

The UWorkItOut UWin Program: Improving University Students' Psychological Distress through Physical Activity

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ABSTRACT

Background: The predominance of mental health concerns among post-secondary students has amplified the demand for campus counselling services. Although exercise is positively linked to mental health, campus interventions that integrate supervised exercise and exercise counselling are limited. **Objectives:** The purpose of the present study was to examine the impact of the UWorkItOut UWin program on students' psychological distress. **Methods:** The UWorkItOut UWin program is a 6-week exercise training and counselling intervention offered to low risk, sedentary students seeking counselling services at a mid-sized Canadian University. The participants included 49 (male, $n = 16$; female, $n = 32$; gender invariant, $n = 1$) university students (71% undergraduate) with a mean age of 23.08 years ($SD = 4.97$). Students completed one unsupervised (60 minutes) and two supervised (45 mins each) exercise training sessions per week. Students also attended weekly individual exercise counselling sessions (30 minutes each). The Mental Health Inventory-38 (MHI-38) was used to measure changes in the three subscales of psychological distress: 1) anxiety, 2) depression, and 3) loss of emotional control. **Results:** Paired samples t tests demonstrated significant decreases in anxiety and depression scores from pre-to post-intervention ($ps < .05$). No significant change was found for loss of emotional control from pre-to post-intervention ($p > .05$). **Conclusion:** The findings provide evidence for the effect of exercise in reducing university students' psychological distress. Consequently, exercise is an additional mental health service for this population, alleviating strain on campus counselling services.

Key words: Depression, Mental Health, Psychological Distress, Anxiety, Counselling, Students, Exercise

INTRODUCTION

Across the country, adults are struggling with mental health concerns, particularly young adults (20-30 years of age) who report the highest rate of anxiety and depression compared to individuals at any other age (Mental Health Commission of Canada, 2013). University students are no exception, with up to 70% of Canadian students reporting symptoms of anxiety and depression, which impacts their day to day functioning and academic performance (American College Health Association-National College Health Assessment II: Canadian Reference Group Executive Summary, 2016). Such high rates of psychological distress can also hinder university students' psychological well-being (i.e., positive feelings and development), a significant contributor to overall mental health (Herbert, Meixner, Wiebking, & Gilg, 2020). The World Health Organization (WHO; 2005, p. 2) defines mental health as a "state of well-being in which the individual realizes his or her own abilities, can cope with normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his/her community." However, the

multitude of adversities and changes students face as they transition to post-secondary education (e.g., missing home, lack of support, and poor nutrition), can hinder their capacity to be mentally healthy (Bewick, Koutsopoulou, Miles, Slaa, & Barkham, 2010). In a 12-month period, 90% of Canadian students "felt overwhelmed with all they had to do" while 65% "felt overwhelming anxiety." Furthermore, 45% "felt so depressed that it was difficult to function" (American College Health Association [ACHA], 2016).

Anxiety is represented by extreme fear due to a foreseen event, which results in cognitive (e.g., restlessness and impaired concentration) and physical (e.g., increased heart rate and rapid breathing) symptoms that persist for at least six months (APA, 2013). Depression involves negative emotions such as sorrow, loneliness, and irritability, resulting in reduced energy, hindering of daily functioning, and disengagement in activities once enjoyed (APA, 2013). Extant mental health literature has primarily focused on individuals diagnosed with a clinical mental illness. However, it is also important to consider those with mental health concerns,

which involves symptoms of psychological distress (e.g., anxiety and depression) that do not meet the DSM-5 diagnostic criteria for a mental illness (Mayo Clinic, 2020). High levels of psychological distress have been reported in non-clinical university students, with 36.6% and 41.8% reporting depressive and anxiety symptoms, respectively (Herbert et al., 2020). In a 3-year longitudinal study examining mental health in a general undergraduate student population ($N=24,234$), anxiety and depressive symptoms spiked in year one and steadily increased in years two and three (Bewick et al., 2010). Given psychological distress heightens throughout one's university experience, evidence-based strategies are needed across campus to promote students' mental health.

The predominance of mental health concerns among post-secondary students (ACHA, 2016) has led to a greater demand for campus counselling services, which can exceed 40% of the student body (Center for Collegiate Mental Health, 2019). Such demands, coupled with the high rates of mental health concerns among university students, indicate a crisis. Although treatments such as psychotherapy and pharmacology are being used for mental health concerns, additional services devoted to students' mental health are needed across university campuses to ease the stress on the mental health services system (Huang, Nigatu, Smail-Crevier, Zhang, & Wang, 2018). To make the largest effect on mental health in post-secondary students, it is recommended for mental health professionals to utilize therapeutic lifestyle changes (i.e., physical activity, nutrition, recreation) to improve symptoms in individuals with mental health concerns (Walsh, 2011).

There is empirical evidence to support the effectiveness of physical activity as an alternative therapy to prevent and treat mental illness (Rosenbaum, Tiedemann, Sherrington, Curtis, & Ward, 2014). Physical activity is any bodily movement by skeletal muscle that produces energy expenditure (Caspersen, Powell, & Christenson, 1985). Physical activity has an inverse relationship with depression, as adults who lack physical activity have an 83% increased risk of developing depression (Paulo et al., 2016). The benefits of physical activity on mental health have been displayed in several reviews and meta-analyses (e.g., Rosenbaum et al., 2014). However, only 44% of Canadian undergraduate students reported meeting the physical activity guidelines of 150 minutes of moderate to vigorous physical activity per week (Canadian Society for Exercise Physiology, 2018). The significant time spent sitting in class, completing assignments, and studying for exams can promote sedentary behaviour in this population, which coincides with poor dietary habits and obesity (Kolodinsky, Harvey-Berino, Berlin, Johnson, & Reynolds, 2007). Therefore, it is vital to promote physical activity engagement in university students to encourage adherence following graduation (Kolodinsky et al., 2007). Nonetheless, university students noted feeling receptive to physical activity as a self-care strategy and acknowledged its distinct benefits (e.g., relapse prevention and absence of side effects) not afforded in traditional approaches (deJonge, Omran, Faulkner, & Sabiston, 2020).

Exercise, a subset of physical activity, is defined as any regular and organized activity for the purpose of improving fitness (Caspersen et al., 1985). The physical benefits of exercise are far reaching as it can lower blood pressure, improve cardiovascular fitness, reduce weight, and avert chronic disease (e.g., diabetes, cancer, heart disease, and obesity; Mikkelsen, Stojanovska, Polenakovic, Bosevski, & Apostolopoulos, 2017). Various types of exercise have been shown to improve mental health in adults such as aerobic exercise and resistance training (Rosenbaum et al., 2014). Although the benefits of physical activity on mental health are well recognized, there is a scarcity of exercise interventions across post-secondary campuses to improve university students' mental health (Fenton, White, Hamilton-Hinch, & Gilbert, 2018). A meta-analysis examining the effectiveness of interventions for mental health concerns among university and college students included merely one exercise protocol (Huang et al., 2018). This exercise program involved three 20-minute sessions per week, which resulted in significant decreases in anxiety and depression with a large effect size of -2.15 (Smits et al., 2008). Compared to the other interventions included in the meta-analysis, exercise as well as art and peer support interventions exhibited the highest effect size (-0.76) for treating depression and anxiety (Huang et al., 2018). Moreover, in a review of 21 campus recreational programs to address mental health issues in post-secondary students, only one was exclusively exercise-based (Fenton et al., 2018). Specifically, Demers (2013) reported 150 minutes of moderate aerobic exercise per week to decrease students' anxiety and depression. More recently, a 6-week online aerobic exercise intervention (12 sessions) significantly decreased depressive symptoms in 73.7% of non-clinical university students (Herbert et al., 2020). However, such exercise interventions were self-supervised and may be subject to bias as a result. Therefore, supervised interventions are warranted as they promote exercise maintenance in university students (deJonge et al., 2020).

In addition to exercise participation, exercise counselling techniques, such as motivational interviewing, have been shown to reduce depressive symptoms in post-secondary students (McFadden, Fortier, & Gu erin, 2017). Given the positive impact of exercise counselling on mental health, its integration with exercise training has been implemented in recent research. Nasstasia et al. (2019) found the combination of exercise (i.e., 3-5 times per week for 1 hour) and motivational interviewing to increase exercise readiness, enhance self-efficacy, and lower depression in youth. Such findings show promise for interventions of this nature to positively contribute to university students' mental health.

The aforementioned shortcomings (i.e., scarcity of interventions, unsupervised exercise) pose a need to expand exercise and mental health research with a university population, particularly those experiencing mental health concerns. Exercise can protect against psychological distress by serving as an adaptive coping strategy to manage stress and ultimately enhance resilience (Hegberg & Tone, 2015). This is significant for university students as they have reported using maladaptive coping strategies (e.g., self-blame and denial)

in stressful situations, which predicted symptoms of anxiety and depression (Mahmoud, Staten, Hall, & Lennie, 2012). Addressing such symptoms at an early stage can prevent future onset of a clinical disorder (Tampke, 2013). Therefore, the purpose of the present study was to examine the effects of a six-week supervised exercise training and counselling intervention (the UWorkItOut UWin program) on the psychological distress (i.e., depression, anxiety, and loss of emotional control) of low risk university students seeking counselling services on campus. The university student counselling center (SCC) has experienced a surge in students seeking support, which aligns with the demands faced by most post-secondary institutions (Center for Collegiate Mental Health, 2019). Consequently, long wait periods hinder the opportunity for students to meet regularly with a counsellor, especially for those without a psychological disorder. Therefore, the intervention also serves to reduce the burden placed on counselling services by assessing an alternative mental health resource to those waiting to see a counsellor. It was hypothesized that participants would report reduced scores for depression, anxiety, and loss of emotional control after completing the six-week exercise intervention.

METHODS

Study Design and Participants

The current study used a quasi-experimental pretest-posttest single-group design to detect changes in psychological distress after completing the UWorkItOut UWin program. Participant inclusion criteria included: a) enrollment at the participating university, b) seeking services at the SCC, and c) identification as “low risk” (see definition below) and sedentary by a counsellor at SCC. Participants were excluded from the study if exercise was deemed unsafe based on a self-report screening tool of their current physical health (refer to recruitment section). A total of 84 students were deemed eligible to participate in the intervention, of which 58 enrolled. However, 9 participants did not adhere to the intervention requirements or stopped responding to the research coordinator on efforts to arrange weekly exercise and counselling sessions. Consequently, 49 participants successfully completed the intervention. Using G*Power 3.1, a priori power analysis was performed to examine changes in psychological distress from pre- to post-intervention using paired samples *t*-test. Consequently, a sample size of 34 was required to achieve a medium effect size ($d = .50$) with 80% power ($\alpha = .05$, two-tailed). This sample size aligns with that of previous exercise interventions using this statistical analysis (Knobf, Thompson, Fennie, & Erdos, 2014). Participants included male ($n = 16$), female ($n = 32$), and gender invariant ($n = 1$) students with an average age of 23.08 ($SD = 4.9$) years. Additional characteristics of the study sample are provided in Table 1.

Recruitment

Recruitment spanned from Fall 2017 to Winter of 2019, in which five rounds (each round spanning 6 weeks) of the UWorkItOut UWin program were implemented. The number

Table 1. Sample characteristics ($N = 49$)

Characteristic	<i>n</i> (%)
Gender	
Female	32(65.3)
Male	16(32.7)
Gender invariant	1(2.0)
Ethnicity	
Caucasian	28(57.2)
South-Asian	10(20.4)
Arab	5(10.2)
African Canadian	2(4.1)
Filipino	2(4.1)
Chinese	1(2.0)
Other	1(2.0)
Year of Study	
1 st year undergraduate	6(12.2)
2 nd year undergraduate	6(12.2)
3 rd year undergraduate	14(28.6)
4 th year undergraduate	6(12.2)
5 th year undergraduate	3(6.1)
Graduate student	14(28.6)
Student Status	
Full-time	44(89.8)
Part-time	5(10.2)
Faculty/Department	
Arts, Humanities & Social Science	17(34.7)
Engineering	11(22.4)
Science	8(16.3)
Law	7(14.3)
Nursing	3(6.1)
Business	2(4.1)
Human Kinetics	1(2.0)

of participants involved in each round was based on the available resources at that time (personal trainers, space, and equipment). Upon receiving ethics approval, participant recruitment occurred at the SCC on campus. Sedentary students deemed low risk by a counsellor at the SCC were referred to enroll in the UWorkItOut UWin program. According to the SCC, low risk signifies individuals who experience anxiety and depressive symptoms but maintain daily functioning. Although these individuals do not experience suicidal thoughts, they want to enhance their mental state and daily functioning.

Students deemed eligible to participate were provided with program information and permission was sought for the UWorkItOut UWin program coordinator to contact them (via phone or email) to schedule an initial meeting. At the initial meeting, students provided consent and completed pre-intervention assessments online. Participants also completed a hard copy of the Physical Activity Readiness Questionnaire (PAR-Q) (Canadian Society for Exercise Physiology, 2002) to ensure their readiness to participate in physical activity prior to intervention commencement. The PAR-Q includes polar questions (yes or no) regarding an

individual's current physical health. All participants were granted approval to exercise as they answered "no" to all of the questions in the PAR-Q. They were then paired with a personal trainer for the duration of the intervention. Upon completion of the intervention, students completed the same online assessments administered pre-intervention.

Program Description

The UWorkItOut UWin program was 6 weeks in duration and involved two main components. The first component comprised two supervised one-on-one exercise training sessions each week. Over the course of the program, each participant engaged in 18 exercise sessions (45 minutes each) under the supervision of their personal trainer (roughly 900 minutes total). Progress was monitored by the personal trainer through the TeamBuildr™ strength and conditioning app, which recorded participants' repetitions, weight, or time (e.g., plank hold) for each exercise. Given social support is a primary predictor of physical activity engagement in university students (Scarapicchia, Sabiston, Pila, Arbour-Nicitopoulos, & Faulkner, 2017), all exercise sessions were instructed by a qualified student trainer. All student trainers were undergraduate or graduate students, with prior training experience and/or certifications (e.g., Canfitpro). In addition, all student trainers were required to attend an orientation session delivered by the UWorkItOut UWin research team. The session involved a review and demonstration of proper exercise practices, the characteristics of psychological distress, and protocol for helping a student in need. Participants were paired with a personal trainer based on scheduling compatibility and participants' preferred gender of their trainer. University students have expressed discomfort and self-presentation anxiety as barriers to engaging in exercise in a public gym (deJonge et al., 2020). Therefore, all exercise sessions were held in a secluded workout room within a fitness center on campus.

The exercise sessions included light cardiovascular fitness training (e.g., stationary bicycle), whole body strength training (e.g., plank, dumbbell, kettlebell, machines), and flexibility training (e.g., hamstring stretch). Prescribed exercise is related to greater mental health and adherence to exercise (deJonge et al., 2020). Further, participants were required to engage in exercise independently for 60 minutes each week in order to reach 150 minutes of moderate to vigorous physical activity as per the Canadian guidelines (Canadian Society for Exercise Physiology, 2018). An online questionnaire was administered to participants each week to monitor the type, length, and intensity of their exercise.

The second component of the UWorkItOut UWin program consisted of individual exercise counselling sessions held once per week for 30 minutes each. The primary aim of the counselling sessions was to enhance participants' motivation to engage in exercise without supervision. A different topic was discussed each week and included: 1) self-awareness and motivational readiness to change, 2) FITT (frequency, intensity, type and time) principles of goal setting, 3) identifying and overcoming barriers to exercise, 4) enlisting social support, 5) using positive self-talk, and

6) implementing environmental cues to action. During each session, participants engaged in a variety of activities relevant to the current topic. For example, in the third week of the program, participants were required to identify barriers they have encountered or anticipate encountering when attempting to reach their exercise goals. With assistance from the exercise counsellor, participants were then asked to brainstorm strategies to overcome such barriers. Participants were paired with one of two exercise counsellors for the duration of the intervention. Both exercise counsellors were graduate students specializing in exercise psychology and/or certified in health and wellness coaching (i.e., Wellcoaches).

The structure of the intervention was loosely grounded in Bandura's (1997) Self-Efficacy Theory as it utilized the four predictors (i.e., mastery experience, vicarious learning, verbal persuasion, and physiological/affective states) of self-efficacy. The supervised and unsupervised exercise sessions promoted mastery experience (i.e., successful exercise accomplishments) and also elicited vicarious learning (i.e., watching others succeed) as the personal trainer provided demonstration and instruction for each exercise. In the training and counselling sessions, verbal persuasion (i.e., encouragement from others) was used to motivate participants to maintain regular exercise. Given the current sample was sedentary at the start of the intervention, the exercise counselling sessions helped participants to perceive their physical indicants (i.e., increased heart rate, fatigue, sweating, muscle pain) from exercise as positive (physiological and affective states). Previous research has shown beginner exercisers to misconstrue an elevated heart rate for symptoms of anxiety (Lox, Martin Ginis, Gainforth, & Petruzzello, 2019).

Measurement

The current study was part of a larger scale study in which participants completed a battery of measures, which also assessed participants' physical activity levels and quality of life. However, for the purposes of the current study, only the scores of the Mental Health Inventory-38 (MHI-38) (Veit & Ware, 1983) will be examined as it assessed changes in psychological distress.

The MHI-38 is a standardized 38-item self-report questionnaire that assesses psychological distress and psychological well-being with respect to frequency or intensity. Specifically, the scale of psychological distress comprises 24 items, which assess three subscales: anxiety, depression, and loss of emotional control. Nine items represent anxiety (summative scores varying from 9-54), four items represent depression (summative scores varying from 4-23), and nine items represent loss of emotional control (summative scores varying from 9-53). Higher scores indicate greater levels for each subscale (Davies, Sherbourne, Peterson, & Ware, 1988). With the exception of two (scored from 1-5), all items are measured on a six-point scale ranging from 1-6. An example item measuring depression is, "Did you feel depressed during the past month?", where 1 represents "Yes, to the point I did not care about anything for days at a time" and 6 represents "No, never felt depressed at all". The MHI-38 has shown strong internal consistency (ranging

from .83-.91), adequate construct and external validity (Veit & Ware, 1983), as well as good test-retest reliability after one year, ranging from .56 and .64 (Delman, Robinson, Kimmelblatt, & McCormack, 2008).

Data Analysis

In accordance with the scoring guidelines for the MHI-38 (Davies et al., 1988), several items are reverse scored to ensure a higher score reflected greater anxiety, depression and loss of emotional control. Statistical analyses were performed using IBM SPSS Software (Version 23: Armonk, NY, USA). The Shapiro-Wilk test of normality was conducted to test for normal distribution and box plots were created to identify outliers in the data (i.e., values greater than 1.5 box-lengths). To determine whether the exercise intervention contributed to changes in participants' psychological distress, two-tailed paired-samples *t*-tests were conducted to compare within-group changes for anxiety, depression, and loss of emotional control from pre-to post- intervention. Statistical significance was set at $p < .05$ for all tests. Cohen's *d* was used to calculate effect size for all three subscales to determine the magnitude of change from pre- to post-intervention. As recommended by Cohen (1988), effect size was interpreted using cut-off values of 0.2 (small effect), 0.5 (medium effect) and 0.8 (large effect).

RESULTS

Means and standard deviations for pre-and post-intervention were calculated for anxiety, depression, and loss of emotional control (displayed in Table 2). The Shapiro-Wilk's test revealed all subscales to meet the assumption of normality and no outliers were identified upon inspection of the box plots.

Paired samples *t*-test indicated a significant reduction in anxiety scores from pre- (32.12 ± 8.26) to post- (27.27 ± 8.29) intervention, which disclosed a significant mean decrease of 4.86 (95% CI, 2.82 to 6.90), $t(48) = 4.78$, $p < .01$. Cohen's *d* revealed a medium effect size ($d = .68$) for the

difference in anxiety scores from pre-to post-intervention. Similarly, depression scores significantly decreased from pre- (12.27 ± 3.49) to post- (10.96 ± 4.26) intervention, with a significant mean decrease of 1.31 (95% CI, .26 to 2.35), $t(48) = 2.52$, $p < .05$. Results of Cohen's *d* calculation indicated a small effect size for the change in depression scores from pre-to post-intervention ($d = .36$). A non-significant change in mean scores were found for loss of emotional control from pre- (24.80 ± 6.44) to post- (22.61 ± 7.34) intervention, with a mean decrease of 2.18 (95% CI, -.02 to 4.39), $t(48) = 1.99$, $p > .05$. An overview of the results of the paired samples *t*-test are presented in Table 3.

DISCUSSION

The scarcity of supervised campus exercise interventions and their lack of integration with exercise counselling warranted the need to expand this area of research, and as such led to the purpose of the current study. We aimed to investigate the effects of a six-week exercise training and exercise counselling intervention (the UWorkItOut UWin program) on anxiety, depression and loss of emotional control in low risk university students. It was hypothesized that students would report a reduction in anxiety, depression, and loss of emotional control from pre- to post-intervention. Overall, the integration of exercise training and exercise counselling served to reduce university students' psychological distress. In support of the hypothesis, a significant decrease in anxiety scores was found post-intervention with a medium effect size. This is consistent with previous research that found exercise to decrease anxiety symptoms in university students (Demers, 2013; Smits et al., 2008). Similarly, the current study found a significant decrease in depression scores from pre-to post-intervention with a small effect size. Such findings are in line with results from a meta-analysis wherein various types of exercise (e.g., aerobic exercise, resistance training) showed significant decreases in depression scores with university students (Demers, 2013; Smits et al., 2008).

The effects of exercise in reducing anxiety and depressive symptoms in university students is significant to their post-secondary experience. Depression and anxiety are significant predictors of low GPA in university students (Lepp, Barkley, & Karpinski, 2014). Therefore, exercise can indirectly improve academic performance by reducing anxiety and depressive symptoms. Given psychological distress can lead to student drop-out (Marcotte & Lévesque, 2018), exercise can also facilitate degree completion by providing a buffer against university drop-out. Furthermore, the notable demand for accessibility services among students with anxiety

Table 2. Means and standard deviations for anxiety, depression and loss of emotional control

Subscale	Pre-Intervention Mean (SD)	Post-Intervention Mean (SD)
Anxiety	32.12(8.26)	27.7(82.9)
Depression	12.27(3.49)	10.96(4.26)
Loss of Emotional control	24.80(6.44)	22.61(7.34)

Table 3. Summary of paired samples T-Test

Subscale	Mean (SD)	95% CI	<i>t</i>	df	<i>p</i>	<i>d</i>
Anxiety	4.86(7.11)	2.82-6.90	4.78	48	.000 **	.68
Depression	1.31(3.64)	.262-2.35	2.52	48	.015 *	.36
Loss of Emotional control	2.18(7.67)	-.02-4.39	1.99	48	.052	.28

* $p < .05$, ** $p < .01$

disorders (Sokal, 2016) suggests that exercise can reduce students' need for these services and the negative connotations (i.e., fear of resentment from peers, negative stigma) that accompany its use. Moreover, exercise can mitigate the negative impact of psychological distress on life satisfaction and future professional development in this population (Lepp et al., 2014). Given such benefits, standard workshops can be held across campuses to promote exercise as a coping mechanism to reducing psychological distress.

In addition to psychological gains, exercise can also provide physiological benefits to university students. Structured and regular exercise can positively influence cardiovascular endurance and muscular strength and can combat health conditions and diseases such as coronary heart disease, obesity, high blood pressure, type 2 diabetes, and cancer (Mikkelsen et al., 2017). Therefore, exercise can provide additional benefits not afforded by other mental health treatments (e.g., medication) and can serve as a cost-effective alternative for university students.

Although scores for loss of emotional control decreased from pre- to post-intervention, this change was non-significant and did not support our hypothesis. The lack of statistical significance contradicts previous research that found high self-regulation ability (control over thoughts, performance regulation, and impulse control) to be associated with higher exercise participation levels in university students (Ahn, Jeon, & Kwon, 2016). One possible explanation for the lack of significance in the current study could be attributed to the time of year in which the intervention was implemented. Given each round of the intervention began after reading week (both Fall and Winter reading weeks) to avoid interruption, academic stressors may have been a predominant concern. During this time, students had received their mid-term exam results and were already studying for final exams and submitting final projects. Given procrastination, test anxiety, and low grades are students' main motives for seeking counselling (Cairns, Massfeller, & Deeth, 2010), these academic factors may have had an influence on students' perceived control over their thoughts, emotions, and feelings. However, it can be argued that the UWorkItOut UWin program may have averted students from experiencing greater declines in loss of emotional control during this time of adversity. Nonetheless, future research should consider implementing an exercise intervention with university students at the beginning of the semester when academic stressors may be lessened.

Another explanation for the lack of significant change in loss of emotional control is that some of the items in the MHI-38 which measures that construct may not be suitable to the current sample. The students recruited for this study were deemed "low risk" and did not present any suicidal ideation or intent. Therefore, items such as "During the past month, how often have you felt that others would be better off if you were dead?" and "During the past month, did you think about taking your own life?" were probably not applicable to the current sample. This may attribute to the non-significant change in loss of emotional control. Therefore, psychometric testing of the MHI-38 with this low risk

population is needed. Moreover, qualitative measures (i.e., focus groups and interviews) are needed to further explore the impact of exercise on emotional control in university students, as it can provide insight that may not be captured in quantitative research.

There are several noteworthy strengths of the current study such as the use of a private exercise room as well as the supervised and individualised nature of the intervention. As such, these components may be essential to programs for individuals with mental health concerns. Furthermore, the inclusion of exercise counselling is significant, as this component is typically lacking in traditional exercise interventions (McFadden et al., 2017). Given adults with mental health concerns often refrain from exercise due to a lack of confidence and low self-esteem, exercise counselling is pertinent to this population as it aims to improve confidence and enhance exercise autonomy (McFadden et al., 2017). However, it should be noted that the impact of the counselling sessions in isolation from exercise training was not investigated in the current study. Therefore, future research seeking to measure the effects of an integrated exercise and counselling intervention should include an exercise-only condition and a counselling-only condition to determine which has a greater impact on psychological distress. Lastly, the current study involved a diverse sample with respect to ethnicity, year of study, and faculty/department. Therefore, the findings are generalizable to low-risk sedentary students enrolled at other universities.

There are limitations to the current study that must be acknowledged. On ethical grounds, students were not prohibited from using other mental health resources (e.g., psychologist) while participating in the intervention. Although this is reflective of "real-world" conditions, such resources may have contributed to changes in students' psychological distress. However, in personal discussion with the participants, majority of them did not seek therapy during the time of the intervention, and for those that did, this was on a limited scope. Nonetheless, additional research is warranted in which other mental health resources are controlled. Furthermore, the absence of a control group prohibited comparisons to be made regarding changes in psychological distress. Given the exercise intervention was a service to students experiencing symptoms of psychological distress, a control group was not included as it would be unethical to withhold those students the opportunity to better their mental health. To ensure such findings are attributed to the intervention, future research should consider including a wait-list control in which participants would receive the intervention at a later date. Moreover, given the current study lacked a follow-up assessment, future research should also assess exercise adherence and changes in students' psychological distress overtime (e.g., 3-6 months post intervention).

It should also be noted that the MHI-38, which was used to assess psychological distress, is not a diagnostic tool. Therefore, it does not have the capability to diagnose an individual with mental illness (Veit & Ware, 1983). However, Veit and Ware (1983) administered the MHI-38 with the general population to assess mental health. The following mean

scores were found for the psychological distress subscales in the general population: 19.15 ($SD=6.85$) for anxiety, 8.05 ($SD=2.97$) for depression, and 15.90 ($SD=5.57$) for loss of emotional control. When comparing the current participants' pre-intervention scores to those found in the general population, a score difference of 12.97, 4.22, and 8.90 is evident for anxiety, depression and loss of emotional control, respectively. Consequently, it would seem that participants in the current study had higher psychological distress than the general population from 1983. Nonetheless, caution should be taken when comparing current findings to those with a clinically diagnosed sample. Additionally, it is important to acknowledge that 26 students were eligible to participate in the intervention (were referred by SCC) but did not enroll, while 9 students who enrolled were lost to follow up or did not adhere to the intervention requirements. Several factors (e.g., upward social comparisons, gym culture, and lack of social support) have been found to influence exercise drop-out in men and women (Pridgeon & Grogan, 2012) and as such this would be worthwhile to explore among university students. Understanding participants' decisions for not participating or adhering to the exercise intervention is vital to identifying and addressing barriers to exercise involvement. Such insights can also inform the design and recruitment procedures of future exercise interventions with this population. Moreover, to help prevent drop-out and non-adherence, additional avenues of social support such as a structured exercise class, an exercise companion, and online social networks can encourage exercise participation (Courneya, & McAuley, 1995; Zhang, Brackbill, Yang, & Centola, 2015) and therefore should be considered in future research.

Several other recommendations for future research can be drawn from this study. Regarding duration, the current intervention was implemented over a 6-week period. Although exercise interventions spanning 6-weeks are infrequent, they have been shown to reduce psychological distress similar to the current study. For example, Herring, Jacob, Suveg, and O'Connor (2011) found aerobic exercise and resistance training to improve women's trait anxiety (aerobic, $d=.52$, resistance, $d=.54$) and depression (resistance, $d=.54$) after 6 weeks. However, future researchers should consider implementing a 12-week exercise intervention, as they have produced large effect sizes on mental health outcomes in adults. Mazolini, Jensen, and Melville (2009) ran a 12-week group-based aerobic and resistance training program with schizophrenic patients and found large effect sizes for decreasing depression ($r=.90$) and enhancing overall mental health ($r=.80$). Such findings show promise for a 12-week exercise intervention with university students and would fit within a typical semester period.

The current intervention is novel as it integrated supervised exercise training and individual exercise counselling to improve mental health in university students. Furthermore, the current study is unique in its aim to reduce psychological distress among university students deemed low risk. Thus, the current findings contribute to extant literature by providing support for the benefit of exercise in reducing anxiety and depression among non-clinical university students.

CONCLUSION

This study found statistically significant improvements in university students' anxiety and depression after completion of a 6-week exercise training and counselling intervention. Findings from this research offer practical implications for post-secondary institutions. Supervised exercise training can provide university students with an additional mental health service, reducing the demand for campus counselling services. Future research is warranted to address the aforementioned limitations of the current study and consider the recommendations provided.

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