues, it would be unethical to deny one cohort of students an opportunity to improve their mental state. Future research may consider the use of a control group, which would later receive the exercise intervention.

Despite the limitations of the current study, the findings can direct future research. Exercise interventions with the goal to enhance mental health outcomes among post-secondary students should consider a longer duration than six weeks. Researchers should investigate the effectiveness of 12-week exercise programs as interventions held at this length are the most

common and effective among populations such as clinically diagnosed individuals (Armstrong & Edwards, 2004; Marzolini et al., 2009; Stanton & Reaburn, 2014). Additionally, researchers should consider fully supervised programs, to ensure all participants complete the prescribed amount of physical activity. Researchers should also consider the time of year in which the intervention is provided. Exercise programs which are completed close to the final exam period versus programs completed at other time points in the academic semester may limit stress placed on the students. Lastly, qualitative methods should be considered as a way for researchers to gain insight into the perceptions of those students who are struggling with psychological distress or low well-being. This analysis could lead to a more conclusive stance on which type of exercise is most effective for this population.

Conclusion

Young adults continue to struggle with mental health issues across Canada (Government of Canada, 2016), with post-secondary students being the most frequently affected (ACHA, 2016) thus threatening academic and future occupational success (Harvey et al., 2011; Hysenbegasi et al., 2005). Interventions beyond psychotherapy and pharmacology are needed for the protection and treatment of mental health issues for post-secondary students (Fenton et al., 2018; Huang et al., 2018). The current study investigated the effectiveness of a six-week exercise intervention in improving psychological distress, well-being, and overall mental health in post-secondary students. Although no significant changes on the mental health outcomes of post-secondary students were found, the six-week exercise program may have protected students from a further decline in mental health outcomes during a stressful time in their academic careers.

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TABLE 1

Table 1

Summary of Global Scales and Mental Health Index

| Scale | Baseline | | Post-Intervention | |
|--------------------------|-------------|-----------|-------------------|-----------|
| | <i>Mean</i> | <i>SD</i> | <i>Mean</i> | <i>SD</i> |
| Psychological Distress | 79.80 | 15.45 | 71.40 | 15.88 |
| Psychological Well-Being | 49.70 | 15.19 | 47.30 | 13.59 |
| Mental Health Index | 133.90 | 30.32 | 141.90 | 26.65 |

Note. Psychological Distress scores range from 24-142; Psychological Well-Being scores range from 14-84; Mental Health Index scores range from 38-226

TABLE 2

Table 2

Pearson Correlations Among MHI-38 Scales

| Scale | 1 | 2 | 3 |
|-----------------------------|------|-------|--------|
| 1. Mental Health Index | 1.00 | .89** | -.92** |
| 2. Psychological Well-Being | | 1.00 | -.63* |
| 3. Psychological Distress | | | 1.00 |

Note. *Correlation is significant at the .05 level; **Correlation is significant at the .001 level

TABLE 3

Table 3

Summary of Paired Samples T-Test

| Scale | <i>Mean</i> | <i>SD</i> | 90% Confidence Interval | | Test Statistic | df | Sig. (1-tailed) |
|--------------------------|-------------|-----------|-------------------------|-------|----------------|----|-----------------|
| | | | Lower | Upper | | | |
| Psychological Distress* | -8.40 | 21.03 | -20.59 | 3.79 | -1.26 | 9 | .12 |
| Psychological Well-Being | -2.40 | 13.71 | -10.35 | 5.55 | -.55 | 9 | .30 |
| Mental Health Index | 8.00 | 33.72 | -11.54 | 27.54 | .75 | 9 | .24 |

Note. *Psychological Distress did not meet normality

REVIEW OF LITERATURE

Introduction

Many young adults, including those enrolled in post-secondary education programs, struggle with mental illness (Ibrahim, Kelly, Adams, & Glazebrook, 2013; Lipson, Zhou, Wagner, Beck, & Eisenberg, 2016; Sontag-Padilla et al., 2018). In fact, 18.4% and 14.7% of Canadian students have been treated in the past 12 months for anxiety and depression, respectively (American College Health Association [ACHA], 2016). This is concerning as this number only represents those students who are being treated. In the same study, 44.4% of Canadian students responded that at one point in the previous 12 months they felt so depressed it was difficult to function, 64.5% of students reported overwhelming anxiety, and 13% seriously considered suicide (ACHA, 2016). Mental illnesses impact one's cognitions, emotions, and behaviors and ultimately one's ability to prosper in occupational, social, and personal aspects of life (American Psychiatric Association [APA], 2013). Given the crucial role students play in moving society forward, it is imperative that mental health issues among post-secondary students are addressed. Due to the consistent increase in students accessing campus mental health services and therefore long wait times (Council of Ontario Universities, 2017; Hunt & Eisenberg, 2010), investigating means of treatment and prevention other than the commonly used pharmacology and psychotherapy (Huang, Nigatu, Smail-Crevier, Zhang, & Wang, 2018; Klerman, Weissman, Roundsaville, & Chevron, 1994) is critical. More immediate, means of treatment and prevention of mental health issues for students need to be explored (Conley, Durlak, & Dickson, 2013; Fenton, White, Hamilton-Hinch, & Gilbert, 2018). Exercise has emerged as a means to treat and prevent mental illness for the general population (Rosenbaum, Tiedemann, Sherrington, Curtis, & Ward, 2014; Schuch et al., 2016; Stubbs et al., 2017). There is growing evidence that

recreation and physical activity programs for post-secondary students provide positive mental health benefits (Fenton et al., 2018): however, there is a dearth of studies that investigate exercise as an intervention for mental health issues among post-secondary students. The following review will highlight the prevalence of mental health related issues, theories, and models that describe mental health and illness, measurements of mental illness and well-being, and treatments such as psychotherapy, pharmacology, and ultimately physical activity. The review will highlight the mechanisms of exercise and its beneficial effects on mental health as well as the recommended prescription of exercise for optimal mental health benefits. Lastly, the prevalence of mental health issues among post-secondary students will be highlighted, as well as past exercise interventions for this population.

Mental Health

Mental health is a growing concern and one of today's primary issues worldwide (World Health Organization [WHO], 2016). Mental health is defined as,

a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community. (WHO, 2014)

Mental Disorders

Given physical, social, and mental well-being are indices of overall health (WHO, 2014), mental disorders can threaten one's overall health. Mental disorders are characterized by a disturbance in cognitions, emotion regulation, and behaviors that reflect dysfunction in the psychological, biological, and developmental processes of mental functioning (APA, 2013). Mental disorders encompass a spectrum of specific symptoms and issues associated with each diagnosis (WHO, n.d.). Common mental disorders include depression, bipolar affective disorder,

anxiety, schizophrenia, psychosis, dementia, intellectual disabilities, and developmental disorders such as autism (APA, 2013). Among common mental disorders, there are generally two main categories: anxiety disorders and depressive disorders (WHO, 2017). Both categories of disorders influence the mood and feelings of individuals with symptoms ranging with severity and duration (WHO, 2017). It is important to note that these disorders are separate from the feelings of sadness, stress, and fear experienced in day to day life such as the loss of a loved one (APA, 2013; World health Organization, 2017). Mental disorders are commonplace in the general population. In Canada specifically, 5.4% of the population aged 15 years and over reported symptoms that met the criteria for a mental disorder in the previous year (Government of Canada, 2016b).

Anxiety disorders. Anxiety disorders are one of the most commonly diagnosed mental disorders (Kessler, Ruscio, Shear, & Wittchen, 2009) and are characterized by excessive fear or anxieties that persist beyond developmentally appropriate periods (APA, 2013). Fear is an emotional response to real or perceived threat, whereas anxiety is a response to the anticipation of a future threat (APA, 2013) such as social and unfamiliar situations (Craske & Stein, 2016). Anxiety disorders differ from one's regular transient fears and anxieties that are associated with stressors of life as disordered anxiety is often persistent for 6 months or more (APA, 2013). Diagnosis relies on clinical judgment of the severity and frequency of one's fears and anxieties such that they exceed the normal proportions of the threat posed and are linked to social, occupational, and other functional impairments (Craske & Stein, 2016). There are numerous types of anxiety disorders each distinct from the next while sharing common features. Among these sub-types of anxiety disorders are selective mutism, phobias, social anxiety disorder, panic disorder, agoraphobia, and generalized anxiety disorder (APA, 2013). The global prevalence of

anxiety disorders was estimated to be 3.6% in 2015 (WHO, 2017). In 2013, 11.6% of Canadians reported a mood or anxiety disorder (Government of Canada, 2016a). Furthermore, approximately one in nine individuals will have an anxiety disorder at any given time (Baxter, Scott, Vos, & Whiteford, 2013) and women are twice as likely as men to have an anxiety disorder (Craske & Stein, 2016).

Depressive disorders. Depressive disorders are characterized by the presence of feelings of sadness, emptiness, and irritability that are accompanied by cognitive and somatic changes that affect an individual's ability to function (APA, 2013). There are two main sub-categories of depressive disorders: depressive episode and major depressive disorder (WHO, 2017). A depressive episode ranges from mild to severe in nature depending on the number of present symptoms such as decreased energy, depressed mood, loss of interest, and enjoyment in activities formerly enjoyed (WHO, 2017). A mild depressive episode, for example, will include some difficulty in continuing ordinary work and social activities, but the individual will most likely be able to continue functioning, whereas severe depressive episode will involve the individual being unable to continue with social, work, or domestic activities (WHO, 2018b). Major depressive disorder, commonly referred to as depression, involves persistent sadness and a loss of interest in activities that one normally enjoys, accompanied by an inability to carry out activities for at least two weeks (WHO, 2018a). Depression affects each individual differently, therefore each person will have a unique set of symptoms, often a combination of depressed mood, feelings of guilt or worthlessness, loss of interest or pleasure in formerly enjoyed activities, change in weight or appetite, sleep disturbances, decreased energy or fatigue, thoughts of death, and poor concentration (Government of Canada, 2016b). Although unique to each individual, there are certain symptoms that predict a more chronic course of depression (Boland

& Keller, 2009). Symptoms such as severe fatigue, loss of interest, insomnia, suicidal ideation, and social withdrawal have been more strongly correlated as predictors of more chronic depression (Moos & Cronkite, 1999). The total estimated number of people living with depression has increased by 18.4% in 10 years from 2005 to 2015 (Vos et al., 2016). That is, the global prevalence of individuals suffering from depression is over 300 million people, equivalent to 4.4% of the world's population (WHO, 2017). In Canada, there is a National rate of 4.7% for major depressive disorder among the general population (Government of Canada, 2016b). Furthermore, 11.3% of individuals in Canada are experiencing significant depressive symptoms, although not clinically diagnosed (Government of Canada, 2016b). Similar to anxiety disorders, depression is more common among women than men (WHO, 2017).

Well-being

Inherent in the definition of mental health above, is not only the absence of mental illness, but the presence of well-being. Mental health, which was once exclusively thought of as the absence of psychopathology or disease, was considered an indicator of well-being (Greenspoon & Saklofske, 2001). That is, if one is free of mental illness, one is mentally healthy. However, this consideration has been controversial and mental health has also been viewed as a complete state of being, comprised of not only the absence of mental illness but also the presence of positive factors (Keyes, 2002)

Those who have supported this recent consideration of mental health have investigated it through the concept of well-being (Diener 2000; Greenspoon & Saklofske, 2001; Keyes, 2002; Ryff, 1989). The term subjective well-being (SWB) was coined by Warner Wilson (1967) and has evolved over years of research (Diener, 2000). SWB has been referenced as the scientific term for happiness (Suldo & Shaffer, 2008), and is a multidimensional construct that

incorporates positive affect (e.g., joy, excitement) and infrequent negative emotions (e.g., sadness, anxiety) paired with a cognitive positive assessment of one's overall quality of life (Antaramian, Huebner, Hills, & Valois, 2010). SWB plays a crucial role in many models of mental health (Greenspoon & Saklofske, 2001; Keyes, 2002; Westerhof & Keyes, 2010).

Mental Health and Illness Models

The study of mental health has evolved substantially over the last 70 years. Researchers have debated the paradigm in which mental health and illness is defined. Over the last century, mental health has transformed from a negatively defined construct, such as the absence of psychopathology, to a complete state of being consisting of not only the absence of illness but also the presence of well-being. The following sections highlight the influential models that have shaped the landscape of the current description of mental health.

Biopsychosocial model. From the end of World War II until the mid-1970s, the psychosocial model (later coined the biopsychosocial model) was the prominent approach to assessing mental health (Wilson, 1993). This approach was informed by psychoanalytic and sociological thinking, with the addition of biological insights (Engel, 1977; Wilson, 1993). Spokespersons of this model included Adolf Meyer and Karl Menninger. Meyer regarded the individual as the focus for theory and practice in psychiatry and that assessment should focus on understanding the patient as a person (Double, 2005). Menninger, viewed as the more articulate of the two spokespersons (Wilson, 1993), echoed the sentiments of Meyer claiming that it is crucial to observe how the maladjustment originated and what the meaning of one's symptoms are (Menninger, 1963). A list of the assumptions of the biopsychosocial framework are noted below (Wilson, 1993, p. 400):

- 1) The boundary between the mentally well and the mentally ill is fluid because normal persons can become ill if exposed to severe-enough trauma.
- 2) Mental illness is conceived along a continuum of severity- from neurosis to borderline conditions to psychosis.
- 3) An untoward mixture of noxious environment and psychic conflict causes mental illness.
- 4) The mechanisms by which mental illness emerges in the individual are psychologically mediated.

Although this model was prominent through the better part of 30 years, it was attacked on the grounds that the biopsychosocial model did not clearly differentiate the mentally well from the mentally ill (Wilson, 1993). What ensued was an antipsychiatry movement in which assumptions of the biopsychosocial approach were challenged. Those within this movement argued that a fluid boundary between the mentally well and mentally ill renders psychiatric diagnoses to be arbitrary (Wilson, 1993). Psychiatrists advocated for a more conventional medical model of psychopathology.

Biomedical model. Traditionally, the field of mental health has been dominated by the biomedical model of mental health and illness, also known as a Neo-Kraepelinian approach (Antaramian et al., 2010; Double, 2005; Keyes, 2005). The biomedical model of mental health dates back to the views of Emil Kraepelin, the founder of modern psychiatry (Double, 2005). This approach regained popularity after the antipsychiatry movement of the mid 1970s (Wilson, 1993). In this modern psychiatry, biological aspects of mental illness are regarded as the central concern of psychiatry (Double, 2005). For many years, those involved in researching mental health have focused on psychopathology and have viewed mental health as an absence of such

psychopathological illnesses (Antaramian et al., 2010). The biomedical model is a pathogenic approach that seeks to determine symptoms and treat illnesses (Keyes, 2005).

In recent decades this model has been challenged on the basis that mental health does not equate to a sole absence of mental illness (Antaramian et al., 2010). According to this model, individuals are either diagnosed with a psychopathology, or presumed to be mentally healthy (Keyes, 2005). Researchers have since been arguing that mental health and mental illness are related but distinct dimensions (Greenspoon & Saklofske, 2001; Keyes, 2002; Suldo & Shaffer, 2008) and that the biomedical model represents a narrowing of psychiatry's clinical perspective (Wilson, 1993).

Dual factor model. The dominance of the biomedical model places extreme importance on psychopathology and implies that mental health and illness are opposite ends of a single continuum (Greenspoon & Saklofske, 2001). As highlighted, challenges to this ideology have been plentiful (Greenspoon & Saklofske, 2001; Keyes, 2002; Suldo & Shaffer, 2008) in an attempt to integrate positive indicators of well-being into the concept of mental health.

Greenspoon and Saklofske (2001) were among the first to expand the model of mental health, including measures of SWB with psychopathology, in a dual factor model. This model assesses the integration of inter-related yet distinct constructs of SWB and psychopathology. The authors of this model suggest that if there is an increase in one, a decrease in the other is not inevitable (Greenspoon & Saklofske, 2001). Using only psychopathological measures, an individual who reports that life is "great" could be classified as "normal," just as someone who may report being "not so good" (Greenspoon & Saklofske, 2001; Schlosser, 1990). Therefore, a model which describes SWB and psychopathology as two inter-related but distinct constructs effectively highlights the dynamic nature of mental health and illness.

In Greenspoon and Saklofske's (2001) study, they assessed mental health in children using the dual factor model. Children were classified into one of four groups having either high SWB and low psychopathology, low SWB and high psychopathology, low SWB and low psychopathology, or high SWB and high psychopathology. The first two groups fit the former belief that mental health and illness lie on opposite ends of a singular continuum. However, individuals in the latter two groups are unique to this model having high SWB whilst experiencing the presence of mental illness or having low subjective well-being without the presence of mental illness.

The results of the inaugural study (Greenspoon & Saklofske, 2001), along with many other studies focusing on children (Antaramian et al., 2010; Lyons, Huebner, & Hills, 2013; Suldo & Shaffer, 2008) and adults (Teismann et al., 2018; Trompetter, Lamers, Westerhof, Fledderus, & Bohlmeijer, 2017) have supported the use of the dual factor model in assessing mental health and illness. Each study uses a specific set of measurement scales that appropriately measure SWB and psychopathology for the population being assessed.

A mental health model that assesses an individual on two dimensions is critically important to assessing the functionality of an intervention (Trompetter et al., 2017). Interventions for mental health and illness are often only evaluated by investigating psychopathology instead of both psychopathology and SWB. A dual factor model demonstrates that an intervention effective in relieving psychopathology symptoms is not necessarily effective in enhancing SWB and vice versa (Trompetter et al., 2017). Therefore, in order to properly assess the effectiveness of an intervention, both dimensions should be measured. Therein lies the strength of the dual factor model.

Measures of Mental Health

A model with which to assess mental health and illness must also coincide with a properly fitting measure. There are many separate measures of mental illness and well-being; however, as highlighted above mental health and illness are two distinct yet related measures (Greenspoon & Saklofske, 2001). Therefore, an effective measure should work in concert with the guiding model of mental health and illness to assess indicators of both mental health and illness. The following sections review common measurement tools that account for both mental health and illness.

Mental Health Continuum – short form. The Mental Health Continuum (MHC-SF; Keyes et al., 2008) was developed to assess mental well-being including emotional, psychological, and social well-being. The 14-item measure, which corresponds to the three components of well-being, begins with the stem “In the past month...” and includes items such as “how often did you feel happy?” and “that your life has a sense of direction or meaning to it?” (Keyes et al., 2008; Lamers, Westerhof, Bohlmeijer, Klooster, & Keyes, 2011). Based on scores, individuals are placed in one of three categories: flourishing, languishing, or moderately healthy. Flourishing individuals exhibit high levels of well-being and positive function, whereas those who are languishing exhibit low levels of well-being and functioning. Moderately mentally healthy individuals do not fit the criteria for flourishing or languishing and fall between the two classifications (Keyes et al., 2008). This model has strong psychometric properties such as internal consistency and reliability (Keyes et al., 2008) and is consistent among different populations (Karaś, Ciecuch, & Keyes, 2014; Keyes et al., 2008; Lim, 2014). Although this measure addresses languishing and a lack of mental health, it does not measure psychopathology

and mental illness. Therefore, the mental health continuum may not be the most appropriate measure to assess one's mental illness and well-being.

General Well-Being Schedule. The General Well-being Schedule (GWB) was the product of an initial effort to develop a structured instrument to assess SWB and distress (Fazio, 1977). The GWB schedule contains 18 items that are combined to produce a general indicator of well-being as well as six subscales including anxiety, depression, positive well-being, self-control, vitality, and general health (Taylor et al., 2003). The GWB schedule has demonstrated concurrent and construct validity in certain contexts such as when in association with measures of self-concept, depression, and other health behaviors (Taylor et al., 2003). However, the GWB is primarily unidimensional and the existence of six independent subscales has not been supported (Taylor et al., 2003). Therefore, in using the GWB schedule, researchers are often limited to reporting the total GWB score, rather than reporting on the six hypothesized dimensions (Taylor et al., 2003).

Mental Health Inventory-38. The Mental Health Inventory-38 (MHI-38) is a standardized 38 item survey designed to measure psychological distress and well-being in general populations (Veit & Ware, 1983). This measure was highly influenced by the aforementioned GWB schedule, as both place emphasis on psychological distress constructs and the inclusion of items measuring well-being (Veit & Ware, 1983). The MHI-38 includes positive and negative items in order to address their distinct dimensions (Veit & Ware, 1983). The MHI-38 has six subscales: Anxiety, Depression, Loss of Behavioral/Emotional Control, General Positive Affect, Emotional Ties, and Life Satisfaction (Veit & Ware, 1983). These six subscales fall under two second-order factors, Psychological Well-Being and Psychological Distress (Liang, Wu, Krause, Chiang, & Wu, 1992). Furthermore, Psychological Well-Being and

Psychological Distress are sub-factors of a single factor: The Mental Health Index (Liang et al., 1992). The MHI-38 supports a range of scoring options from six distinct mental health constructs, to reliance on a single mental health factor, to two distinct higher order factors in Psychological Distress and Psychological Well-Being (Veit & Ware, 1983). The two-factor (Al Mutair et al., 2018; Heubeck & Neill, 2000; Manning, Newhouse, & Ware, 1982; Ostroff, Woolverton, Berry, & Lesko, 1996) and the one-factor (Canetti, Bachar, & Bonne, 2016; Moxham et al., 2018; Veit & Ware, 1983) specifications are frequently used among researchers. The six subscales have also been used in empirical research (Moxham et al., 2018; Pourhabib, Fotokian, Nasiri, & Abrotan, 2018; Veit & Ware, 1983). The MHI-38 has high internal consistency with a Cronbach's alpha of .96. Each second order factor (Psychological Distress and Psychological Well-Being) have been shown to have internal consistency with a Cronbach's alpha of .94 and .92, respectively, as does each subscale, Anxiety (.90), Depression (.86), Loss of Behavioral/Emotion Control (.83), General Positive Affect (.92), and Emotional Ties (.81). The MHI-38 has been consistently shown to have construct and external validity (Al Mutair et al., 2018; Heubeck & Neill, 2000; Liang et al., 1992; Manne & Schnoll, 2001; Veit & Ware, 1983). The versatile nature of this measurement proves effective in measuring mental health in intervention research. For this reason, the MHI-38 is used in the current study.

Treatment for Mental Illness

Numerous treatment and preventative measures are available for mental illnesses such as depressive and anxiety disorders. The following sections highlight the commonly used treatment and preventative measures for depressive and anxiety disorders.

Pharmacology. Antidepressants have been widely used and readily available for the treatment of mental disorders for the better part of 50 years (Lox, Martin Ginis, & Petruzzello,

2010). Today, selective serotonin reuptake inhibitors such as Zoloft™, and serotonin-noradrenaline reuptake inhibitors are efficacious common first-line treatments for depressive disorders and anxiety disorders (Blumenthal et al., 2007; De Vries, De Jonge, van den Heuvel, Turner, & Roest, 2016). However, there are growing concerns on whether or not antidepressants are overprescribed and if the risks associated are minimized (Spence, 2013). The side effects associated with antidepressants include nausea, agitation or sedation, sexual side-effects, hypertension, and more (Craske & Stein, 2016). Furthermore, a lack of compliance to prescribed drugs is a common issue (Lawlor & Hopker, 2001).

Anxiety disorders are often treated differently than depressive disorders. Although antidepressants often play a role in the pharmaceutical treatment of anxiety disorders, they often serve different functions from those prescribed to treat depressive disorders. Drugs prescribed to treat anxiety disorders inhibit neurotransmitter systems causing sedative effects (Lox et al., 2010). A few common antidepressants prescribed for their anti-anxiety effects are serotonin-noradrenaline reuptake inhibitors, benzodiazepines, tricyclic antidepressants, or specific serotonin reuptake inhibitors (Bandelow et al., 2015). These anti-anxiety medications are required to be taken for a long period of time, often up to six months or more. Time is not the only concern for these medications as they often cause a number of side effects and withdrawal is not uncommon (Khawan, Laurencic, & Malone, 2006).

Psychotherapy. Although antidepressants are often the most common method of treating anxiety and depressive disorders, psychotherapy is also a commonly used tool in the treatment of both illnesses. These psychotherapies often emphasize interpersonal relationships while recognizing the role of genetic, biochemical, developmental, and personality factors and assist in the development strategies for dealing with symptoms of one's disorder and avoiding problem

behaviors (Klerman et al., 1994). Psychotherapy often is a lengthy process with a large cost, lengthy waiting periods, and a lack of widespread access (Mccrone et al., 2004; Stubbs et al., 2017). Furthermore, about a third of individuals do not respond to psychotherapy (Hoffman & Smits, 2008). Similar to pharmacology, psychotherapy has its own set of side effects. Although much more difficult to recognize, side effects include unwanted events such as changes in life circumstances, emergence of new symptoms, and negative well-being (Linden, 2013). Despite the support for both psychotherapy and antidepressants in the treatment of mental disorders, side effects are inevitable. As such, alternative treatments, such as physical activity, for individuals diagnosed with these illnesses should be considered.

Physical Activity

Defined as any bodily movement by skeletal muscle that results in energy expenditure (Caspersen, Powell, & Christenson, 1985), physical activity is a broad term under which exercise falls. Exercise is planned, structured, and repetitive and has a final or an intermediate objective to improve or maintain physical fitness (Caspersen et al., 1985). Fitness is often a product of exercise and is defined as the ability of the circulatory and respiratory systems to supply oxygen to working muscles during sustained physical activity, typically expressed as $\text{mLO}^*\text{kg}^*\text{min}$ (Lee, Artero, Sui, & Blair, 2010). What is not correlated with cardiorespiratory fitness or exercise, however, is sedentary behavior. Sedentary behavior is any waking behavior characterized by an energy expenditure of less than 1.5 metabolic equivalents (METs) while in a sitting or reclining posture (Biswas et al., 2015). Exercise is often described as either acute or chronic in nature. Acute exercise would account for a single bout of exercise at any given level of intensity or duration whereas chronic exercise involves a regular program lasting weeks or months and

designed to increase aerobic capacity or strength gains in the form of resistance training programs (Lox et al., 2010).

Physical activity as a treatment for mental illness. Physical activity is noted as a highly effective treatment and preventative measure for mental health issues (Chekroud et al., 2018; Mikkelsen, Stojanovska, Polenakovic, & Bosevksi, 2017; Rosenbaum et al., 2014; Schuch et al., 2016; Stubbs et al., 2017). Physical activity has been described as having an inverse relationship with depression (Mammen & Faulkner, 2013) and is believed to be a useful tool in alleviating symptoms for anxiety disorders (Stubbs et al., 2017). Exercise has also shown to positively affect the physical and psychological domains of an individual while improving quality of life (Schuch et al., 2016). Low levels of physical activity amongst adult populations have been correlated with an 83% increased risk of developing depressive symptoms (Paulo et al., 2016) and among children, those who are physically active have shown a 38% decreased risk of experiencing depressive symptoms (Kremer et al., 2014). Physical activity and its positive effects on mental health have been investigated for quite some time. Martinsen, Hoffart, and Solberg (1989) demonstrated that aerobic exercise such as walking or jogging and non-aerobic training such as resistance training or flexibility training resulted in significant psychological improvements amongst patients with anxiety disorders. Further, researchers (Meyer, Broocks, Bandelow, Hillmer-Vogel, & R  ther, 1998) found that a 10-week running program resulted in clinical improvements in patient's anxiety. A host of recent studies have also investigated physical activity's promising benefits for mental health (Da et al., 2018; Mikkelsen et al., 2017; Toups et al., 2017). Additionally, researchers have also frequently found positive influences of exercise on mental health when comparing the effects to pharmacology (Blumenthal et al., 1999; Blumenthal et al., 2007; Hallgren et al., 2015).

The use of physical activity as a treatment for anxiety has been a controversial topic for some time due to inconsistent and mixed findings across the literature. For example, in the 1990s, researchers suggested that only aerobic exercise was effective in alleviating anxiety symptoms (Petruzello, Landers, Hatfield, Kubitz, & Salazar, 1991). This hypothesis was built on a finding that resistance training demonstrated slight increases in anxiety (Petruzello et al., 1991). A common speculation was that inexperience with resistance training may affect the way an individual perceives exercise intensity, mistaking exercise symptoms for anxiety (Lox et al., 2010). Years later, researchers found a decrease in anxiety symptoms 15 and 30 minutes after a low intensity resistance training session (Bartholomew & Linder, 1998). In 2013, a meta-analysis of the anxiolytic effects of exercise was conducted (Bartley, Hay, & Bloch, 2013) in which the researchers concluded that aerobic exercise could not be supported as an effective treatment for anxiety disorders.

This complicated past has been clarified in more recent research (Gaudlitz, Plag, Dimeo, & Ströhle, 2015; Powers et al., 2015; Rosenbaum, Sherrington, & Tiedemann, 2015) such that positive effects of exercise (both aerobic and non-aerobic) on anxiety disorders have been found. Additionally, a more recent meta-analysis of six randomized control trials found exercise to significantly improve anxiety symptoms in individuals with an anxiety or stress related disorder (Stubbs et al., 2017). With the prevalence of more recent research, both aerobic and other forms of exercise show significant and positive benefits for anxiety disorders.

Physical activity as a treatment for depressive and anxiety disorders has frequently been compared to pharmacological treatments (Blumenthal et al., 1999; Blumenthal et al., 2007; Hallgren et al., 2015). The most groundbreaking of this research was conducted by Blumenthal et al. (1999) comparing the effects of aerobic exercise to an antidepressant sertraline (Zoloft).

Older adults were either assigned to an aerobic exercise group that exercised three times per week at 70-85% of their heart rate reserve, a group that was prescribed Zoloft, or a combined method of exercise and Zoloft. Patients in all three groups experienced significant reductions in depressive symptoms. Those in the medication group responded faster; however, those in the exercise group had significantly lower relapse rates than participants in the treatment groups. Other studies have found similar results such that exercise has proven to be just as effective as pharmacotherapy in the treatment of depressive and anxiety disorders with longer lasting effects and less likelihood of relapse (Blumenthal et al., 2007; Hallgren et al., 2015; Hoffman et al., 2009; Stubbs et al., 2017). In a study comparing the influence of a running program that took place three times per week to clomipramine, an anti-anxiety medication, Meyer et al. (1998) found that after 10 weeks of treatment, the exercise group showed similar levels of improvements to the pharmacological group. These studies play a crucial role in understanding the importance of physical activity in the treatment of mental disorders. However, it is important to note that exercise is not necessarily better than pharmacological methods for treating mental disorders and should be seen as an additional method to be considered, one with numerous positive side effects.

Mechanisms of Physical Activity

Given the body of research, one can accurately state that physical activity has a positive effect on the mental health of an individual. Although researchers have not agreed upon one specific mechanism as to why physical activity is an effective treatment for mental illness, several theories have been advanced.

Distraction/time-out hypothesis. Physical activity naturally takes more time from one's daily routine than pharmacology and even psychotherapy. If we consider the definition of

exercise from earlier, it is any planned, structured, and repetitive physical activity (Caspersen et al., 1985). The Canadian guidelines for physical activity for individuals aged 18-64 is 150 minutes of moderate to vigorous aerobic physical activity per week, in bouts of 10 minutes or more (Canadian Society for Exercise Physiology, 2018). Therefore, these planned and structured exercise sessions provide a break from one's daily routines. The distraction hypothesis posits that the positive benefits on mental health from exercise could be due to the mental time out from daily life that is associated with exercise rather than physiological change (Bahrke & Morgan, 1978; Mikkelsen et al., 2017). In the first conceptualization of this hypothesis, researchers gave three groups mental time outs, one group had an exercise time out, one group meditation, and one relaxing in a reclining chair (Bahrke & Morgan, 1978). The results showed all the groups having similar reductions in anxiety and stress, providing support for the distraction hypothesis. Despite its support, researchers suggest there is more at work than distraction from one's anxieties and stressors (Faulkner, Trinh, & Arbour-Nicitopoulos, 2015)

Thermogenic hypothesis. The thermogenic hypothesis is derived from research showing that elevated body temperature can have therapeutic benefits (e.g., reduced muscle tension) (Raglin, 1990; Raglin & Morgan, 1987). This hypothesis proposes that a response from the elevated temperature due to exercise triggers a relaxation response resulting in reduced anxiety (Faulkner et al., 2015). This hypothesis has been challenged consistently and at times refuted (Mikkelsen, 2017). Researchers suggest that elevated body temperature is most likely not directly responsible for the anti-anxiolytic response of exercise (Koltyn, Shake, & Morgan, 1993; Petruzzello, Landers, & Salazar, 1993).

Endorphin hypothesis. Similar to the thermogenic hypothesis, the endorphin hypothesis suggests that the positive mental health effects of physical activity are due to the body's reaction

to the elevated physiological stress, releasing endorphins post-exercise (Mikkelsen et al., 2017). There is an association with euphoria and reduced receptor availability for endorphins (i.e., a greater amount of endorphins in plasma; Boecker et al., 2008). Furthermore, researchers have confirmed that there are elevated plasma levels of endorphins after an exercise session (Tendzegolskis, Viru, & Orlova, 1991). The feelings of euphoria, sedation, analgesia, and well-being following intense training sessions are commonly reported by athletes and is often referred to as the ‘runners’ high (Mikkelsen et al., 2017). Although there are studies that support this hypothesis (Antunes et al., 2016; Heyman et al., 2012), it is extremely difficult to conclude the endorphin hypothesis due to the fact that the level of endorphins in plasma does not necessarily mean that it reflects the levels in the central nervous system (Mikkelsen et al., 2017).

Monoamine hypothesis. The monoamine hypothesis attempts to explain the effects of exercise through the responses of the brain, specifically the release of neurotransmitters such as serotonin, norepinephrine, and dopamine (Chaouloff, 1989). These neurotransmitters, or ‘monoamines’, are thought to be involved in the pathogenesis of mental illness as imbalances have been reported in those suffering with anxiety and depression (Anderson & Shivakumar, 2013; Maletic et al., 2007). More specific hypotheses have been developed to more accurately reflect the subtypes of neurotransmitters such as the serotonin hypothesis (Chaouloff, 1997) and the norepinephrine hypothesis (Dishman, 1997). For the purposes of this review however, only the monoamine hypothesis will be reviewed.

Neurotransmitters such as serotonin and norepinephrine are associated with the regulation of emotion, and the release (volume released and uptake of neurotransmitters) of these neurotransmitters are altered through exercise. That is that exercise can increase the rate that these neurotransmitters are released as well as enhance the rate of uptake (Mikkelsen et al.,

2017). Moderate to vigorous exercise has shown increases of these neurotransmitters in blood plasma (Melancon, Lorrain, & Dionne, 2014; Wipfli, Landers, Nagoshi, & Ringenbach, 2011). Therefore, exercise seems to operate in a similar fashion to antidepressants (Mikkelsen et al., 2017). However, there is a lack of evidence that links exercise to neurotransmitter in the human brain (Faulkner et al., 2015). Although the monoamine hypothesis has strong support, it cannot yet be considered fully accepted.

Mastery hypothesis. According to Bandura (1977), self-efficacy (i.e., situation specific self-confidence) can be fostered through past performance accomplishments, vicarious experiences, verbal persuasion, and level of physiological arousal. Therefore, if one is to engage in physical activity and experiences success through enhanced fitness, bodily changes, one's self-efficacy will improve due to feelings of accomplishment. This feeling of accomplishment and self-efficacy may break a series of negative affect such as depression and anxiety. In Craft's 2005 study, the exercise intervention rendered a significant reduction in depression with significantly increased coping self-efficacy. In other words, the participants felt a greater sense of being able to deal with obstacles that would have before ceased their participation in exercise.

Although no mechanism has proven to be the sole contributor to the positive effects physical activity has on mental health, many of the above hypotheses account for its effectiveness.

Physical Activity Prescription for Mental Health

Understanding why physical activity affects mental health is important; however, what is of equal importance is understanding how exercise is best prescribed. In order to prescribe exercise to reap optimal mental health benefits as well as to develop effective interventions, it is

imperative to understand the most desirable frequency, time, intensity, and type of exercise for optimal outcomes (Stubbs et al., 2017).

Frequency, time, and intensity. There are many differing opinions on how much and how often physical activity should be prescribed for mental health benefits. Tkachuk and Martin (1999) in their review highlight that researchers suggests significant benefits can be achieved for individuals with depression with as little as three times per week, aerobic or non-aerobic physical activity of low to moderate intensity (50% of maximum heart rate), lasting 20-60 minutes in duration for five weeks. In a 2014 review, effective physical activity interventions ranged from 10 days total to 8 months, with a 12-week program being the most common intervention (Rosenbaum et al., 2014). In a recent cross-sectional study of Americans from 2011-2015, the researchers found that the strongest association of mental health benefits came from those who exercised for 30 to 60 minutes, three to five times per week (Chekroud et al., 2018). In a recent review of aerobic exercise interventions for anxiety related disorders, exercise intensity was commonly prescribed at 70% of one's maximal aerobic output, and between a 12-17 in the rate of perceived exhaustion (RPE) scale (Gaudlitz et al., 2015; Powers et al., 2015; Rosenbaum et al., 2015). However, a common issue is the lack of clarity of exercise interventions reported in the studies (Rosenbaum et al., 2014). It is important to understand the frequency, time, and intensity of exercise regimes that are effective in order to further replicate the findings. Despite the lack of one concise exercise guideline for mental health benefits, a dose-response relationship can help guide the prescription of exercise for mental health benefits. A dose-response relationship among exercise and mental health has been established (Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005) such that a higher dose of exercise (more energy expenditure) was a more effective treatment for depression than a lower dose (less energy expenditure).

Furthermore, a meta-analysis (Schuch et al., 2016) demonstrated that vigorous exercise has greater effects on depression than more mild exercise. However, these findings must be considered carefully as extreme ranges of exercise (23 sessions per month, or longer than 90 minutes) were shown to lead to worse mental health outcomes than exercise programs with less extreme ranges in Chekroud's cross-sectional study (2018). Although no one single prescription has been accepted for the treatment and prevention of mental illness, including a relatively high dose through higher intensity exercise (70% max HR, between 12-17 on RPE), three to five times per week for 20 to 60 minutes are appropriate guidelines in today's literature.

Type. Researchers also need to consider the different types of exercise that are appropriate for enhancing mental health. A majority of programs assessing the effects of exercise on mental health have done so through aerobic exercise (Mikkelsen et al., 2017; Rosenbaum et al., 2014). Anxiety disorders are typically treated with aerobic exercise; Stubbs et al. (2017) conducted a meta-analysis of exercise interventions for anxiety disorders, in which all studies included an aerobic based program that rendered positive benefits. Although there are fewer studies investigating other forms of physical activity such as resistance training, flexibility, cross-training (e.g., yoga, dance, martial arts), these alternative forms do provide positive benefits for mental health (Mikkelsen et al., 2017). Chekroud et al. (2018) also found that all exercise types were associated with a decrease (11.8-22.3% decrease) in mental health issues. In Rosenbaum's 2014 review, of the 20 interventions reviewed, a broad spectrum of exercise types was included (aerobic exercise, resistance training, group-based multimodal exercise, walking, aquatic, tai chi, dance, and yoga) showing positive benefits. It is evident then, that physical activity in many different forms can be prescribed to reap mental health benefits.

Mental Health and Physical Activity in Post-Secondary Students

Although many populations are at risk for mental health issues, post-secondary students are a sub-population of individuals with high prevalence of mental health issues (Ibrahim et al., 2013). Given that these young students will be the future leaders of our society, exploring ways in which students can enhance their mental health is critical.

Mental Illness Prevalence in Post-Secondary Students

University students are considered at high risk for developing mental illness and the issue is now widely considered a crisis in popular media (Craggs, 2012; Lunau, 2012; Sanford, 2018). Mental illness symptoms often work against a student's ability to experience success in academics (Hysenbegasi, Hass, & Rowland, 2005), in relationships (Whitton & Whisman, 2010), and at work (Harvey et al., 2011). Students enrolled in post-secondary education often have higher rates of mental illness (Ibrahim et al., 2013). In fact, a systematic review reported a mean prevalence of 30.6% of depression rates among university and college students (Ibrahim et al., 2013). Other studies show a range of up to 36% of post-secondary students who report at least one mental health issue (Lipson et al., 2016; Sontag-Padilla et al, 2018) compared to an average of 5.4% in the general Canadian population (Government of Canada, 2016b). In fact, a high percentage of Canadian post-secondary students are being treated for anxiety (18.4%) and depression (14.7%; ACHA, 2016). This number represents only a portion of this issue as these are only the students who are being treated. In a 12-month period, 44.4% of Canadian students reported feeling so depressed it was difficult to function, whereas 64.5% students reported overwhelming anxiety, and 13% seriously considered suicide (ACHA, 2016). This high prevalence of mental illness among post-secondary students is evident due to the increase in usage of campus' counseling services (Hunt & Eisenberg, 2010). In the 2016 annual report of

over 400 universities from the Center for Collegiate Mental Health (Center for Collegiate Mental Health [CCMH], 2016) in the United States, there was a 28% increase in resources devoted to counseling service access in six years (CCMH, 2016). This high increase in prevalence does not only apply to undergraduate students. Although it is proposed that issues that young students deal with such as separation from home and a lack of support contribute the development of mental illness (Ibrahim et al., 2013), graduate students have their own set of predispositions that contribute to mental health issues. In a survey of 2,279 graduate students, 39% of respondents received moderate to severe depression scores compared to 6% of the general population (Evans, Bira, Gastelum, Weiss, & Vandford, 2018). Contributing factors that students may face are changes in lifestyle which can lead to lack of sleep and poor nutrition, financial strain, changes in family dynamics, academic stress, and a lack of clarity for post-graduation life (Ibrahim et al., 2013).

Exercise Rates among Post-Secondary Students

As noted, transitioning from high school to post-secondary education is a transition period for young adults in which they face a change of lifestyle and different stressors (Ibrahim et al., 2013). This period in time is often correlated with a decline in physical activity (Bray & Born, 2004; Han et al., 2008; Kwan, Cairney, Faulkner, & Pullenayegum, 2012). In fact, in a study of Canadian undergraduate students (Bray & Born, 2004), 66.2% of the participants reported adequate levels of physical activity while in high school, yet only 44.1% of students reported meeting standard physical activity guidelines in their first eight weeks at university. Furthermore, one third of the sample was active in high school but became inactive once at university and reported higher levels of fatigue and lower levels of vigor than those who continued to be active (Bray & Born, 2004).

Exercise and Mental Health in Post-Secondary Students

Although post-secondary students often experience a decline in physical activity, exercise interventions aimed at enhancing the quality of life and mental health of students are promising. Considering the recent spike in use of campus mental health services, having a broad range of services for the protection and treatment of mental health issues is crucial (Conley et al., 2013; Fenton et al., 2018). In the past, the interventions for students with mental health issues have included antidepressants, psychotherapies, art therapy, and physical exercise and have been delivered individually, in group settings, through guided self-help, or internet-based formats (Huang et al., 2018). A meta-analysis of interventions for student mental health issues has demonstrated that a wide range of interventions have proved to be effective for depression and anxiety disorders among students (Huang et al., 2018). Of the interventions assessed, art, peer support, and exercise had the highest support for both depression and anxiety among college and university students (Huang et al., 2018). Only one exercise protocol (Smits et al., 2008) was included in this review. Smits et al. (2008) found that a two-week program with six, 20 minute sessions on a treadmill at 70% of the participants' maximal heart-rate resulted in significant decreases in anxiety and depression. A separate review of recreation programs designed to mitigate the development of mental health problems and to enhance resilience and coping among post-secondary students was conducted by Fenton et al. (2018). The recreation programs investigated included relaxation, stress management, relationship development, and exercise. Through the review, the researchers concluded that recreation programs have beneficial effects on mitigating the deterioration of mental health and enhancing mood among post-secondary students. Of the 21 recreation studies reviewed, only one study focused on exercise. Demers (2013) conducted an exercise intervention in which students were expected to complete 150

minutes of self-supervised moderate aerobic exercise per week for six weeks. Paired samples *t* test revealed significant decreases in anxiety and depression (Demers, 2013). Other studies included in Fenton's review (2018) reported physical activity such as tai chi, Pilates, and yoga, which rendered positive mental health and well-being benefits (Caldwell, Emery, Harrison, & Greeson, 2011; Caldwell, Harrison, Adams, & Triplett, 2009; Eastman-Mueller, Wilson, Jung, Kimura, & Tarrant, 2013). In both reviews (Fenton et al., 2018; Huang et al., 2018), exercise interventions were not of primary interest as described above. Given the positive findings, yet scarcity of exercise interventions, there is incentive to give deep consideration to exercise interventions as a primary means of protecting and enhancing post-secondary students' mental health. Further studies must be completed.

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APPENDICES

APPENDIX A

Demographic Questionnaire

Appendix F: (Demographic questionnaire)**Demographics (not formatted):**

Date: _____

ID: _____

Age (yrs): _____ *Sex:* _____

1. People living in Canada come from many different cultural and racial backgrounds. Are you (check all that apply):

White?

Chinese?

South Asian (e.g., East Indian, Pakistani, Sri Lankan)?

Black?

Filipino?

Latin American?

Southeast Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese)?

Arab?

West Asian (e.g., Afghan, Iranian)?

Japanese?

Korean?

Other – Specify _____

2. What language you speak most often at home?

English

Portuguese

French

Punjabi

Arabic

Spanish

Chinese

Tagalog (Pilipino)

Cree

Ukrainian

German

Vietnamese

Greek

Persian

Dutch

Hindi

Hungarian

Russian

Italian

Tamil

Korean

Other, specify: _____

3. What is your highest level of education?

| | | but not treated | with medication | With psychotherapy | With medication And psychotherapy | treatment |
|---|--|--------------------|--------------------|-----------------------|--------------------------------------|-----------|
| Attention Deficit and Hyperactivity Disorder | | | | | | |
| Bipolar Disorder | | | | | | |
| Bulimia | | | | | | |
| Depression | | | | | | |
| Insomnia | | | | | | |
| Other sleep disorder | | | | | | |
| Obsessive compulsive disorder | | | | | | |
| Panic attacks | | | | | | |
| Phobia | | | | | | |
| Schizophrenia | | | | | | |
| Substance abuse or addiction (alcohol or other drugs) | | | | | | |
| Other addiction (e.g., gambling, internet, sexual) | | | | | | |
| Other mental health condition | | | | | | |

APPENDIX B

Physical Activity Readiness Questionnaire

Physical Activity Readiness
Questionnaire - PAR-Q
(revised 2002)

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

| YES | NO | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. Has your doctor ever said that you have a heart condition <u>and</u> that you should only do physical activity recommended by a doctor? |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Do you feel pain in your chest when you do physical activity? |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. In the past month, have you had chest pain when you were not doing physical activity? |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. Do you lose your balance because of dizziness or do you ever lose consciousness? |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity? |
| <input type="checkbox"/> | <input type="checkbox"/> | 6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition? |
| <input type="checkbox"/> | <input type="checkbox"/> | 7. Do you know of <u>any other reason</u> why you should not do physical activity? |

If
you
answered

YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want — as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active — begin slowly and build up gradually. This is the safest and easiest way to go.
- take part in a fitness appraisal — this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

DELAY BECOMING MUCH MORE ACTIVE:

- if you are not feeling well because of a temporary illness such as a cold or a fever — wait until you feel better; or
- if you are or may be pregnant — talk to your doctor before you start becoming more active.

PLEASE NOTE: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

No changes permitted. You are encouraged to photocopy the PAR-Q but only if you use the entire form.

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

"I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction."

NAME _____

SIGNATURE _____

DATE _____

SIGNATURE OF PARENT
or GUARDIAN (for participants under the age of majority) _____

WITNESS _____

Note: This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer YES to any of the seven questions.



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APPENDIX C

Self-Report Physical Activity Measure

Please answer the following questions regarding the extra 60 minutes of physical activity you were asked to complete on your own this week. Please note this does not include the time exercising with your personal trainer.

Please indicate what intensity you were exercising at? With 1 being very light exercise, 5 being moderate exercise, and 10 being maximal effort.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------|---|---|---|---|---|---|---|---|---|----|
| Monday | | | | | | | | | | |
| Tuesday | | | | | | | | | | |
| Wednesday | | | | | | | | | | |
| Thursday | | | | | | | | | | |
| Friday | | | | | | | | | | |
| Saturday | | | | | | | | | | |
| Sunday | | | | | | | | | | |

How long did you exercise for?

| | 0 (No exercise) | Less than 10 minutes | 10-20 minutes | 20-30 minutes | 30-40 minutes | 40-50 minutes | 50-60 minutes | 60+ minutes |
|-----------|-----------------|----------------------|---------------|---------------|---------------|---------------|---------------|-------------|
| Monday | | | | | | | | |
| Tuesday | | | | | | | | |
| Wednesday | | | | | | | | |
| Thursday | | | | | | | | |
| Friday | | | | | | | | |
| Saturday | | | | | | | | |
| Sunday | | | | | | | | |

What type of exercise or activities did you participate in?

APPENDIX D

Borg's Rate of Perceived Exhaustion Scale

Rating of perceived exhaustion with ratio properties

| | | |
|-----|-------------------|-------------------|
| 0 | Nothing at all | |
| 0.5 | Very, very weak | (just noticeable) |
| 1 | Very weak | |
| 2 | Weak | (light) |
| 3 | Moderate | |
| 4 | Somewhat strong | |
| 5 | Strong | (heavy) |
| 6 | | |
| 7 | Very strong | |
| 8 | | |
| 9 | | |
| 10 | Very, very strong | (almost max) |
| . | Maximal | |

APPENDIX E
Mental Health Inventory-38

The Mental Health Inventory (MHI-38)

INSTRUCTIONS: Please read each question and tick the box by the ONE statement that best describes how things have been FOR YOU during the past month. There are no right or wrong answers.

1. How happy, satisfied, or pleased have you been with your personal life during the past month? *(Tick one)*
 - 1⁻ Extremely happy, could not have been more satisfied or pleased
 - 2⁻ Very happy most of the time
 - 3⁻ Generally, satisfied, pleased
 - 4⁻ Sometimes fairly satisfied, sometimes fairly unhappy
 - 5⁻ Generally dissatisfied, unhappy
 - 6⁻ Very dissatisfied, unhappy most of the time

2. How much of the time have you felt lonely during the past month? *(Tick one)*

| | |
|---------------------------------------|-------------------------------------|
| 1 ⁻ All of the time | 4 ⁻ Some of the time |
| 2 ⁻ Most of the time | 5 ⁻ A little of the time |
| 3 ⁻ A good bit of the time | 6 ⁻ None of the time |

3. How often did you become nervous or jumpy when faced with excitement or unexpected situations during the past month? *(Tick one)*

| | |
|-----------------------------|-----------------------------|
| 1 ⁻ Always | 4 ⁻ Sometimes |
| 2 ⁻ Very often | 5 ⁻ Almost never |
| 3 ⁻ Fairly often | 6 ⁻ Never |

4. During the past month, how much of the time have you felt that the future looks hopeful and promising? *(Tick one)*

| | |
|---------------------------------------|-------------------------------------|
| 1 ⁻ All of the time | 4 ⁻ Some of the time |
| 2 ⁻ Most of the time | 5 ⁻ A little of the time |
| 3 ⁻ A good bit of the time | 6 ⁻ None of the time |

5. How much of the time, during the past month, has your daily life been full of things that were interesting to you? *(Tick one)*

| | |
|---------------------------------------|-------------------------------------|
| 1 ⁻ All of the time | 4 ⁻ Some of the time |
| 2 ⁻ Most of the time | 5 ⁻ A little of the time |
| 3 ⁻ A good bit of the time | 6 ⁻ None of the time |

6. How much of the time, during the past month, did you feel relaxed and free from tension? *(Tick one)*

| | |
|---------------------------------------|-------------------------------------|
| 1 ⁻ All of the time | 4 ⁻ Some of the time |
| 2 ⁻ Most of the time | 5 ⁻ A little of the time |
| 3 ⁻ A good bit of the time | 6 ⁻ None of the time |

7. During the past month, how much of the time have you generally enjoyed the things you do? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
8. During the past month, have you had any reason to wonder if you were losing your mind, or losing control over the way you act, talk, think, feel, or of your memory? *(Tick one)*
- | | |
|---|--|
| 1 | No, not at all |
| 2 | Maybe a little |
| 3 | Yes, but not enough to be concerned or worried about |
| 4 | Yes, and I have been a little concerned |
| 5 | Yes, and I am quite concerned |
| 6 | Yes, I am very much concerned about it |
9. Did you feel depressed during the past month? *(Tick one)*
- | | |
|---|---|
| 1 | Yes, to the point that I did not care about anything for days at a time |
| 2 | Yes, very depressed almost every day |
| 3 | Yes, quite depressed several times |
| 4 | Yes, a little depressed now and then |
| 5 | No, never felt depressed at all |
10. During the past month, how much of the time have you felt loved and wanted? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
11. How much of the time, during the past month, have you been a very nervous person? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
12. When you have got up in the morning, this past month, about how often did you expect to have an interesting day? *(Tick one)*
- | | | | |
|---|--------------|---|--------------|
| 1 | Always | 4 | Sometimes |
| 2 | Very often | 5 | Almost never |
| 3 | Fairly often | 6 | Never |
13. During the past month, how much of the time have you felt tense or "high-strung"? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
14. During the past month, have you been in firm control of your behaviour, thoughts, emotions or feelings? *(Tick one)*
- | | | | |
|---|------------------------|---|---------------------------------|
| 1 | Yes, very definitely | 4 | No, not too well |
| 2 | Yes, for the most part | 5 | No, and I am somewhat disturbed |
| 3 | Yes, I guess so | 6 | No, and I am very disturbed |

15. During the past month, how often did your hands shake when you tried to do something? *(Tick one)*
- | | | | |
|---|--------------|---|--------------|
| 1 | Always | 4 | Sometimes |
| 2 | Very often | 5 | Almost never |
| 3 | Fairly often | 6 | Never |
16. During the past month, how often did you feel that you had nothing to look forward to? *(Tick one)*
- | | | | |
|---|--------------|---|--------------|
| 1 | Always | 4 | Sometimes |
| 2 | Very often | 5 | Almost never |
| 3 | Fairly often | 6 | Never |
17. How much of the time, during the past month, have you felt calm and peaceful? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
18. How much of the time, during the past month, have you felt emotionally stable? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
19. How much of the time, during the past month, have you felt downhearted and blue? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
20. How often have you felt like crying, during the past month? *(Tick one)*
- | | | | |
|---|--------------|---|--------------|
| 1 | Always | 4 | Sometimes |
| 2 | Very often | 5 | Almost never |
| 3 | Fairly often | 6 | Never |
21. During the past month, how often have you felt that others would be better off if you were dead? *(Tick one)*
- | | | | |
|---|--------------|---|--------------|
| 1 | Always | 4 | Sometimes |
| 2 | Very often | 5 | Almost never |
| 3 | Fairly often | 6 | Never |
22. How much of the time, during the past month, were you able to relax without difficulty? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
23. How much of the time, during the past month, did you feel that your love relationships, loving and being loved, were full and complete? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |

24. How often, during the past month, did you feel that nothing turned out for you the way you wanted it to? *(Tick one)*
- | | | | |
|---|--------------|---|--------------|
| 1 | Always | 4 | Sometimes |
| 2 | Very often | 5 | Almost never |
| 3 | Fairly often | 6 | Never |
25. How much have you been bothered by nervousness, or your "nerves", during the past month? *(Tick one)*
- | | | | |
|---|--|---|----------------------------------|
| 1 | Extremely so, to the point where I could not take care of things | 4 | Bothered some, enough to notice |
| 2 | Very much bothered | 5 | Bothered just a little by nerves |
| 3 | Bothered quite a bit by nerve | 6 | Not bothered at all by this |
26. During the past month, how much of the time has living been a wonderful adventure for you? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
27. How often, during the past month, have you felt so down in the dumps that nothing could cheer you up? *(Tick one)*
- | | | | |
|---|--------------|---|--------------|
| 1 | Always | 4 | Sometimes |
| 2 | Very often | 5 | Almost never |
| 3 | Fairly often | 6 | Never |
28. During the past month, did you think about taking your own life? *(Tick one)*
- | | |
|---|------------------------|
| 1 | Yes, very often |
| 2 | Yes, fairly often |
| 3 | Yes, a couple of times |
| 4 | Yes, at one time |
| 5 | No, never |
29. During the past month, how much of the time have you felt restless, fidgety, or impatient? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
30. During the past month, how much of the time have you been moody or brooded about things? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
31. How much of the time, during the past month, have you felt cheerful, lighthearted? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |

32. During the past month, how often did you get rattled, upset or flustered? *(Tick one)*
- | | | | |
|---|--------------|---|--------------|
| 1 | Always | 4 | Sometimes |
| 2 | Very often | 5 | Almost never |
| 3 | Fairly often | 6 | Never |
33. During the past month, have you been anxious or worried? *(Tick one)*
- | | |
|---|--|
| 1 | Yes, extremely to the point of being sick or almost sick |
| 2 | Yes, very much so |
| 3 | Yes, quite a bit |
| 4 | Yes, some, enough to bother me |
| 5 | Yes, a little bit |
| 6 | No, not at all |
34. During the past month, how much of the time were you a happy person? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
35. How often during the past month did you find yourself trying to calm down? *(Tick one)*
- | | | | |
|---|--------------|---|--------------|
| 1 | Always | 4 | Sometimes |
| 2 | Very often | 5 | Almost never |
| 3 | Fairly often | 6 | Never |
36. During the past month, how much of the time have you been in low or very low spirits? *(Tick one)*
- | | | | |
|---|------------------------|---|----------------------|
| 1 | All of the time | 4 | Some of the time |
| 2 | Most of the time | 5 | A little of the time |
| 3 | A good bit of the time | 6 | None of the time |
37. How often, during the past month, have you been waking up feeling fresh and rested? *(Tick one)*
- | | | | |
|---|-------------------|---|------------------------------|
| 1 | Always, every day | 4 | Some days, but usually not |
| 2 | Almost every day | 5 | Hardly ever |
| 3 | Most days | 6 | Never wake up feeling rested |
38. During the past month, have you been under or felt you were under any strain, stress or pressure? *(Tick one)*
- | | |
|---|---|
| 1 | Yes, almost more than I could stand or bear |
| 2 | Yes, quite a bit of pressure |
| 3 | Yes, some more than usual |
| 4 | Yes, some, but about normal |
| 5 | Yes, a little bit |
| 6 | No, not at all |

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