The SHINE (Supporting Her In Navigating Exercise) Program: An Experimental Study Examining Peer Support as an Exercise Promotion Tool Among Undergraduate Women Initiates

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Abstract

Background: Despite the benefits of regular exercise, many Canadians, especially undergraduate women (UW), experienced decreased engagement throughout the pandemic, due, in part, to feelings of low social support and confidence. One promising approach to enhance participation is peer-mentorship programs (PMP): pairing knowledge-seeking individuals with experienced mentors. To date, theoretically grounded research on PMP tailored to UW remains sparse. **Objective:** Grounded in self-determination theory (SDT), this study examined the impact of a 6-week, campus-based exercise PMP on psychological outcomes and adherence among UW initiates. All participants were expected to improve all outcomes, with greater gains in the PMP group. **Method:** Undergraduate women from a mid-sized Canadian university wanting to increase activity were randomized to intervention or control groups. Senior students in a health discipline with exercise expertise were recruited as mentors and participated in a 2-hour, motivational interviewing focused training workshop. All participants received a standardized campus gym tour, a structured exercise guide, and were asked to exercise triweekly. Once a week, mentors exercised with their intervention participants and offered ongoing virtual support. In addition to demographic data, quantitative data were collected pre-, mid-, and post-intervention through the Psychological Needs Satisfaction in Exercise Scale (PNSES), Behavioural Regulation in Exercise Questionnaire-3 (BREQ-3), and Depression Anxiety Stress Scale- Short Form (DASS-21). Exercise adherence was captured through Strava and software-supported facility attendance. To gain insights into study experiences, post-program participants completed an exit questionnaire to gain insights into their study experiences. Quantitative data were analyzed using descriptive statistics and two-way mixed factorial ANOVAs; qualitative data were inductively and deductively analyzed. **Results:** Eighty prospective participants were

assessed for eligibility, and 33 were randomized to the two conditions. In total, 26 UW completed the intervention or at least two of the three assessments (intervention = 13; control = 13). Intervention participants were supported by one of the six program mentors. Demographic data identified that participants were an average of 24.3 years old (SD = 12.7), most (46%) were enrolled in their first year of university and were classified as having overweight (Body mass index; $M = 25.5$, $SD = 5.6$). Quantitative results found interaction effects ($p < 0.05$) for autonomy and competence, as supported by qualitative accounts. Both groups experienced significant improvements to external, identified, and integrated regulation, along with symptoms of depression, anxiety and stress. **Discussion**: The current PMP proved to be an effective method for enhancing autonomy and competence among participants with a mentor, with additional improvements in other constructs. Taken together and in line with the literature, these results highlight the value of tailored, supportive exercise intervention for promoting UW exercise engagement. This population stands to gain from greater access to exercise opportunities, given the well-established physical and mental benefits associated with more movement. Remarkably, increases in most basic needs, regulation, and distress symptoms emerged in as little as 3 weeks: a novel finding that warrants further exploration, particularly regarding the mechanisms behind these early changes. Based on these findings, future programs should continue exploring accessibility, early engagement, and adaptable delivery methods in longer programs**. Conclusion:** Effective strategies to promote UW exercise habits are essential for improving quality of life and fostering lifelong habits. Strengthening campus movement culture benefits physical and mental health during this critical developmental phase. Results will be shared with key stakeholders, such as Lakehead Athletics and Student Health and Wellness to inform best practice.

Key Definitions

Peer-Mentorship Program (PMP): These programs involve an individual (mentor) with expertise in a field who guides groups of individuals with less experience (mentees) to enhance their knowledge and skill level (Peirson, 1993). Peer mentorship programs foster supportive relationships to improve social support and skills in a specific setting (Peirson, 1993).

Physical Activity: Any bodily movement generated by skeletal muscles and resulting in energy expenditure (Caspersen et al., 1985)

Exercise: A type of physical activity that involves purposeful repetitive movements aimed at achieving or maintaining fitness goals (Caspersen et al., 1985; Dasso, 2019)

Exercise Adherence: The consistent and ongoing participation in planned movement, which signifies an individual's ability and commitment to maintain regular engagement over time (Dishman, 1988)

Exercise Initiates: Individuals who have participated in physical activity one or fewer times per week over the past six months and who aim to increase their habits (Milne et al., 2008)

Undergraduate Women (UW): Individuals pursuing postsecondary education at a university through a bachelor's degree who self-identify as women, regardless of sex.

COVID-19 Pandemic: An acute respiratory syndrome (SARS-CoV-2 virus) that was first detected in China in December 2019 and quickly spread worldwide (World Health Organization [WHO], n.d. -a)

COVID-19 Precautions: The guidelines implemented by authorities to protect the public and curb the spread of COVID-19.

Post-Precaution Removal: The point in time when most/all COVID-19 public health protections were lifted.

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Regular physical activity is vital for optimal health, encompassing any movement that burns and expels energy (Caspersen et al., 1985; World Health Organization [WHO], 2022). Exercise is a subclass of physical activity involving structured bodily movement (Caspersen et al., 1985; Dasso, 2019; WHO, 2022). Both types of engagement offer significant health benefits, including improved cardiovascular health, strength, mobility, mood, and reduced risks of chronic illnesses like obesity and diabetes (Lacombe et al., 2019; Canadian Society for Exercise Physiology [CSEP], 2021). However, nearly half of Canadians do not meet the recommended 150 minutes of weekly activity (ParticipACTION, 2022).

A lack of physical activity and exercise among adults often originates from low adolescent engagement. Young women, in particular, frequently have low self-confidence and motivation challenges, leading to higher dropout rates in organized sports and less frequent exercise engagement (Brennan et al., 2024; Canadian Women and Sport [CWS], 2022). Consequently, women's physical activity and exercise participation tend to decline further with age, especially during the transition to university (Edelmann et al., 2022; Espada et al., 2023). Entering university introduces additional barriers, as many undergraduate women (UW) avoid recreational sports due to perceived skill gaps and discomfort in co-ed settings (Wilson et al., 2022; Wood & Danylchuk, 2015). While gyms provide alternatives, unfamiliarity can deter participation (Hurley et al., 2018; Peters et al., 2019). Among UW, social support has acted as a strong motivator for engagement, as this cohort has often preferred group-based environments (Thomas et al., 2019; Othman et al., 2022).

One construct relevant to promoting physical activity is motivation, which is the foundation of self-determination theory (SDT) and emphasizes that heightened engagement will occur when individuals feel autonomous, competent, and have a sense of relatedness (Deci & Ryan, 1980). Individuals who fail to foster all three of these basic psychological needs (BPN) will be less motivated to engage in exercise, a phenomenon that was commonly experienced among UW during the COVID-19 pandemic (Bell et al., 2023; Deci & Ryan, 1980; Pellerine et al., 2022).

The pandemic precautions negatively affected health behaviours across many populations, but the exercise habits of UW experienced a disproportionate decline (Bell et al., 2023; Pellerine et al., 2022) as compared to those of men. Many UW in this cohort reported adverse outcomes due to low activity levels, including weight gain and poorer dietary habits (Bell et al., 2023). Unfortunately, even after the removal of precautions, the engagement habits of UW continued to decline (Fabiano & Pearson, 2025; Government of Ontario, 2023). This was largely due to a lack of confidence associated with exercising independently (Fabiano & Pearson, 2025; Garćia-Campanario et al., 2022; Peters et al., 2019; Wilson et al., 2022). Research conducted during the pandemic recovery era has indicated that peer-led programs can potentially improve this cohort's exercise habits (Danielsen et al., 2023; Goncalves et al., 2023). However, there is a notable lack of such programs designed to enhance their participation (Danielsen et al., 2023; Goncalves et al., 2023).

To enhance exercise engagement among UW, it is essential to equip them with physical activity-related skills and knowledge that were compromised during the pandemic (Auerswald et al., 2024; Cahuas et al., 2023). Fostering social support is essential for this group, as they heavily rely on their peers to encourage exercise participation; peer-mentorship programs (PMP) show

promise as a way to enhance engagement (Cahuas et al., 2023; Fabiano & Pearson, 2025; Peirson, 1993). However, theoretically grounded research on PMP as a social support strategy in the pandemic recovery era is scarce, especially among UW. Thus, this study will involve implementing a 6-week PMP based on the SDT and assessing its impact on exercise behaviour and psychological constructs among UW attending a mid-sized Canadian university.

Physical Activity and Exercise Overview

While numerous contributors can significantly improve an individual's well-being, engaging in regular physical activity or exercise has been deemed one of the most controllable factors for maintaining optimal health (Lacombe et al., 2019; Ng et al., 2020; ParticipACTION, 2022). The terms "physical activity" and "exercise" are often used interchangeably but have distinct differences (Caspersen et al., 1985; Dasso, 2019). This is because exercise is a subclass of physical activity involving planned, purposeful, and repetitive movements to achieve or maintain fitness goals (Caspersen et al., 1985; Dasso, 2019). Physical activity is a broader term that is often widely promoted because it is considered less intimidating, especially for those newer to purposeful movement (Coulter et al., 2021; Dasso, 2019; Milton et al., 2020). When comparing the two terms, physical activity involves occupational, household, or other activities that involve movement (e.g., taking the stairs, gardening, vacuuming, etc.). At the same time, exercise includes planned movements that are often used to enhance fitness, strength, flexibility, balance, or agility (e.g., working out at a gym, golfing, cycling, etc.; Caspersen et al., 1985; Dasso, 2019).

The literature has widely accepted that regular physical activity and exercise are crucial at every stage of life due to their multifaceted health benefits (CSEP, 2021; ParticipACTION, 2021). Examples of the positive effects of engagement at various life phases include fostering

fundamental skill development in early childhood, enhancing brain health for students, improving posture during pregnancy, and reducing fall risks in old age (CSEP, 2021; Langhammer et al., 2018). In general, the overarching benefits of regular bodily movement include improvements in cardiovascular health, muscle and bone strength, mood, mobility, sleep, and weight management (Lacombe et al., 2019; Myers et al., 2004; Ng et al., 2020; ParticipACTION, 2022). More specifically, regular engagement in physical activity and exercise have been deemed effective in reducing the risk for preventing and treating major chronic diseases, including obesity, cardiovascular disease, and diabetes (Lacombe et al., 2019; Myers et al., 2004; Ng et al., 2020; ParticipACTION, 2022; USPHS, 1996).

Those who engage in regular physical movement are not only prone to experience positive physical health advantages but also improvements in other aspects of their wellness (Mahindru et al., 2023). Wellness is comprised of eight dimensions: physical, intellectual, emotional, social, spiritual, vocational, financial, and environmental (Stowewn, 2017). These elements rely on each other; thus, neglecting one or more areas can have a detrimental effect on one's overall health, well-being, and quality of life (Stowewn, 2017). Similarly, when one aspect of wellness is satisfied, the positive impacts can extend to other areas of one’s well-being, creating a ripple effect of improvement across various dimensions (Stowewn, 2017). For example, research has identified those who engage in regular physical activity and exercise are more likely to have heightened quality of sleep, bone function, memory, productivity, mood, social interactions, self-esteem, feelings of belongingness, active transportation, along with lower rates of anxiety, depression, substance abuse, and risk of chronic diseases (CSEP, 2021; Di Bartolomeo & Papa, 2017; Di Liegro et al., 2019; Hearing et al., 2016; Mazereel et al., 2021; Sjøgaard et al., 2016; Tai et al., 2022; Wanjau et a., 2023). Based on the literature, it is clear that

both physical activity and exercise are highly effective methods to enhance an individual's overall health, making them an essential area of focus in the health promotion arena (CSEP, 2021; ParticipACTION, 2021; Lacombe et al., 2019; Myers et al., 2004; Ng et al., 2020; USPHS, 1996).

Canadian Movement Guidelines

To optimize personal and societal wellness, all Canadian adults are encouraged to follow national physical activity guidelines as created by CSEP (2021). The parameters of these guidelines were established according to the minimum level of physical movement necessary to enhance health outcomes. To reap such benefits, Canadians aged 18-64 are encouraged to attain at least 150 minutes of moderate to vigorous physical activity per week, including time spent engaging in light activities such as standing, and muscle-strengthening activities at least twice a week.

Despite the various health advantages of participating in regular physical activity, an estimated 49.2% of Canadians aged 18-64 fail to meet these established guidelines (Government of Canada, 2023; ParticipACTION, 2022; Rollo et al., 2022). The lack of engagement among Canadians is highly concerning, as prolonged periods of low physical activity can amplify the risks of chronic disease development, impair recovery and response to intervention, reduce life expectancy, and impact the eight dimensions of wellness adversely (Booth et al., 2017; Lacombe et al., 2019; Ng et al., 2020; Stowewn, 2017). Research has, in part, attributed the decrease in physical activity levels to society's increased technology use, particularly the growing use of screen time outside of work and school contexts (ParticipACTION, 2022). This epidemic has been referred to as physical inactivity or low adherence to exercise and has been on the rise

among Canadian adults in the past few decades, particularly among university students (Allison, 1996; Kohl et al., 2012; Lesser & Neinhuis, 2020; Thomas et al., 2019).

University Students' Exercise Engagement Patterns

The commencement of university represents a significant milestone in an individual's life, acting as a pathway for future careers, a hub for creating diverse relationships, and the acquisition of positive behaviours and life skills (Thompson et al., 2021; Worsley et al., 2021). However, this significant period is not devoid of challenges, as the transition from high school to a post-secondary environment has notoriously been viewed as a stressful time for students (Gall et al., 2000; Graves et al., 2021; Zhao et al., 2023). These adverse feelings often stem from the high prevalence of related stressors such as academic, financial, and social burdens, familial expectations, and new responsibilities (Gall et al., 2000; Graves et al., 2021; Zhao et al., 2023). This transition often causes undergraduate students to become more prone to developing harmful habits and behaviours as they navigate their newfound independence into adulthood (Esmaeelzadeh et al., 2018; Maillet & Grouzet, 2023).

An increased stress level associated with this period was supported by the research of Yangdon et al. (2021), who used a mixed-methods study to explore the well-being of undergraduate students (n = 385). These researchers highlighted how many students struggled to manage an increased workload and time commitment to their studies; many simultaneously sacrificed their health to prioritize their academics. This was further supported by the findings of March-Amengual et al. (2022), who surveyed first-year undergraduate students (n = 506) to assess their psychological wellness. Their findings revealed that UW were more likely to display characteristics of psychiatric distress after entering university when compared to their male counterparts due to the increased workload (March-Amengual et al., 2022). These trends are

concerning as research shows a positive relationship between one's mental health and bodily movement, as students who participate in physical activity and exercise not only fulfill their fitness needs but also reduce their psychological stress (Legey et al., 2017; Rodríguez-Romo et al., 2023). Moreover, major declines in physical activity and exercise engagement among university students are problematic given that health behaviours during this period are predictive of future habits (Gordon-Larsen et al., 2004).

When comparing the physical activity levels of UW and men, it is evident that men engage in higher amounts of activity than women, a trend that originates in childhood (Edelmann et al., 2022; Espada et al., 2023; McArthur & Raedeke, 2009; Schmidt, 2012; Towne et al., 2017; Wilson et al., 2022). A study by Carballo-Fazanes et al. (2020) examined the factors influencing physical movement and sedentary behaviour among university students (n = 608) through a questionnaire focused on lifestyle habits. They determined that differences in habits between UW and men may be influenced by societal norms that have historically favoured males in accessing and participating in physical activity and exercise (Carballo-Fazanes et al., 2020). Additionally, those who participated in regular movement in adolescence were more likely to partake in physical exercise while in university, supporting the notion that introducing and supporting healthy habits is essential at a young age (Carballo-Fazanes et al., 2020).

University Students' Exercise Engagement and Social Support

The low levels of exercise engagement among university students have been attributed to difficulties navigating independent exercise due to a lack of support (Ferreira Silva et al., 2022). Lubker and Etzel (2007) explored the exercise challenges faced by former student-athletes during their transition to university (n = 317). Participants completed a series of validated questionnaires focused on social support, athletic identity, and their adaptation to college life.

Through this, the researchers identified that the adjustment to university led to a loss of athletic identity, reducing the activity habits of this population due to diminished confidence and difficulty adapting to independent involvement. For this reason, it is important to emphasize supporting these individuals in their transition to higher education to safeguard their engagement. This is especially noteworthy as this period marks a shift in social identities when individuals seek new connections and are strongly influenced by the habits of their peers (Madtha et al., 2022; Schaefer et al., 2021).

Among university students, research has emphasized the crucial role of social support in motivating physical activity participation (Van Luchene & Delens, 2021). This was evident in a study by Thomas et al. (2019), who explored the exercise habits, barriers, and facilitators of first-year university students (n = 301) in Canada through a questionnaire completed at the beginning and end of one academic school year. The findings revealed a significant link between exercise habits and peer support. Individuals with fewer active friends were less likely to exercise due to interpersonal barriers such as a perceived lack of skill.

Likewise, Zhang et al. (2022) explored the influence of social support on the activity habits of university students. They achieved this by surveying students *(*n = 1,440) from six Mongolian universities using the Self-Efficacy Scale, Social Support Scale, and Physical Exercise Rating scale. The results revealed that these students valued having a well-equipped fitness facility and peers to help facilitate their participation. In fact, they found that social support directly and indirectly influenced exercise behaviour positively by enhancing confidence when engaging with peers, thereby stressing the value of using peer support as a motivational tool.

Although the years spent in university provide a unique opportunity to foster positive habits that can have a lasting and life-long impact on one's health, most students fail to develop such habits due to the high demands experienced during this time, further impairing their health (Romero-Blanco et al., 2020). Given the significant role motivation plays within this cohort, it is essential to leverage it as a tool to encourage participation in bodily movement (Othman et al., 2020; Thomas et al., 2019; Van Luchene & Delens, 2021; Zhang et al., 2022).

Self-Determination Theory and Exercise Engagement

The literature has consistently highlighted the necessity for behaviour change research to be theoretically grounded to better understand key factors that influence motivation (Gillison et al., 2019; Kwasnicka et al., 2016). In the context of exercise participation, motivation has been shown to significantly influence an individual's engagement habits (Buchan et al., 2012). A prominent behaviour change theory that has been used to explain an individual's motivation to participate in a particular behaviour is the Self-Determination Theory (SDT; Buchan et al., 2012; Deci & Ryan, 1980). The SDT has been used to describe an individual's degree of motivation to pursue a specific task or behaviour, contingent on a range of internal and external factors (Deci & Ryan, 1980; Ryan & Deci, 2000). This motivation is influenced by the satisfaction of three BPN: autonomy, competence, and relatedness, each of which plays a distinct role in fostering motivation (Deci & Ryan, 1980; Ryan & Deci, 2000).

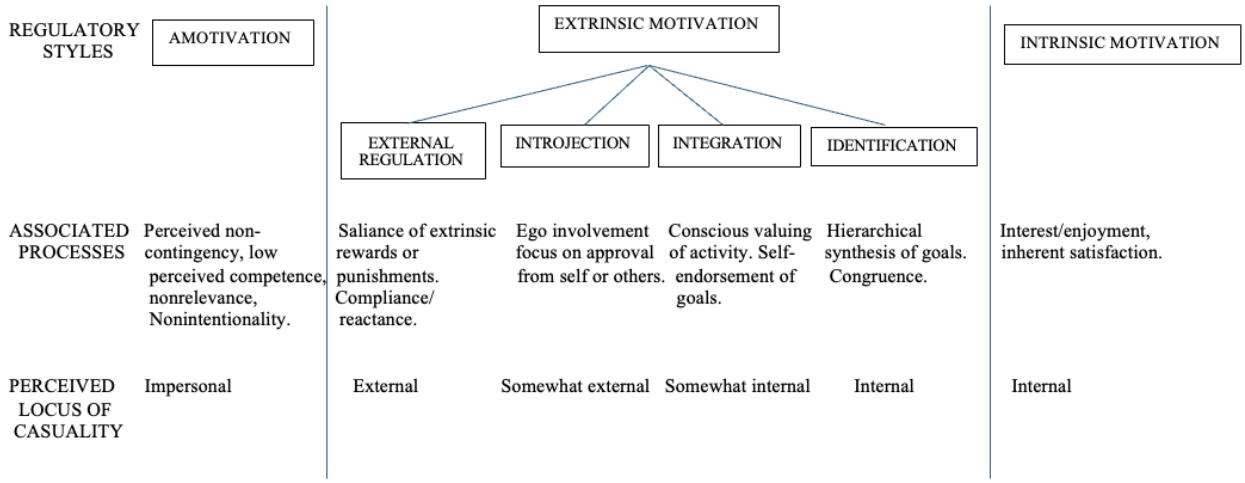
Motivational Continuum

This theory operates along a six-point continuum to explain how motivation varies from being non-existent to more self-determined, based on an individual's degree of self-regulation (Figure 1; Ryan & Deci, 2000). An individual who is non-regulated will be less driven to engage in a behaviour, may not strongly value its outcomes, and is in a state of amotivation (Ryan &

Deci, 2000). External regulation refers to those who perform a behaviour to gain external rewards or evade punishments (e.g., attend a fitness class to receive praise from an instructor or avoid being penalized for missing a class). Introjected regulation describes those who mainly engage in a behaviour to gain approval or avoid negative feelings, such as anxiety or shame (e.g., attending a fitness class not for enjoyment but to avoid feeling guilty for not going). Identified regulation pertains to those partially internally motivated individuals who recognize the value of the behaviour, but have not yet fully internalized its value (e.g., attending a fitness class to better their health, even though they have yet to develop a genuine passion). Integrated regulation represents the highest level of internalization of an extrinsic goal, where individuals engage in a task or behaviour as the outcome aligns with their needs and values (e.g., regularly attending a fitness class not just for health benefits, but because being physically fit is important to them). Intrinsic regulation is seen in those who are self-motivated to engage in certain behaviours due to personal interest, enjoyment, and a sense of satisfaction (e.g., attending a fitness class because they find it enjoyable, rather than for external rewards or obligations).

Figure 1

Motivational Continuum



Note. From "Intrinsic and extrinsic motivations: Classic definitions and new directions," by R. M. Ryan and E. L Deci, 2000, *Contemporary Educational Psychology*, *25*(1), 54–67 (https://doi.org/10.1006/ceps.1999.1020). Copyright 2000 by Academic Press.

Basic Needs Satisfaction

The three BPN are a sub-theory of SDT that has served as a prominent behavioural change framework due to its ability to predict one's engagement in a behaviour based on an individual's sense of having choices (autonomy), experiencing mastery (competence), and feeling a sense of belonging with others (relatedness; Deci & Ryan, 1980). According to the three BPN, individuals are more intrinsically motivated to engage in a behaviour when their social environment satisfies their BPN for autonomy, competence, and relatedness. Conversely, individuals will be less motivated to engage in a behaviour if one or more of their BPN are unmet. In combination with the SDT, this framework looks to identify and enhance the needs that require more attention to facilitate the development of sustained motivation.

Regarding exercise engagement, motivation can be enhanced by evaluating an individual's psychological needs and using this insight to foster engagement through programs that address barriers, customize educational materials, and target specific behaviours and contexts for motivation (Buchan et al., 2012; Kwasnicka et al., 2016). According to Ryan and Deci (2000), the three BPN can be supported in various ways. The researchers determined that providing choices, acknowledging emotions, and offering avenues for self-direction foster feelings of autonomy and enhance intrinsic motivation for a particular behaviour. They also found that competence can be developed through feedback, communication, and rewards while engaging in a particular behaviour, which, in turn, boosts intrinsic motivation for that behaviour. Relatedness was found to be fostered in settings that involve feeling connected and supported by

individuals and their environment. When taking this all together, it underscores the importance of investigating the effectiveness of peer-led programs aimed at improving the exercise habits of university students, especially to address the disproportionate engagement of UW (Colley et al., 2011; CWS, 2022; McCarthy & Warne, 2022).

Peer Mentorship to Promote Exercise Engagement Among University Students

Research on university students has found that social support and personal relationships often serve as mediators to exercise habits and significantly improve participation (Ler et al., 2017; Van Luchene & Delens, 2021; Yasunga et al., 2014). Interventions that foster social support (Estabrooks, 2012; Fried et al., 2018; Ginis et al., 2013) have been deemed central to evoking behaviour change, often producing better results when compared to more traditional individualized alternatives, due to the inclusion of peer mentorship (Burke et al., 2006; Burke et al., 2008; Estabrooks, 2012; Fried et al., 2018; Ginis et al., 2013).

As defined by Peirson (1993), peer mentorship programs involve an individual (mentor) with expertise in a field who guides groups of individuals with less experience (mentees) to enhance their knowledge and skill level through social support in a specific setting. These interventions commonly pair individuals with the same gender identity (Cross et al., 2019; Dasgupta et al., 2015; Feng et al., 2023; Lin et al., 2021; Wu et al., 2022). Research has suggested that women typically prefer mentors of the same gender identity as they believe they can relate better to their guidance, advice, and shared experiences that mentors of the opposite gender may not understand or be aware of (Cross et al., 2019; Lin et al., 2021; Wu et al., 2022). The effectiveness of peer-led programs to enhance exercise engagement has increased when mentors exhibit positive attitudes, a desire to help others, and foundational exercise knowledge (Glazzard et al., 2021; Kabiri et al., 2022; Keeler et al., 2013). As a result, many programs have

recruited sports science or kinesiology students, in addition to providing pre-program training for mentors to ensure they can effectively assist mentees in supporting program parameters (Boyle et al., 2011; Kabiri et al., 2022; Keeler et al., 2013; Smith et al., 2016).

These programs have garnered positive results for university students across settings and age groups, with most research in this area being conducted among adolescents (Jenkinson et al., 2014; McHale et al., 2022; Petosa & Smith, 2014). Relatedly, the mentor-mentee relationship is more effective with at least a two-year age gap, as this has helped foster professional relationships through cross-age mentoring in the context of exercise promotion (Karcher & Berger, 2017; Lavelle et al., 2023). Most studies involving university students do not explicitly address the age gap between mentors and mentees, though they typically involve senior undergraduates or graduate students mentoring first- or second-year students (e.g., Fried et al., 2018; Kirby et al., 2024; Danielsen et al., 2023). The significance of peer mentorship has prompted many studies to adopt this approach, recognizing the vital role of social support and motivation in fostering participation among UW (deJonge et al., 2021; DeShaw et al., 2023; Keeler et al., 2021; Kirby et al., 2024; Lee et al., 2020; Sylvester et al., 2016; Yan et al., 2023).

Peer-Led Exercise Programs

A study by DeShaw et al. (2023) created a program to promote healthy behaviours for new university students through peer coaching. This quantitative study recruited first and second-year students attending an American university (n = 130) who sought support to enhance their physical activity engagement, nutrition, and stress management skills. This study utilized junior or senior university students enrolled in a motivational interviewing (MI) course as peer coaches. Motivational interviewing is a client-focused, collaborative counselling approach that has been used to promote behaviour change by tapping into an individual's values and

motivation (Miller & Rollnick, 2023). In this course, the coaches were trained to collaboratively assist their peers in initiating behaviour change and accomplishing their goals. Participants met with their coaches for 40-minute sessions every two weeks, over the course of 8 weeks, to discuss their desired behaviours, progress, and goals. The pre-, post-intervention, and one-year follow-up surveys examined the participants' lifestyle behaviours. The results showed significant improvements ($p < 0.01$) in activity, stress, and nutrition following the program's conclusion. One year later, activity improvements began to decline ($p < 0.05$), though they remained above baseline, and continued to be higher than the improvements in the other two behaviours. Therefore, DeShaw et al. (2023) underscored the importance of implementing such programs to enhance the health behaviours of university students, specifically highlighting their effectiveness in enhancing bodily movement. The researchers noted that the absence of a randomized control group hindered the interpretation of the effectiveness of their study. Additionally, they noted incorporating accelerometers rather than self-report measures to track movement as a valuable consideration.

Similarly, a study by deJonge et al. (2021) explored the impact of a 6-week on-campus exercise program for Canadian undergraduate and graduate students seeking mental health support between 2016 and 2018 ($n = 68$). Pre- and post-intervention, participants completed questionnaires to assess symptoms of psychological distress, including depression and anxiety; semi-structured interviews with a subset of participants were also conducted to explore their perceptions of the program ($n = 11$). The mentors, who were certified personal trainers with backgrounds in psychology and sports science, attended a workshop of an unknown duration focused on suicide prevention and MI. Each participant attended a weekly hour-long session with a peer mentor where they engaged in 30 minutes of exercise and 30 minutes of discussing

behaviour change strategies. In addition, participants were encouraged to participate in one or two exercise sessions on their own per week. All physical activity sessions were individualized, consisting of a warm-up, 20 minutes of aerobic or resistance activities, and a cool-down. The quantitative findings revealed a significant reduction ($p < 0.05$) in distress, anxiety and depression symptoms post-program, along with improvements in activity adherence. The qualitative findings revealed that the participants benefited from the one-on-one support to help initiate behaviour change, particularly in assisting them to navigate the gym setting. Given the demonstrated effectiveness of such methods, there is a need to implement such research methods to enhance the habits of university students in other populations, such as females, who often experience a decline in participation over time, starting in adolescence.

Relatedly, a study by Lee et al. (2020) implemented a mixed-methods semester-long exercise mentoring program to foster positive habit formation among undergraduate students ($n = 125$). From August 2013 to May 2019, American university students were recruited through convenience sampling methods; nutrition and kinesiology undergraduate and graduate students were recruited as mentors. The mentors completed a pre-program workshop to enhance their ability to apply MI principles to support improved health of their assigned mentees. Throughout a single semester, each participant met a nutrition mentor and an exercise mentor for four sessions, each lasting between 30 to 60 minutes, to discuss potential changes the participant was interested in (Lee et al., 2020). Data collection methods included pre- and post-test surveys exploring barriers to healthy eating, exercise readiness, and engagement. The results revealed that students were able to significantly improve their dietary ($p < 0.001$) and activity habits ($p < 0.001$) through the support of their mentors. Qualitatively, the post-program survey revealed that most participants (86%) were satisfied or greatly satisfied with the program and its associated

benefits. The participants also reported wanting to exercise and cook with their mentors to observe and learn from them, in addition to meeting to discuss behaviour change. The findings from Lee et al. (2020) emphasized the value of mentoring in fostering social support and positively influencing health behaviours among mentees. The researchers also emphasized the importance of hands-on sessions to reduce barriers to initiating behaviour change and preventing relapses.

A recent study by Yan et al. (2023) similarly examined the impact of an 8-week peer coaching intervention on the health behaviours of first- and second-year female undergraduate students from an American university (coaching group = 28; control group = 24). Student coaches were undergraduate students in health sciences who completed two university health coaching courses focused on improving their basic coaching skills. Participants were randomly assigned to a condition, and intervention participants were matched with a peer coach based on gender and ethnicity. Those in the intervention condition met one-on-one with their peer-coach for 30-40 minutes weekly to improve their desired health behaviours (e.g., exercise, nutrition, and sleep) through goal setting; a control group received an educational handbook. Pre- and post-test surveys collected quantitative data and showed improvements in the health behaviours of those in the peer-coaching group; significant results were only found among physical activity engagement ($p < 0.05$). As a result of this program, participants gained the knowledge and tools to overcome barriers to their respective behaviour of focus. The researchers concluded that peer-led interventions are effective among this population, particularly regarding overcoming barriers to exercise participation in female undergraduate students. The researchers noted the importance of future studies collecting data before the end of a semester to retain engagement, as this acted as a limitation in their study. Additionally, they noted that future research should further explore

the relationship between demographic factors such as age, gender, race, socioeconomic status, and first-generation student status and the influence of health coaching due to the lack of research in this area.

Moreover, a study by Sylvester et al. (2016) examined how different quantities of exercise affect behaviours in a six-week program. Inactive university students (n = 121) were randomly assigned to either a low (e.g., four sets of four exercises) or high (e.g., two sets of eight exercises) condition. Participants were asked to complete three 60-minute weekly training sessions, which fitness facility employees supervised to watch for safety and technique. All participants received a handout detailing a specific exercise program (e.g., a structured warm-up, resistance training workout, and a cooldown). Participants were surveyed at baseline, three, and six weeks to collect data on their BPN and various exercises. In this study, the participants who received high-variety support (e.g., increased options) showed greater adherence and statistically significant improvements ($p < 0.05$) compared to those who received less support. According to the authors, changes were related to the psychological needs via autonomy being increased through choices, competence through the detailed exercise guide, and relatedness through engaging with facility employees, suggesting the effectiveness of such interventions to enhance adherence.

Similarly, a recent study by Keeler et al. (2021) involved an 8-week peer-mentorship-based exercise intervention grounded in the SDT for university students with depression symptoms. Inactive university students diagnosed with depression (n = 10) were recruited to engage in the intervention condition. In contrast, those without depression (n = 13) acted as a matched pair control group as selected from three large introductory classes. All participants were paired with a peer assistant and participated in exercise together twice a week for 60

minutes, with the peer assistants discouraged from providing formal training to their mentees. Peer assistants were required to have knowledge in the field of sports sciences, be personable, and complete a workshop to foster skills such as active listening and emphasizing the enjoyment of involvement. Participants were surveyed on their degree of participation, self-efficacy, psychological needs ascribed from SDT (i.e., autonomy, competence, and relatedness), and depression symptoms at baseline and completion of the intervention. The results suggested that the intervention group showed statistically significant *(p* < 0.01) improvements in measures of depression symptoms, exercise engagement, and psychological needs as compared to the control group in both qualitative and quantitative methods. The researchers attributed this change to the control group having higher baseline confidence levels in exercise participation and lower or absent depression symptoms. However, this study still highlighted the effectiveness of peer-led exercise programs in enhancing competence, relatedness, and autonomy and reducing depressive symptoms in inactive university students.

A more recent study by Kirby et al. (2024) implemented a peer-led exercise program grounded in SDT to enhance adherence over 8 weeks in Colorado. Researchers recruited university students experiencing varying barriers to participation (*n* = 10) and students with movement expertise (*n* = 9) for peer leaders. Each pair engaged in physical activity for one hour each week, including walking, running, hiking, swimming, weight training, and recreational sports in the spring of 2020 and fall of 2021. All participants wore a Fitbit device to track their movement throughout the study and completed electronic surveys to track psychological well-being and the three BPN. Focus groups were conducted upon the completion of the study to explore in-depth details of their experiences. The results revealed a lack of statistical significance in the quantitative findings, but the focus groups revealed improvements in well-being and

psychological needs. At baseline, most participants participated in 150 minutes of physical movement; thus, habits did not increase significantly, as most met national guidelines at baseline. However, upon completion of the study, participants expressed that they experienced greater feelings of social support, enjoyment, energy, competence, academic success, and reduced stress and anxiety. Kirby et al. (2024) emphasized the value of peer-led physical activity and exercise programs to enhance the habits of university students and help them overcome the fear or embarrassment of exercising alone. The researchers recommended that further studies be conducted to explore the effectiveness of peer leadership in enhancing movement.

While peer mentorship programs have been deemed some of the most effective and valuable support programs for enhancing social connectedness and psychological constructs known to promote physical movement, the focus has generally been on a range of health behaviours and related outcomes such as nutrition and physical and mental health (deJonge et al., 2021; DeShaw et al., 2023; Lee et al., 2020). Despite the importance of social support for this cohort, previous researchers have failed to implement communication methods that effectively promote behaviour change, despite participant requests (deJonge et al., 2021; Lee et al., 2021; DeShaw et al., 2023; Yan et al., 2023).

Additionally, given the varying needs and participation levels of men and women, it is crucial to effectively develop gender-specific interventions to address each group's unique needs. Since women have historically been less active than males at all ages, it is crucial to develop programs tailored to their needs (Colley et al., 2011; CWS, 2022; McCarthy & Warne, 2022). Despite the effectiveness of physical activity and exercise interventions based on the SDT, there is a lack of research on such programs involving university students (Juwono & Szabo, 2020; Maselli et al., 2018). Considering the unique barriers faced by university students to being and

staying active, especially UW, it would seem that there is an increased need for specific programs that can be used to foster autonomy, competence, and relatedness are warranted (Deci & Ryan, 1980).

Undergraduate Women's Exercise Engagement

The lack of physical activity and exercise involvement among UW has been attributed to their high drop-out rate in adolescence, which often leads to this population to experience diminished self-efficacy, confidence, knowledge, and motivation to engage in physical activity (Egli et al., 2011; Espada et al., 2023; Fabiano & Pearson, 2025; Othman et al., 2022; Seo & Ha, 2019).

Due to the low activity levels among many university students, particularly women, universities often provide various opportunities to promote participation, addressing the sedentary nature of student life. However, while campus recreation and intramural sports are available to students at many universities, those who lack experience are less likely to participate (Brown et al., 2024; Shifman et al., 2012; Thomas et al., 2019; Wood & Danylchuk, 2015). This is especially true for UW, who often struggle to participate in the predominantly co-ed sports environment due to a perceived lack of skill, while those confident in their abilities are more likely to engage (Kanters & Forester, 1997; Thomas et al., 2019; Wilson et al., 2022; Wood & Danylchuk, 2015).

Considering this, UW are often forced to turn to gym settings to facilitate their activity habits (Peters et al., 2019; Wilson et al., 2022). Research has suggested that university typically serves as a primary setting for individuals to partake in exercise and physical activity (Peters et al., 2019; Wilson et al., 2022). Concurrently, the literature has emphasized the limited knowledge and familiarity UW possess in this context, leading to feelings of discomfort in gym

environments (Fabiano & Pearson, 2025; Hurley et al., 2018; Peters et al., 2019; Wilson et al., 2022).

Undergraduate women's introduction to the gym setting is often hindered by the prevalence of gendered exercise environments (Martínez-Sánchez et al., 2024; Salvatore & Marecek, 2010). Persistent gender norms have consistently hindered the activity involvement of UW, largely stemming from inequities they have encountered in fitness facilities: inequities that their male peers often experience less frequently (Andreasson & Johansson, 2018; Martínez-Sánchez et al., 2024; Salvatore & Marecek, 2010). These findings were corroborated by additional research, which determined that gendered pressures, such as stereotypical workout expectations, have restricted training options for UW (Coen et al., 2018; Edwards & Sackett, 2016; Turnock, 2021; Vasudevan & Ford, 2022).

Undergraduate women have also faced challenges in the gym setting due to unfamiliarity with the environment, which can make them uncomfortable in such spaces (Fabiano & Pearson, 2025; Wilson et al., 2022). Research has suggested that positive interactions with staff members have made individuals feel more welcomed and enhanced their likelihood of using fitness facilities (Brown et al., 2014). To the researcher's knowledge, the literature on providing formal facility tours before physical activity interventions is minimal, particularly in a post-secondary context. To date, several studies (e.g., Brown et al., 2017; Lloyd, 2008; McLaughlin et al., 2021; Rimmer et al., 2004; Riseth et al., 2021; Sheill et al., 2022) examining activity habits in the general public included facility tours, but they did not provide details about such practices. The lack of details regarding gym tours in the current literature is problematic, as these services can help individuals become more familiar and comfortable with a new environment. Moreover, this baseline information could be useful for health and fitness promoters to develop best practices in

this context. This information may, in turn, lead to improved exercise habits, especially among UW students, by helping them feel more comfortable in the gym environment, addressing a key barrier to their participation (Fabiano & Pearson, 2025; Hurley et al., 2018; Othman et al., 2022; Wilson et al., 2022). Given the perceived benefits of facility tours, it is essential to implement them in populations facing barriers to participation to enhance familiarity with the setting and boost confidence.

Barriers and Facilitators to Exercise Engagement Among Undergraduate Women

Given the challenges UW have faced in maintaining a regular activity regimen, various studies have explored the barriers and facilitators to involvement as a means of understanding potential methods that can be used to improve their participation (e.g., Brown et al., 2024; Othman et al., 2022; Thomas et al., 2019; Peng et al., 2023).

The literature suggests that their perceived level of social support strongly influences UW participation in physical activity and exercise, leading many to prefer exercising in group settings (Burke et al., 2006; Pannor Silver et al., 2019; Thomas et al., 2019; Othman et al., 2022). Peer support has proven to be invaluable for this group, particularly as many lack body confidence, knowledge, and skills in this context (Korn et al., 2013; Martínez-Sánchez et al., 2024; Othman et al., 2022; Ouyang et al., 2020; Peng et al., 2023). Thus, this support can ignite a newfound sense of comfort in an exercise environment (Brown et al., 2024; Johannes et al., 2024; Korn et al., 2013; Martínez-Sánchez et al., 2024; Othman et al., 2022; Ouyang et al., 2020). Furthermore, while some UW were motivated to participate in activity to reap health benefits, others have mentioned a lack of interest, opportunities, and time as barriers to participation (Ferreira et al., 2022; Martínez-Sánchez et al., 2024; Peng et al., 2023). However, when physical exercise was framed as a social opportunity, UW have been more interested in participating (Brown et al.,

2024; Johannes et al., 2024; Korn et al., 2013; Martínez-Sánchez et al., 2024; Othman et al., 2022; Ouyang et al., 2020). Thus, the importance of grounding such programs in social support to enhance participation among UW is worthy of consideration. This is especially true for UW, whose involvement in exercise declined during the COVID-19 pandemic (Fabiano & Pearson, 2025).

Exercise Engagement During the COVID-19 Pandemic

In early 2020, the novel coronavirus (COVID-19) began to spread rapidly, initiating a global health crisis that led to a widespread outbreak of a respiratory illness that claimed the lives of more than 3.4 million individuals and negatively impacted the well-being of countless others (WHO, n.d.-a; WHO, n.d.-b). The COVID-19 pandemic resulted in significant social, economic, and health-related challenges, such as overwhelmed healthcare systems, economic disruptions, and mandated protections for daily life (Filip et al., 2022). These protections in Ontario were particularly stringent as this province had a high concentration of COVID-19 cases throughout the pandemic (Clarke et al., 2022). Examples of such policies implemented by the provincial government included a stay-at-home order, proof of vaccination in non-essential settings (e.g., gyms, restaurants), mask mandates, limited capacity for outdoor and indoor spaces, travel restrictions, closure of non-essential businesses, encouragement of remote work, hybrid or remote policies for schools, required physical distancing and sanitation measures, COVID-19 testing, contact tracing, isolation periods, and province-wide lockdowns (Canadian Institute for Health Information, 2022; Clarke et al., 2022).

While the pandemic-induced precautions played a crucial role in curbing the virus's spread, they also negatively impacted the health behaviours of many Canadians, drastically

altering their lives and daily routines during this period (Chen et al., 2020; Faulkner et al., 2021; Lesser & Nienhuis, 2020).

Undergraduate Women's Exercise Engagement During the Pandemic

Throughout the COVID-19 pandemic and amidst the implementation of related precautions, many UW began participating in less activity (Bell et al., 2023; Fabiano & Pearson, 2025; Pellerine et al., 2022). For example, participation was significantly hindered by the closure of fitness facilities and reduced social interactions: two factors that have historically been central to UW participation in exercise (Fabiano & Pearson, 2025; Pellerine et al., 2022).

This notion was supported in a Canadian study by Pellerine et al. (2022), who examined the physical activity and exercise habits of this population during the pandemic, in relation to the national activity guidelines. This study examined the facilitators and barriers to engagement in undergraduate students (n = 341) through a closed-ended survey. The multiple-choice survey assessed activity and sedentary behaviours in the 2021-2022 school year. They determined that only 53% of participants met the movement guidelines, as their participation was impaired by perceived barriers such as prioritizing academics, work, other time constraints, and limited access to fitness facilities. The researchers noted that these findings may have been limited by the self-report nature of these surveys, which included broad terminology to avoid errors in the data.

Likewise, a study by Bell et al. (2023) explored body composition, exercise, and nutritional habits during the pandemic to identify potential changes in lifestyle behaviours. To achieve this, they recruited Canadian full-time undergraduate students (n = 1346) to take part in a two-part online survey in September 2020 (i.e. first lockdown) and again in March of 2021 (e.g., second lockdown). The first survey assessed participants' body mass, height and demographic

information (e.g., gender, race, age, year of study, and living situation/location) along with activity and nutritional habits, while the second survey explored perceived differences in physical activity and dietary habits since the first survey. The participants were predominantly white female students (~80%), and the results revealed an increase in body mass, while dietary habits worsened as participants began consuming fewer fruits and vegetables. Regarding physical activity, participants reported engaging in less exercise during the first lockdown compared to before the pandemic, which deteriorated further during the second lockdown. The researchers noted that this study lacked cultural diversity and pre-pandemic data collection. Furthermore, the high attrition rate between the two data collection periods may have introduced selection bias, limiting the generalizability of the results to all Canadian undergraduate students. The authors emphasized the need for future research to explore the lifestyle habits of undergraduate students during the pandemic recovery era to assess whether the observed changes were sustained.

To date, it appears that only these few studies have focused on Canadian-specific UW in this context. Thus, examining Italian studies to corroborate these findings is useful, given that the country's COVID-19 precautions closely resembled those implemented in Canada (Bosa et al., 2022; Dyer, 2022).

Italian Undergraduate Women's Exercise Engagement. A study by Ferrara et al. (2022) investigated the variations in adherence to a healthy diet and exercise levels among university students before and during the pandemic, aiming to gain deeper insights into the individual and environmental factors at play. To enroll a diverse sample, they recruited all undergraduate and graduate-level university students (n = 2001). Participants took part in a repeated cross-sectional survey conducted at two distinct periods: before (November 2018 to

February 2019) and during the pandemic (November 2020 to February 2021). The results revealed that during the pandemic, there was a decrease in time spent engaging in activity, driven by a high dropout rate and shift in how engagement was pursued, along with an increase in sedentary behaviour, especially among women. More specifically, they identified low physical activity, high sedentary behaviour, and changes in eating habits with an increased body mass index (BMI) among women participants. The researchers noted that this study may be limited by the cross-sectional survey design, as it could not identify causal relationships. They suggested that future research should examine the regulatory styles of participation, utilize improved scales to measure MET expenditure, and repeat the survey after removing precautions to reassess health behaviours at this time.

Similarly, a study by Brancaccio et al. (2021) aimed to evaluate the effects of the pandemic precautions on university students' exercise and eating habits to identify gender differences. They recruited men (n = 423) and women (n = 707) participants from an Italian university, comprising both students (78.2%) and staff (21.8%). In May 2020, participants completed an online questionnaire which explored their lifestyle, well-being, dietary behaviours, and activity habits during the pandemic. The survey data underscored the pandemic's negative impact on physical activity habits within this population, with 42.30% of women and 44.20% of men reporting a decrease in their engagement. Brancaccio et al. (2020) noted that the study's limitations included the lack of causal relationships established and dependence on self-reported data, thereby necessitating further study.

In sum, Italian research on UW supports the notion that this population's exercise habits decreased during the pandemic (Brancaccio et al., 2021; Ferrara et al., 2022) and highlights the

need for additional studies after pandemic precautions are lifted to evaluate the long-term effect of the pandemic on this cohort's health behaviours (Bell et al., 2023; Ferrara et al., 2022).

Undergraduate Women's Exercise Engagement in the Pandemic Recovery Era

In Ontario, Canada, all COVID-19 precautions were lifted by April 27, 2022, to allow Ontarians to resume their pre-pandemic activities (Government of Ontario, 2023). The period following has been referred to as the *pandemic recovery era*: marked by the removal of pandemic precautions and focused on efforts to restore normalcy while addressing the lasting effects of this worldwide event (Persaud et al., 2021). Nevertheless, even after the lifting of COVID-19 precautions, the movement patterns of UW continued to worsen (Fabiano & Pearson, 2025; Vučković et al., 2022): a pattern that was not mirrored in the exercise habits of men (Hernańdez-Segura et al., 2023).

This was evident in a study by Fabiano and Pearson (2025), who sought to understand the barriers and facilitators to exercise engagement post-removal of COVID-19 precautions among Canadian UW (n = 10) through semi-structured interviews. The participants underscored the crucial role of social support for participation, as its presence and absence were identified as barriers and facilitators. In line with the findings, it was speculated that this decline stemmed from the forced transition to independent engagement during the pandemic; many were deprived of the necessary knowledge, skills, and confidence to participate in physical activity that their predecessors would have attained through activities such as physical-education classes and recreational sports activities (Fabiano & Pearson, 2025). As such, the researchers emphasized the importance of developing group-based exercise programs to enhance the knowledge and confidence of this cohort, thereby increasing their involvement through social support (Fabiano & Pearson, 2025).

Additional studies had similar findings and showed that UW were more likely to partake in lower levels of physical activity and exercise post-precaution removal compared to their pre-pandemic engagement levels (Garćia-Campanario et al., 2022; McCarthy et al., 2021). For example, a Spanish cross-sectional study assessed the health habits of first-year undergraduate students (n = 10,096) from 2012 to 2022 through a self-administered questionnaire (Hernańdez-Segura et al., 2023). Researchers organized the data into three time periods: before, during, and after the removal of COVID-19 precautions. These results showed improvements in students' exercise levels after precautions were lifted, and it was noted that UW continued to participate in less activity than men. The researchers concluded that behaviour change interventions should focus on university students to improve their exercise levels, with special attention paid to gendered differences.

Despite the extensive research on UW exercise habits before and during the pandemic, there is a notable dearth during the pandemic recovery era (Fabiano & Pearson, 2025). Overall, the literature highlights how pandemic-related circumstances have led to unique experiences for this cohort, such as missing opportunities to develop and refine their physical exercise skills that they might have otherwise gained (Bosa et al., 2022; Fabiano & Pearson, 2025; Líška et al., 2024; Purc-Stephenson et al., 2022; Vučković et al., 2022). More specifically, many were forced to prematurely transition from organized sports or limited movement opportunities to independent engagement without the skills or guidance of a coach or educator (Fabiano & Pearson, 2025; Lubker & Etzel, 2007).

Peer-Led Exercise Programs in the Pandemic Recovery Era

While not plentiful, few mixed-method randomized controlled trials have analyzed the effectiveness of programs to improve the exercise habits of UW post-removal of COVID-19

precautions (Copeland et al., 2021; Fabiano & Pearson, 2025; Gómez Chaćon et al., 2024; Liao et al., 2023).

Goncalves et al. (2023) conducted a study to improve mental health and physical fitness through an 8-week physical activity intervention. This pilot randomized controlled trial recruited undergraduate and graduate students who wanted to become more active in France in September of 2021, a period when in-person teaching had resumed and precautions were gradually being lifted. Participants were randomly assigned to the control (n = 55) or intervention condition (n = 55), ensuring each group was balanced for the gender, age, and seniority of each participant. The control condition engaged in exercise independently without external support, while the intervention condition included a workshop to build rapport amongst participants and assess students' exercise engagement and interest. The information gained from the workshop was used to tailor the program to the participants' needs, addressing low engagement levels through coaching from sports science students, time for engagement, and daily 60-minute physical activity sessions with one team sport per week. All participants wore accelerometers and completed pre-and post-test quantitative surveys, which were used to monitor activity and sedentary behaviour, psychological variables, anxiety and depressive symptoms, body image and well-being, along with anthropometric (e.g., height, weight, BMI, body composition) and fitness measures (e.g., flexibility, lower limb strength, cardiovascular fitness). The findings identified significant improvements ($p < 0.05$) in body image, autonomous motivation, and activity among the intervention group, while decreased engagement was seen in the control group as they lacked the skills required for consistent engagement when experiencing external stressors (i.e., exams). Many students dropped out before and throughout the program, leaving 27 in the intervention group and 20 in the control group due to the large time commitment and lack of understanding of

the program. However, despite the challenges of group-based exercise, participants who received mentorship were better equipped to engage in activity despite other demanding life events. This suggests a strong dedication to their engagement and implies that the intervention successfully impacted their habits and adherence. The researchers reported difficulties recruiting participants, resulting in a smaller sample size than anticipated. They also noted that students were overwhelmed by the amount of information presented at the start of the study. The researchers recommended that future studies implement similar methods to enhance university students' physical exercise by providing them autonomy to choose when and how to engage, while providing support to facilitate their engagement.

Post-removal of pandemic precautions in Norway, Danielsen et al. (2023) piloted a 10-week group-based exercise program for university students (n = 13) with mental health challenges (e.g., those who sought campus counselling services in the past seven days). University students aged 20-39 were recruited to engage in a group-based exercise program twice a week for one hour. The exercises were tailored to each participant's mental health, physical fitness and capabilities, while generic warm-up and cool-down games were used. The exercise sessions consisted of high-intensity interval and circuit training, which were supervised by graduate students with backgrounds in sports science, who gradually increased the intensity of each session over time. Throughout the program, participants' mental and physical health were quantitatively assessed through surveys and fitness testing. The surveys explored self-reported depression, anxiety, well-being, life satisfaction, and fitness tests measuring muscular endurance, strength, and cardiorespiratory fitness. The data collection methods revealed that participants perceived the program as achievable and beneficial within a supportive environment, as evidenced by their significant improvements in ($p < 0.01$) cardiorespiratory fitness, strength, and

symptoms of depression and anxiety. Based on the observed advances in physical fitness, this study supports the notion that peer-led exercise interventions are effective methods to enhance adherence and engagement. This study was limited by the lack of a control group, which should be implemented in future studies. The researchers emphasized the need for future studies in this area to employ larger sample sizes to more accurately assess the impact of such programs through randomized controlled trials.

To the best of the researcher's knowledge, only two interventions have targeted the exercise habits of undergraduate students in the pandemic recovery era (Danielsen et al., 2023; Gonclaves et al., 2023). Both studies called for further research, noting their lack of theoretical frameworks and communication methods beyond structured sessions. Given the importance of social support in the pandemic recovery era, a qualitative lens is required to gain in-depth participant perspectives and support findings with theories (Kowalski et al., 2018; Kwasnicka et al., 2016).

Limitations in the Current Literature

The pandemic has led to declining health and related behaviours among Canadians (Chen et al., 2020; Faulkner et al., 2021; Lesser & Nienhuis, 2020). Unlike men, UW exercise habits worsened as a result of the COVID-19 precautions (Brancaccio et al., 2021; Fabiano & Pearson, 2025; Ferrara et al., 2022; Pellerine et al., 2022). Considering lifelong habits are frequently established while in university, it is essential to equip this population with exercise competence (Gordon-Larsen et al., 2004; Telama et al., 2009). Despite this, programs targeting UW exercise habits in the pandemic recovery era are limited (Fabiano & Pearson, 2025; Ferrara et al., 2022). Collecting data in this area is timely and vital to equip these young adults with the tools to engage in lifelong exercise.

Given the pandemic's disruption of in-person interactions, social support has served as an important mediator for UW exercise habits, causing them to become more reliant on their peers to foster exercise habits (Cahuas et al., 2023; Fabiano & Pearson, 2025; Hailey et al., 2022). While social support has been recognized as a key factor in promoting UW engagement, peer-led programs incorporating online communication outside of formal sessions have been largely overlooked (Danielson et al., 2023; deJonge et al., 2021; DeShaw et al., 2023; Gonclaves et al., 2023; Lee et al., 2021; Yan et al., 2023). Considering the significant role socialization has played in fostering exercise adherence, it is crucial to explore the impact of peer support and its potential to stimulate behavioural changes among UW (Fabiano & Pearson, 2025; Fried et al., 2018; Estabrooks et al., 2012). Additionally, many studies on UW engagement lack a theoretical framework (Danielson et al., 2023; deJonge et al., 2021; Deshaw et al., 2023), despite evidence that theory-based interventions yield better outcomes (Craig et al., 2008; Kwasnicka et al., 2016; Michie & Prestwich, 2010).

A promising strategy to improve UW exercise habits and address the current gaps is PMP. These programs provide a collaborative approach for experienced individuals to transfer knowledge and skills to others (Peirson, 1993). Studies have demonstrated the efficacy of peer-led programs in improving UW health behaviours, particularly exercise and physical activity (dejonge et al., 2021; DeShaw et al., 2023; Keeler et al., 2021; Kirby et al., 2024). These programs have offered personalized social support, enhancing social connectedness and psychological constructs known to promote engagement (dejonge et al., 2021; DeShaw et al., 2023; Keeler et al., 2021; Kirby et al., 2024). However, PMP research focused on UW following a worldwide pandemic has yet to be conducted.

To the best of the researcher's knowledge, the literature on fitness facility tours as a strategy to enhance exercise engagement, particularly among UW, is limited (Brown et al., 2017; Lloyd et al., 2008; McLaughlin et al., 2021; Rimmer et al., 2004; Riseth et al., 2021; Sheill et al., 2022). Exercise interventions that include facility tours lack detailed methodology (Brown et al., 2017; Lloyd et al., 2008; McLaughlin et al., 2021; Rimmer et al., 2004; Riseth et al., 2021; Sheill et al., 2022), highlighting the need to document effective methods for helping UW feel comfortable in the gym (Fabiano & Pearson, 2025; Hurley et al., 2018; Othman et al., 2022; Wilson et al., 2022).

Exploring strategies to overcome barriers to exercise and boost involvement in the pandemic recovery era is vital for enhancing UW well-being and equipping them for lifelong engagement (Edwards & Sackett, 2016; Othman et al., 2022). To this end, a PMP based on a theoretical framework intended to offer social support and enhance autonomy, competence, and relatedness among UW is worthy of exploration.

Purpose

The overarching purpose of this experimental study, titled the SHINE Program: **S**upporting **H**er **I**n **N**avigating **E**xercise, was to test the effectiveness of a six-week peer mentoring program, grounded in SDT, to explore the psychological constructs and exercise behaviour of UW. All participants received an exercise guide, facility tour with equipment demonstrations, and were randomly assigned to one of two conditions. The intervention group received additional support from a trained senior student with exercise expertise during exercise sessions and had access to an online messaging platform for communication between sessions, while the control group engaged in independent exercise. Senior undergraduate and graduate students with backgrounds in health disciplines were recruited as mentors for the intervention

condition and engaged in a 2-hour workshop to enhance their MI skills and review the fundamentals of exercise engagement (Fried et al., 2018; Keeler et al., 2021; Kwan et al., 2020; Paré et al., 2023).

The main objectives of this study were threefold. The primary objective was to quantify the degree to which a peer-mentorship intervention improved exercise motivation-based constructs, including the three BPN (i.e., autonomy, competence, and relatedness) and motivational regulations (e.g., amotivation, external, introjected, identified, integrated, and intrinsic regulation) in UW. A secondary objective was to explore the impact of the intervention on symptoms of psychological distress (e.g., depression, anxiety, and stress) and exercise engagement (e.g., warm-up, workout, cool-down) throughout the study. A tertiary objective was to qualitatively explore participants' experiences following program completion using an open-ended survey and mentor-participant conversations.

Hypotheses

Based on previous research focused on exercise promotion, it was hypothesized that there would be positive changes in the constructs associated with the primary and secondary objectives for all participants, but to a greater degree in the PMP condition due to the extra assistance and support from mentors (Fried et al., 2018; Keeler et al., 2021; Kwan et al., 2020; Paré et al., 2023).

Method

Study Design

This randomized controlled trial used a parallel group design with repeated measures to explore the effectiveness of a 6-week peer-supported exercise intervention delivered by trained

senior and graduate student mentors (herein referred to as mentors). To enhance internal validity, this study followed the CONSORT Guidelines (see Appendix A).

To provide a comprehensive understanding of the intervention and add to the sparse literature on exercise interventions in the pandemic recovery era, a mixed-methods approach was used, whereby a qualitative post-intervention component was added. Thus, quantitative data were used to assess the impact of the intervention on the dependent variables, while the qualitative data were used to explore participants' experiences (Danielsen et al., 2023; Goncalves et al., 2023; Kowalski et al., 2018). Data were collected at three time points to examine the degree to which the dependent variables changed over time (Dorgo et al., 2011; Fried et al., 2018), allowing for group comparisons.

Eligible individuals were classified as either program participants, randomized to the intervention (exercise plus mentor) or control condition (exercise alone). All participants, regardless of condition, were encouraged to engage in 30-minute exercise sessions at the campus fitness center three times a week for 6 weeks (Benes et al., 2023; Fried et al., 2018; Goncalves et al., 2023; Keeler et al., 2013; Marenus et al., 2021; Yan et al., 2023).

Most previous interventions with similar foci spanned 8 weeks, a duration proven to effectively initiate behaviour change, particularly among student populations (Benes et al., 2023; Fried et al., 2018; Goncalves et al., 2023; Keeler et al., 2013; Marenus et al., 2021; Yan et al., 2023). However, students often face significant time constraints that may hinder their ability to complete an 8-week program, yet they stand to benefit greatly from well-structured behavioural interventions. Given the decreased resilience seen among students in the pandemic recovery era, resulting in heightened stress and overwhelm, it is crucial to evaluate the feasibility of shorter behaviour change interventions (Auerswald et al., 2024; Zarowski et al., 2024). Pre-pandemic,

six-week programs were deemed effective for initiating behaviour change (deJonge et al., 2021; Sylvester et al., 2016), suggesting that exploring shorter durations may help design effective and manageable initiatives for students.

This study was registered as a clinical trial and can be identified by NCT06823336 (https://clinicaltrials.gov/study/NCT06823336?term=SHINE%20PROGRAM&rank=5).

Inclusion Criteria

Mentors

Program mentors were deemed eligible to participate if they; 1) identified as women; 2) were senior students (e.g., third or fourth-year undergraduate or graduate level) at Lakehead University enrolled in a health-based discipline and/or engage in a minimum of 150 minutes of activity in the gym per week; 3) wanted to help others become more active; 4) reported an absence of health risks that would interfere with exercise engagement as determined by the Get Active Questionnaire (CSEP, 2021); 5) could commute to Lakehead's campus; 6) were willing to engage in a 2-hour training workshop; 7) had active access to online technology (e.g., email, zoom); 8) could assist two to three undergraduate students at any given time; and 9) were fluent in English. Inquirers who did not meet the outlined criteria were considered ineligible.

Participants

Participants were deemed eligible to participate if they; 1) identified as women; 2) were full-time undergraduate students at Lakehead University; 3) classified as an exercise initiate (EI; e.g., report one or fewer bouts of exercise per week; Milne, 2008); 4) reported an absence of health risks that would interfere with exercise engagement as determined by the Get Active Questionnaire (CSEP, 2021); 5) feel comfortable using social media platforms; 6) could commute to Lakehead's campus; 7) wanted to become more active; 8) had active access to

online technology (e.g., email, zoom); and 9) were fluent in English. Inquirers who did not meet the outlined criteria were considered ineligible.

Sample Size

Mentors

This study built upon previous research in this area, whereby participants in the PMP condition were provided 1:1 support from their designated peer mentor (Dorgo et al., 2013; Fried et al., 2018; Yan et al., 2023). The literature has supported using a 2-3:1 ratio of participants to mentors, ensuring the quality of mentorship and consistency of participant experiences (Fried et al., 2018; Lavelle, 2023; Lee et al., 2023). The rationale behind this quantity has been rooted in the literature, as individuals who receive individualized guidance are often better supported than those who must share the attention and expertise of a single mentor, especially amongst large groups (Losch et al., 2016). Additionally, the low enrolment of mentors (n = 6) supported this study's internal validity.

Participants

A power analysis used BPN scores from a matched-pairs control group in an 8-week exercise PMP for university students with and without depression (Keeler et al., 2021), to avoid confounding depression symptoms. G*Power indicated that 14 participants would provide a sufficient sample size to detect a meaningful effect and achieve statistical significance (see Appendix B). To offset attrition, nine additional participants were added as prior UW research revealed attrition rates of 15.96% (Keeler et al., 2021) to 60% (Goncalves et al., 2023) in prior exercise interventions. The sample was increased to 24 to achieve balanced conditions.

Recruitment Procedures

Following approval from the Research Ethics Board (#100315), purposive sampling methods were used to recruit mentors (November 2024 to January 2025) and participants (January to March 2025; see Appendix C). A rolling recruitment approach was used to continuously onboard participants. Eligible participants and mentors were recruited through purposive sampling (Kowalski et al., 2018). Recruitment involved social media ads (e.g., student researcher, Lakehead Athletics Department, School of Kinesiology), campus posters, and class presentations. Posters were displayed at key campus locations, including the C.J. Sanders Fieldhouse, University Centre, residence housing, and the Braun Building. This approach aimed for a sample size sufficient to achieve statistical significance quantitatively while enabling data saturation qualitatively (Kowalski et al., 2018). Participant recruitment also took place through the Psychology Department's Sona System, a portal used to promote research projects to students enrolled in a psychology course, offering bonus points that could be added to their final grade for an eligible course.

To support recruitment and retention, participants received $20 or a 2% Sona credit for completing each of the three data collection periods (e.g., baseline, mid, post-program). As for mentors, they received $18.00 for each hour they contributed to the study. This was calculated based on their involvement in a 2-hour workshop, 1 hour per week interacting with a designated participant for a maximum of three participants, and a post-program interview.

Participant and mentor posters and social media ads (see Appendix D) included the study title, participation conditions, criteria, researcher contact details, and a QR code to screen prospective participants and mentors. The screening tool included the Get Active Questionnaire and a specific tool for participants and mentors (see Appendix E). Interested students provided

contact info, completed the tool, and scheduled a facility tour (participants) or a pre-program interview (mentors) via Google Forms. The form included a letter of information (e.g., details of data collection and generation, participant expectations, potential harms, and benefits of participation) to inform prospective participants and mentors of their potential role in the study.

Ineligible participants received a standardized email from the student researcher notifying them of their ineligible status and thanking them for their interest (see Appendix F). If no health risks were posed, they were provided information on how to schedule a facility tour with Lakehead Athletics.

Pre-Program Mentor Screening Interview

Mentors deemed eligible through online screening met at an agreed-upon time in a private room at the C.J. Sanders Fieldhouse. During a pre-program, one-on-one semi-structured meeting, their eligibility was further assessed by exploring their history and current exercise habits (see Appendix G). The interview served to explore how potential mentors may support new exercisers throughout the program. After the interview, mentors who were considered eligible engaged in a 2-hour workshop. Ineligible participants received a standardized email from the student researcher notifying them of their status and thanking them for their interest.

SHINE Program Procedures

Mentor Workshop

After recruiting six program mentors, a training workshop was held at the host institution to equip them with the necessary knowledge and skills for this role (Carlin et al., 2021; Kettle et al., 2022). Before commencing the workshop, mentors were given a letter of information (see Appendix H) and provided an opportunity to voluntarily sign a consent form (see Appendix I). The 2-hour session was led by a Kinesiology Associate Professor and Certified Co-Active

Professional to ensure credibility. The workshop was delivered in consultation with Lakehead Athletics. In the existing literature, many studies recruited mentors with a health or sports science background and provided minor or no additional training to enhance mentors' exercise knowledge (Danielson et al., 2023; deJonge et al., 2021; Yan et al., 2023). See Appendix J for sample workshop slides.

The workshop covered four main areas: program procedures, MI, exercise structuring, and communication policies (Lee et al., 2020). Sixty minutes were dedicated to MI (Fried et al., 2018), and another 60 minutes addressed mentor roles, responsibilities, and exercise structuring (Lee et al., 2020), with breaks between topics. Similar peer-led programs have shown these methods effectively convey expectations and equip mentors to identify engagement barriers, evoke change reasons, and assist in goal setting (Lee et al., 2020).

The workshop was tailored for SHINE program mentors, using proven methods from literature and expert insights (Carlin et al., 2021; Kettle et al., 2022; Leslie et al., 1999; Marenus et al., 2021). The MI section was developed congruently with a PMP mentor training manual created at Queen's University (Dineen & Condra, 2016). The workshop incorporated a blend of PowerPoint slides, group activities, videos, and discussions. Detailed content is outlined below.

Workshop Content. The workshop began by reviewing mentors' roles and responsibilities, emphasizing the importance of mentorship and PMP goals. Attendees listed desirable and undesirable mentor traits for group discussion. Information on UW exercise initiates habits during the pandemic recovery era was used to highlight mentee needs. The MI section, the bulk of the workshop, introduced participants to concepts like SMART goal setting, OARS (open questions, affirmations, reflections, summarizing), active listening, and communication skills. Mentors were expected to use these techniques for support during the

study. Interactive exercises, including videos, vignettes, discussions, and mock interactions, were integrated to develop these skills. The third portion of the workshop covered program guidelines and structuring workouts, including warm-ups, cool-downs, cardiovascular, and resistance training exercises. Attendees practiced structuring cardiovascular and resistance training workouts, focusing on overload and recovery.

The workshop concluded with tips for mentors' success, starting with guidance on downloading the GroupMe app for communication with participants (See Appendix K). Mentors were encouraged to initiate a minimum of 30 minutes of virtual conversation (an estimated two conversations) with their participants per week, exploring topics such as barriers/facilitators and their experiences with solo engagement (Fried et al., 2018; deJonge et al., 20201; Yan et al., 2023). Program boundaries and confidentiality guidelines will be shared to maintain professionalism, especially as mentees may disclose sensitive information. At the end of the workshop, mentors were asked to provide their estimated availability to exercise with mentors from January to April (see Appendix L).

Participant Baseline Assessment and Information Session

Before commencing the 6-week exercise program, all participants engaged in a 60-90-minute individual meeting with the student researcher at a mutually convenient time in the C.J. Sanders Fieldhouse. The student researcher greeted participants, reviewed the information letter (see Appendix H), answered questions, and obtained informed consent. After consent was granted, participants completed the baseline assessment, including the first battery of surveys and obtaining height and weight measurements to calculate BMI.

Orientation. The participants then generated an identification code, which was used on all research-related forms (see Appendix M). The identification code was then used to create a

Strava account, an online fitness tracking platform, where they friended the SHINE Program account and were taught how to track their exercise engagement in real time, see Appendix N for account creation and tracking instructions. The duo then reviewed the exercise guide to help participants structure their workouts (Sylvester et al., 2016; see Appendix O). This guide included definitions of common exercise terminology, engagement parameters, and a sample workout plan created in alliance with CSEP guidelines (CSEP, 2021).

Facility Tour. The participants then engaged in a 15-minute personal tour of the campus gym (see Appendix P) with the student researcher. This involved equipment demonstrations, sign-in instructions, and identification of washrooms and change rooms. Following this, the participants were encouraged to apply their newfound knowledge of the space to begin their 6-week program. Participants were permitted to use the four sections of the campus gym. Gym A is a large, multi-use facility featuring an indoor track, turf field, and a small area with machines and free weights. Gym B is a mirrored room with open floor space, typically used for stretching, body weight and free weight exercises. Gym C is a bright and newly renovated two-level gym, offering the largest array of cardiovascular equipment and various machines and free weights. Gym D hosts many free weights and has the oldest equipment.

Upon completion of the orientation, participants were sent the outlined educational material in a standardized email (see Appendix Q).

Randomization. After completing the data collection and educational components, participants were randomized to the control or intervention condition. A block size of six was used to ensure an even split of participants between the control and intervention groups (Efird, 2011). All possible block combinations (n = 12) were preestablished to evenly allocate participants across groups, which were randomly selected through a randomization website

(https://wheelofnames.com/). A research assistant was responsible for randomly selecting the block combination and sealing the sequence in labelled opaque envelopes, blinding the student researcher to the sequence. The student researcher did not have access to the allocation sequence.

Before attending the orientation session, all participants were matched with mentors based on mutual availability. Those assigned to the intervention condition were randomly assigned a mentor via the randomization website. This ensured each participant-mentor duo could exercise together weekly, facilitating consistency and adherence. Upon assigning participants to conditions, no one was blinded to their group assignment.

Additional Intervention Procedures. Participants assigned to the intervention condition were given their designated mentor's contact information (e.g., via GroupMe) to facilitate social support and relatedness. The student researcher assisted participants in downloading and creating a GroupMe profile to facilitate communication with their mentor. A document with communication guidelines was discussed, encouraging participants to only communicate via GroupMe, to keep all shared information confidential, and to contact their mentor within two days to arrange an initial meeting (Pearson et al., 2013). Upon being matched with an intervention participant, mentors were sent a standardized email informing them of their new participant and providing their availability (see Appendix R).

Exercise Engagement Parameters

To set attainable and realistic expectations for participants, they were asked to engage in at least 90 minutes per week (Keeler et al., 2021; Rodríguez-Romo et al., 2023; Yang, 2019). This approach aimed to set achievable goals to ensure meaningful progress without overwhelming participants, considering their limited exercise experience, knowledge, and free time as university students (CSEP, 2021; Keeler et al., 2021; Rodríguez-Romo et al., 2023;

Yang, 2019). This was supported by an exercise intervention that occurred post-removal of pandemic restrictions, which successfully improved physical and mental health with aerobic activity two to three times a week for 20-60 minutes (Kwak et al., 2023).

In alliance with the CSEP activity guidelines and previous research, all participants were encouraged to engage in cardiovascular and resistance training (CSEP, 2021). Participants were asked to complete a five-minute warm-up, a 20-minute workout, and a five-minute cool-down (deJonge et al., 2021). Session frequency and duration followed CSEP guidelines, starting at an achievable pace to prevent injury and avoid overwhelming participants (Bonilla et al., 2022; CSEP, 2021; Keeler et al., 2021; Yang, 2019).

These guidelines were implemented to support participants' engagement, autonomy, and competence as exercise initiates. Participants were encouraged to access the various spaces and exercise machines on campus. While improvements in fitness are not a primary study objective, participants were educated on proper form, etiquette and how to structure workouts to reduce injury risk.

Intervention Condition. Participants in the PMP condition had a mentor join one of their three weekly exercise sessions on a mutually agreed-upon day each and time week to ensure consistent support and knowledge sharing occurred within a standardized time frame (deJonge et al., 2021; Leenstra et al., 2019). Virtual communication was facilitated via GroupMe to enable mentors to provide support beyond the exercise sessions, addressing a need highlighted by participants in previous programs (Lee et al., 2020). This quantity was chosen as similar studies in this area have shown effectiveness in developing a sense of relatedness through social support among participants and their mentors (Fried et al., 2018; Kirby et al., 2022).

The peer mentors were responsible for providing one-on-one support to a range of two to three participants at any time to enhance their exercise knowledge and confidence (Danielsen et al., 2023; Goncalves et al., 2023; Yan et al., 2023). During the weekly exercise session, mentors supported their participants by engaging in workouts with them, assisting with equipment use, structuring workouts, and developing skills to enhance engagement (Leenstra et al., 2019; deJonge et al., 2021).

Communication Methods. Intervention participants were encouraged to utilize GroupMe (version 7.60.8), a virtual text-messaging and video call application, throughout the study. All participant-mentor duos were invited to join a private group chat, which was monitored by the student researcher. This enabled participants to communicate with their mentor to schedule weekly exercise sessions and receive social support (e.g., mentors were required to initiate two conversations per week), which was anticipated to enhance relatedness and organization (Buja et al., 2024; Goodyear et al., 2021). In previous studies with university students, GroupMe has been shown to be an effective communication method due to its user-friendly structure (Galliart et al., 2023; Gronseth & Hebert, 2019). When communicating online, both parties were encouraged to only communicate via GroupMe. Mentors were encouraged to set realistic communication expectations, explaining that while they may not always be able to respond immediately, but were expected to reply within 24 hours.

Control Condition. Participants in the control group were not paired with a mentor; rather, they engaged in an individual exercise program. These participants relied on the facility tour, exercise program, and a handout to support their engagement.

Upon program completion, all participants received debriefing information outlining the scientific rationale behind the SHINE program (see Appendix S; Tesch, 1977).

Data Collection Measures

This study's main data collection methods only applied to program participants, as the mentors were solely included to support intervention participants. A standardized email was sent to participants seven business days before the second and third data collection periods to prompt survey completion (see Appendix T and U). Participants completed an online survey via Qualtrics at three time points (pre-, mid-, and post-program). The demographic questionnaire was only administered at the start of the program. In contrast, the Psychological Needs Satisfaction in Exercise Scale (PNSES), Behavioural Regulation in Exercise Questionnaire-3 (BREQ-3), and the Depression Anxiety Stress Scale- Short Form (DASS-21) were administered at all three time points. Additional data collection included gym sign-in, exercise tracking, and communication tracking (intervention only). Post-program, participants completed an exit questionnaire.

Demographic Questionnaire

A demographic questionnaire was used to contextualize the study's participants (see Appendix T, Tables T1 and T2; Kowalski et al., 2018). To gain insights into the background of participants, items queried participant's age, birth country, program, year of study, ethnicity, self-perceived fitness and exercise knowledge levels on a scale of 1-10 (1 = below average, 5 = average, 10 = above average), height (cm), weight (lbs), living status (e.g., independently, with parents), employment status (e.g., unemployed, part-time), and transportation method (e.g., personal vehicle, bus). Mentors were asked about their birth country, program, year of study, ethnicity, self-perceived fitness and exercise knowledge, ranked on the same scale as participants.

Primary Outcomes

Psychological Needs Satisfaction in Exercise Scale. The PNSES has been used to measure one's perception of their ability to foster autonomy, competence, and relatedness in the context of exercise, as supported by the SDT (see Appendix U, Table U2; Wilson et al., 2006b). The PNSES is an 18-question scale where participants evaluate each question as being true (= 6) or false (= 1), based on how it applied to them over the past week. In this scale, six statements are allotted for each of the three basic needs, including questions representing: competence "I feel confident that I can do even the most challenging exercises," autonomy "I feel like I am the one who decides what exercises I do," and relatedness "I feel connected to the people who I interact with while we exercise together." When scoring the PNSES, subscale scores were calculated by averaging the six items assigned to each BPN. This scale was initially designed for undergraduate students (Wilson et al., 2006b) but has since been used in various clinical (Petrella et al., 2021) and non-clinical populations (Vlachopoulos et al., 2023). Research supports this scale's high test-retest reliability (0.98) and Cronbach's alpha (0.90-0.91; Sabo et al., 2022; Wilson et al., 2006b).

Behavioural Regulation in Exercise Questionnaire-3. The BREQ-3 is a tool that has been used to gauge an individual's exercise motivation, as supported by the SDT (see Appendix U, Table U3; Markland & Tobin, 2004; Wilson et al., 2006a). The BREQ-3 has been used to gauge where an individual falls on the six-point motivational continuum. The 24 questions in this measure operate on a five-point Likert scale (0 = not true for me, 2 = sometimes true for me, 4 = very true for me). Participants evaluated each statement based on how it applied to them over the past week. Statements have been designed to align with each of the six different styles of regulation, including questions representing amotivation "I don't see why I should have to

exercise", external regulation "I exercise because other people say I should", introjected regulation "I feel guilty when I don't exercise", identified regulation, "I value the benefits of exercise", integrated regulation "I exercise because it is consistent with my life goals", and intrinsic regulation "I exercise because it's fun." When using the BREQ-3, the mean score for each item was calculated to generate subscale scores. This scale has often been used in post-secondary contexts (Dafogianni et al., 2022; Ryes-Molina et al., 2025). Research supports BREQ-3's reliability (0.78-0.84), construct validity and internal consistency (0.61 to 0.88), and Cronbach's alpha (0.73- 0.86; Cid et al., 2018; Cocca et al., 2024; Markland & Tobin, 2004; Palombi et al., 2023; Wilson et al., 2006a).

Secondary Outcomes

Depression Anxiety Stress Scale-21. The DASS-21 has been used to assess general psychological distress, including symptoms in three categories: depression, anxiety, and stress for individuals aged 17 and older (see Appendix U, Table U4; Antony et al., 1998; Lovibond & Lovibond, 1995). The 21-question scale operates on a four-point Likert scale (0 = never, 1 = sometimes, 2 = often, 3 = almost always) and asks participants to evaluate each statement based on how it applied to them over the past week (Antony et al., 1998). In this scale, seven questions have been allotted to each of the three categories, including questions representing depression, "I found it difficult to work up the initiative to do things," anxiety, "I was worried about stations in which I might panic and make a fool of myself," and stress, " I found it difficult to relax." When scoring the DASS-21, the scores for each of the three categories were independently summed and ranked on their respective scales (depression: normal = 0 to 4, mild = 5 to 6, moderate = 7 to 10, severe = 11 to 13, extremely severe 14 and above; anxiety: normal = 0 to 3, mild = 4, moderate = 5 to 7, severe = 8 to 9, extremely severe 10 and above; stress: normal = 0 to 7, mild =

8 to 9, moderate = 10 to 12, severe = 13 to 16, extremely severe 17 and above). This scale has often been used in post-secondary contexts (Johansson et al., 2021; Kia-Keating et al., 2018), and research supports its high internal reliability (0.82- 0.90), Cronbach's alpha (0.86- 0.93), and satisfactory test-retest reliability over two weeks (0.71- 0.81; Antony et al., 1998; Henry & Crawford, 2005). Research has suggested that the DASS-21 has a high internal reliability, ranging from 0.82 to 0.90, with a Cronbach's alpha ranging from 0.86 to 0.93, along with a satisfactory test-retest reliability over a two-week duration, ranging from 0.71 to 0.81 (Antony et al., 1998; Henry & Crawford, 2005).

Exercise Engagement. Participants were required to track their exercise engagement via Strava, which they were asked to upload following all exercise sessions. Strava automatically recorded the date, time of day, duration and distance of each workout, while users could also track additional metrics such as calories burned, average speed, and heart rate (if wearing a compatible watch). If participants forgot to track a workout, they could manually enter their workout metrics into Strava. Regarding program-specific data, participants were required to manually record the duration, exercise (e.g., strength training, cardiovascular training), and location (e.g., Gym A, B, C, D) of each activity (e.g., warm-up, workout, cool-down), enabling the student researchers to monitor engagement in real-time. This permitted participants to track their progress by viewing their previous statistics for each workout (e.g., duration, distance, type of workout, gym areas utilized). Self-monitoring has worked to keep clients accountable, remind them to stay active, and clearly show how far they have come (Pekmezi et al., 2009; Van der Poleg et al., 2010).

Facility Attendance. Before each exercise session, participants were required to sign in by scanning their student card at the gym's front desk. The software-supported facility

attendance tracking system, Fusion, allowed researchers to verify the dates and frequency of participants' exercise sessions at the end of the study, providing a level of assurance. Descriptive statistics were used to determine the average time of day participants signed in at (morning [6:00 am-12:00 pm], afternoon [12:00 pm-5:00 pm], evening [5:00 pm-10:00 pm]), as well as the average day of the week sign-ins occurred for each condition.

Tertiary Outcomes

Exit Questionnaire. Upon completing the program, all participants engaged in an open-ended questionnaire to gain an in-depth understanding of their program experiences (see Appendix U, Table U5; Kowalski et al., 2018). This questionnaire was comprised of open-ended questions adopted from previous research in this area (deJonge et al., 2021; Fried et al., 2018; Van Rijen et al., 2023). The exit questionnaire included questions regarding topics such as exercise habits, motivation, BPN, and their perception of the SHINE program, such as "In what ways did having control over your exercise engagement choices impact your overall engagement?" and "how would you rate your exercise knowledge in the gym environment on a scale of one to 10, with 10 being very high and 1 being very low?"

Communication Tracking. Each week, mentors were required to initiate 30 minutes or two separate virtual conversations with each of their assigned participants, as supported by previous research in this area (Fried et al., 2018; deJonge et al., 20201; Yan et al., 2023). Researchers conducted qualitative and quantitative analyses of the GroupMe conversations to better understand participants' and mentors' communication habits. Descriptive statistics were used to examine the frequency and quantity of messages each mentor and participant sent weekly and the average duration between each text message. Qualitatively, each conversation was

reviewed to explore topics of conversation, program experiences, communication habits, and the efficacy of virtual communication methods in a PMP program.

Data Analysis

Quantitative Data

To address the primary and secondary study purposes, quantitative data were collected to analyze potential differences between the control and intervention conditions to explore the efficacy of the SHINE program. The effect of the independent variables was determined by measuring the primary and secondary outcomes at three points in time.

Quantitative data were analyzed through IBM SPSS (version 30.0) software with significance set at $p < .05$. The demographic data, exercise engagement, facility attendance, and frequency of communication amongst intervention participants were analyzed using descriptive statistics (i.e., means, standard deviations, and frequencies). To assess within- and between-group differences over time, a series of two-way mixed-factorial ANOVAs were conducted separately for the PNSES, BREQ-3, and DASS-21. Each analysis included a between-subjects factor (group: intervention vs. control) and a within-subjects factor (time: pre-, mid-, post-program). Assumptions of normality, homogeneity of variance, and sphericity were evaluated prior to analyses.

If a significant interaction or main effect was detected, post hoc analyses were performed using Fisher's Least Significant Difference test to identify where significance occurred for PNSES, BREQ-3, DASS-21 and exercise data. Only participants who provided data for at least two time points were included in the analysis (Lachin, 2017). This method was not applied to non-starters (i.e., those who completed the baseline assessment but did not exercise) or

individuals who only completed one assessment, as benefits from engagement likely would not have been evident and may have enhanced biases (Saha & Jones, 2009).

Qualitative Data

To address the tertiary study purpose, qualitative data were analyzed through an inductive and deductive content analysis to generate findings from the exit questionnaire and common topics from the participant-mentor conversations (Bingham, 2023; Kowalski et al., 2018). This method was chosen to enable the discovery of emergent themes and subthemes directly from the data, while deductive analyses permit testing pre-existing theories, such as SDT (i.e., autonomy, competence, relatedness; Bingham, 2023; Kowalski et al., 2018). This process improved trustworthiness by combining the two approaches to create a comprehensive exploration of data (Bingham, 2023; Kowalski et al., 2018). To achieve this, the student researcher repeatedly read the questionnaire responses and GroupMe conversations, highlighting concepts that aligned with the study's objectives. By doing so, this enhanced trustworthiness by increasing familiarity with the data and supporting the consistent identification of themes (Bingham, 2023; Kowalski et al., 2018). The responses were then coded and categorized to identify and derive themes and subthemes that emerged across participant interviews and conversations. The qualitative data were categorized into themes according to frequency, with experiences noted by 50% or more participants in each condition qualifying for inclusion (Koralesky et al., 2025), ensuring the themes were reflective of participant experiences. Two researchers (M. F., E. P.) independently analyzed the responses and then reconvened to compare their findings, which worked to minimize researcher bias (Bingham, 2023; Kowalski et al., 2018).

To support these analyses, strategies to enhance credibility and trustworthiness of the findings were implemented such as audit trails (i.e., keeping a record of interactions with

mentors and participants, researchers decisions and procedures); peer debriefing (i.e., co-conducting the analyses and interpretation of the data with an expert to receive feedback and remove biases); and researcher reflexivity (i.e., the student author reflected on how their biases, assumptions, and perspectives may have influenced the research process; Bingham, 2023; Kowalski et al., 2018).

Results

Sample Characteristics

Mentors

Eight interested individuals completed the screening survey, and seven engaged in a pre-program interview. Two did not meet the outlined criteria. Thus, six mentors engaged in the workshop and were paired with 2-3 participants throughout the program. Mentors age spanned from 22 to 28 years old (Mean [*M]* = 24.5, Standard Deviation [*SD*] = 3.1), five (83%) had a formal education in kinesiology, and all reported above average fitness (*M* = 8.8, *SD* = 7.3) and knowledge levels regarding exercise (*M* = 8.00, *SD* = 0.84). Table 1 provides a complete account of mentor demographics.

Table 1

Mentor Demographic Data (n = 6)

Category	Frequency (%)	*M*	*SD*
Age	Range: 22-28	24.5	3.1
Birth country			
Canada	5 (83%)		
Peru	1 (17%)		
Program of study			
Kinesiology (undergrad)	2 (33%)		
Kinesiology/Concurrent education (undergrad)	1 (17%)		
Kinesiology (masters)	2 (33%)		
Psychology (doctoral)	1 (17%)		
Year of study			
1st	2 (33%)		

2nd	2 (33%)		
3rd	1 (17%)		
4th	1 (17%)		
Perceived fitness level /10		8.08	7.3
Perceived exercise knowledge /10		8.00	0.84

Participants

Eighty potential participants expressed interest in the program. Forty-seven of these individuals did not meet the inclusion criteria, one declined to participate, and seven did not attend their scheduled orientation session. Thus, 33 UW completed the baseline assessment, of whom 15 were randomly assigned mentors.

Once the program began, two intervention participants dropped out within the first two weeks: one due to illness and the other for unknown reasons. Two more withdrew after three weeks, both due to illness. In the control group, five participants did not complete the program, one citing scheduling conflicts, the rest for unknown reasons. One additional control participant withdrew after three weeks for unknown reasons. See Figure 2 for a CONSORT diagram depicting participant flow over time.

A last observation carried forward approach was applied to account for missing data from participants who did not complete the program (Lachin, 2017). In the current study, this was applied to participants (n = 3) who completed at least half of the program, for which approximately 3.7% of their missing data was replaced by carrying forward their mid-program survey responses (Lachin, 2017).

Independent samples t-tests revealed significant differences in demographic variables between participants who completed the program and those who did not. Those who did not complete the program had a significantly higher BMI, $t(31) = 2.51$, $p < .01$, $d = 1.07$, and lower exercise knowledge at baseline, $t(31) = –2.71$, $p < .01$, $d = 1.15$.

A total of 26 UW completed the 6-week program, or at least two of the three assessments. Participants' ages ranged from 17 to 71 years old, with the intervention condition (M = 28.0, SD = 18.7) being older than the control (M = 19.6, SD = 6.3). Across both groups, the average BMI was in the overweight category (M = 25.12 kg/m^2, SD = 5.4 kg/m2). Self-reported fitness (M = 4.7, SD = 1.5) and knowledge (M = 4.4, SD = 2.1) levels were below average ($\leq$ 5). Tables 2 and 3 provide a complete account of participant demographics.

Figure 2

CONSORT Flow Chart

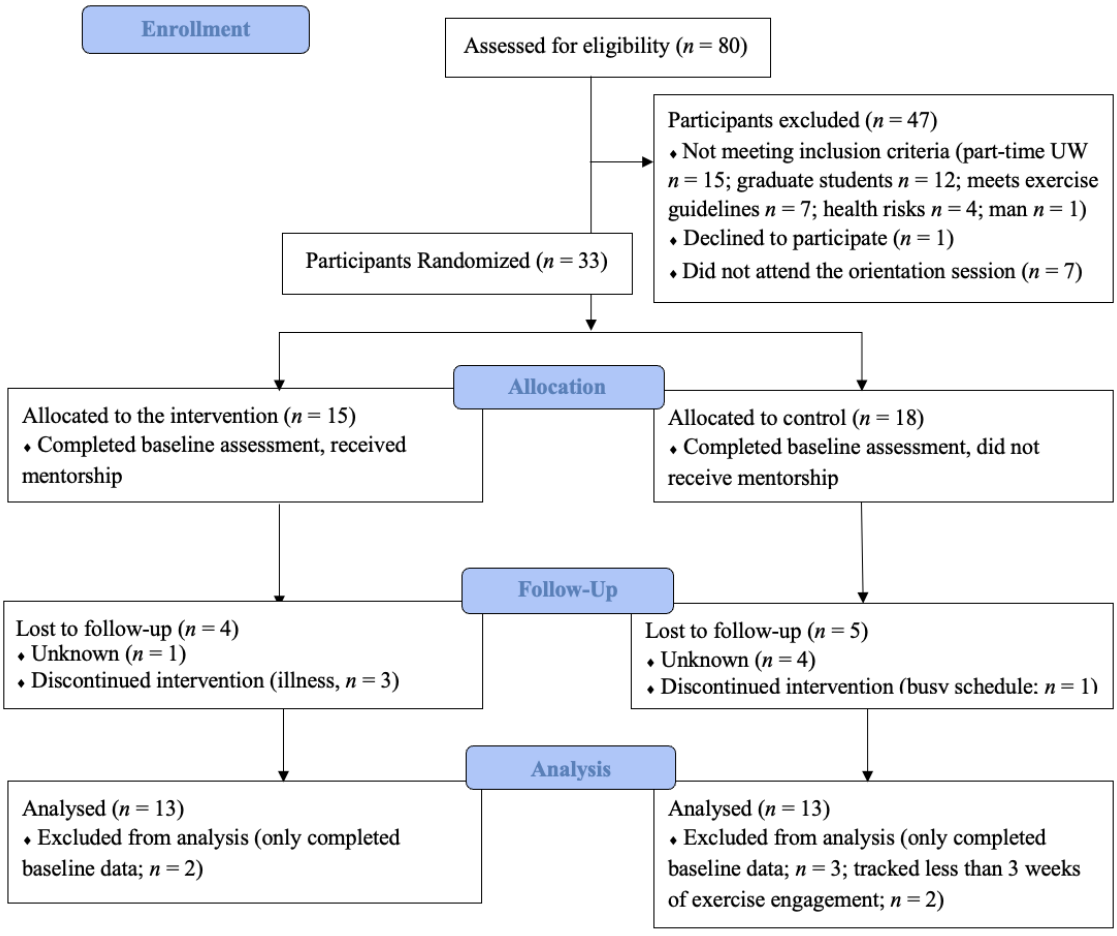


Table 2

Participant Demographic Data (n = 26))- Descriptives

Category	Intervention (n = 13)			Control (n = 13)			Total (n = 26)		
	Range	M	SD	Range	*M*	*SD*	Range	*M*	*SD*
Age (years)	18-71	28.0	18.7	17-31	19.6	6.3	17-71	24.3	12.7
BMI (kg/m^2)	20.5-35.1	25.9	4.6	19.2-35.2	25.1	6.6	19.2-35.2	25.5	5.6
Fitness level /10	2-6	4.3	1.7	3-8	4.8	2.2	2-8	4.7	1.5
Exercise knowledge /10	1-8	3.6	2.2	2-9	5.0	2.1	1-9	4.4	2.1

Note. The BMI categories (kg/m^2) for individuals over 18 years of age are classified as < 16 = severely underweight, 16.0-16.9 = moderately underweight, 17.0-18.4 = mildly underweight, 18.5-24.9 = normal weight, 25-29.9 = overweight, 30.0-34.9 = obese class I (moderate), 35.-39.9 = obese class II (severe), and $\geq$ 40 = obese class III (very severe/morbid; Heart and Stroke Foundation, 2021).

Table 3

Participant Demographic Data (n = 26)

Category	Intervention	Control	Total
	Frequency (%)	Frequency (%)	Frequency (%)
Birth country			
Canada	9 (69%)	2 (15%)	11 (42%)
Nigeria	1 (8%)	3 (23%)	4 (15%)
Syria	0 (0%)	2 (15%)	2 (8%)
Honduras	1 (%)	2 (15%)	3 (12%)
India	1 (8%)	0 (0%)	1 (4%)
Bangladesh	1 (8%)	0 (0%)	1 (4%)
China	0 (0%)	1 (8%)	1 (4%)
Peru	0 (0%)	1 (8%)	1 (4%)
Vietnam	0 (0%)	1 (8%)	1 (4%)
Thailand	0 (0%)	1 (8%)	1 (4%)
Program of study			
Nursing	1 (8%)	6 (46%)	7 (27%)
Biology	1 (8%)	2 (15%)	3 (12%)
Indigenous learning	3 (23%)	0 (0%)	3 (12%)
Business	2 (15%)	1 (8%)	3 (12%)
Chemistry	1 (8%)	1 (8%)	2 (8%)
Social work	1 (8%)	0 (0%)	1 (4%)
Psychology	0 (0%)	1 (8%)	1 (4%)
Political science	1 (8%)	1 (8%)	2 (8%)
Environmental science	0 (0%)	1 (8%)	1 (4%)
History	1 (8%)	0 (0%)	1 (4%)

Applied life sciences	0 (0%)	1 (8%)	1 (4%)
Bioinformatics	0 (0%)	1 (8%)	1 (4%)
Year of study			
1st	5 (38%)	7 (54%)	12 (46%)
2nd	4 (31%)	3 (23%)	7 (27%)
3rd	2 (15%)	2 (15%)	4 (15%)
4th	2 (15%)	1 (8%)	3 (12%)
Ethnicity			
European	7 (54%)	3 (23%)	10 (38%)
Black	2 (15%)	1 (8%)	3 (12%)
Latino	1 (8%)	3 (23%)	4 (15%)
Middle Eastern	0 (0%)	2 (15%)	2 (8%)
South Asian	1 (8%)	1 (8%)	2 (8%)
Asian	0 (0%)	3 (23%)	3 (12%)
Indigenous	2 (15%)	0 (0%)	2 (8%)
Main transportation			
Personal vehicle	9 (69%)	4 (31%)	13 (50%)
Bus	5 (38%)	8 (62%)	13 (50%)
Living arrangement			
On own	9 (69%)	11 (85%)	20 (77%)
With parents	4 (31%)	2 (15%)	6 (23%)
Employment status			
Part-time	7 (54%)	6 (46%)	13 (50%)
Unemployed	6 (46%)	7 (54%)	13 (50%)

Primary Outcomes

In line with the primary purpose of exploring participants' psychological constructs, BPN and self-regulation were quantitatively analyzed using descriptive and inferential statistics.

PNSES

Descriptive statistics revealed that the intervention and control conditions had similar levels of autonomy (I: $M = 31.77$, $SD = 4.00$, C: $M = 30.62$, $SD = 6.28$), competence (I: $M = 21.31$, $SD = 9.00$, C: $M = 28.31$, $SD = 9.92$) and relatedness (I: $M = 27.54$, $SD = 8.26$, C: $M = 26.77$, $SD = 11.70$) at baseline. This was further verified through Box's and Levene's Test of Equality, which identified that the groups possessed non-significant differences at baseline.

When comparing those who completed the program to those who did not, no significant differences were identified at baseline. However, when comparing program completers and non-completers, those who completed less than three weeks of the program had significantly lower baseline scores, $t(11) = -3.77$, $p < .01$, d = 2.10. Table 4 and Figure 3 provide a complete account of PNSES subscale scores.

To explore autonomy, a two-way mixed factorial ANOVA revealed a statistically significant interaction effect when analyzing autonomy scores, $F(1.51, 36.12) = 4.00$, $p = .025$, $\eta^2 = .14$, indicating that changes in autonomy differed between groups over time. Post-hoc comparisons were then conducted to better understand this interaction. In the intervention group, a significant increase in autonomy was observed from pre- to mid-program ($p = .017$, CI: [-6.96, -.74]). As for the control group, they experienced significant improvements in autonomy pre- to mid- ($p = .003$, CI: [-8.11, -1.89]), followed by a significant decline in autonomy from mid- to post-program ($p < 001$, CI: [-10.28, -3.56]). These results suggest that while the control group experienced a decline in autonomy, the intervention group demonstrated improvements, particularly in the first half of the program, which they maintained until the program's end.

Regarding competence scores, a two-way mixed factorial ANOVA was conducted to assess the effects of time (within-subjects: pre-, mid-, and post-program) and condition (between-subjects: intervention vs. control). Results revealed a statistically significant interaction effect, $F(2, 48) = 8.11$, $p <.001$, $\eta^2 = .25$, indicating that the pattern of change in competence over time differed between the two groups. Post hoc analyses provided further insight into these trends. Within the intervention group, a significant increase in competence occurred from pre- to mid- ($p < .001$, CI: [-11.53, -3.85]), mid- to post- ($p < .001$, CI: [-9.53, -2.78]), and pre- to post-program ($p < .001$, CI: [-18.57, -9.12]). Significance was not found amongst the control group,

suggesting they did not experience significant changes in competence scores throughout the program. These findings suggest that the intervention was more effective in enhancing participants' sense of competence over time, while those in the control condition did not experience as significant changes.

Relatedness scores were also analyzed through a two-way mixed factorial ANOVA to examine the effects of time (pre-, mid-, and post-program) and condition (intervention vs. control) on relatedness scores. The analysis did not reveal a statistically significant interaction effect, indicating that changes in relatedness over time did not differ significantly between the two groups and time points. However, a significant within-subjects main effect of time was observed, $F(2,48) = 3.23$, $p = .048$, $\eta^2 = .12$, suggesting that relatedness scores changed over time across both groups. Post hoc comparisons were conducted to explore the effect of time. Statistically significant differences in relatedness were observed from mid to post-program ($p < .001$, CI: [-10.28, -3.56]), indicating that scores changed across time, regardless of group. Based on visual inspection, it would appear that the intervention group experienced greater improvements mid- to post-program (see Figure 4), albeit non-significant. In summary, while the interaction effect was not statistically significant, the significant time effect and within-group findings indicate that participants generally reported changes in relatedness by the end of the program.

Table 4

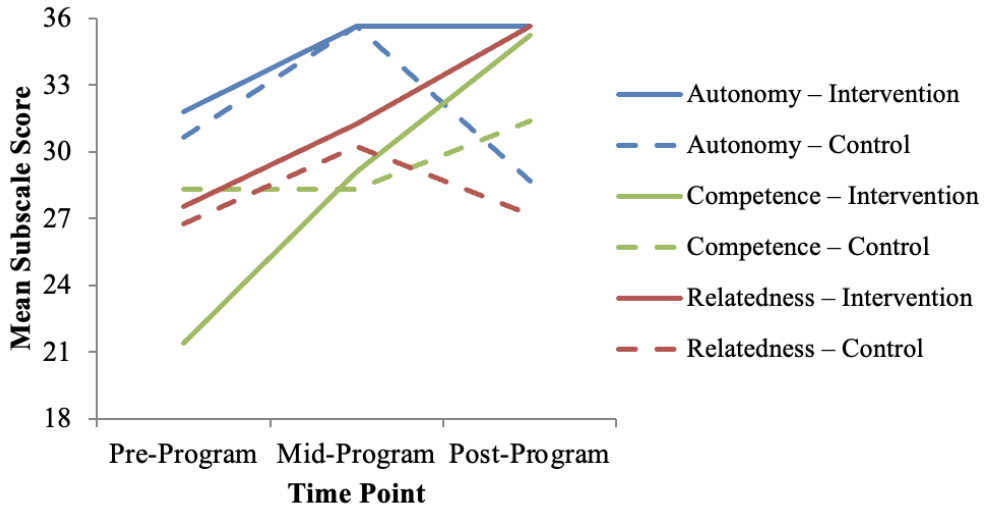
PNSES Scores

Category	Intervention (n = 13)		Control (n = 13)		Total (n = 26)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Autonomy (Week 1)	31.77	4.00	30.62	6.28	31.19	5.19
Competence (Week 1)	21.38	9.00	28.31	9.92	25.85	9.93
Relatedness (Week 1)	27.54	8.26	26.77	11.70	27.15	9.93
Autonomy (Week 3)	35.62	1.39	35.62	1.39	35.62	1.39

Competence (Week 3)	29.08	4.80	28.31	7.64	28.69	7.65
Relatedness (Week 3)	31.23	5.34	30.23	10.38	31.00	8.12
Autonomy (Week 3)	35.62	1.39	28.69	7.80	32.15	6.53
Competence (Week 3)	35.23	1.88	31.38	5.94	33.31	4.74
Relatedness (Week 3)	35.62	1.39	27.15	8.93	31.38	7.61

Figure 3

PNSES Subscale Scores



BREQ-3

Descriptive statistics revealed that both conditions had similar levels of amotivation (I: *M* = 3.54, *SD* = 2.11, C: *M* = 2.45, *SD* = 2.03), external (I: *M* = 3.77, *SD* = 2.42, C: *M* = 4.23, *SD* = 2.83), introjected (I: *M* = 9.15, *SD* = 4.24, C: *M* = 6.62, *SD* = 4.98), identified (I: *M* = 7.46, *SD* = 2.85, C: *M* = 7.23, *SD* = 5.34), integrated (I: *M* = 7.46, *SD* = 2.85, C: *M* = 7.23, *SD* = 5.34) and intrinsic regulation (I: *M* = 8.92, *SD* = 2.50, C: *M* = 9.92, *SD* = 3.97) at baseline. This was further verified through Box's and Levene's Test of Equality, which identified that the groups possessed non-significant differences at baseline. Figures 4 and 5 provide a complete account of subscale scores. No significant differences were evident at baseline when comparing those who completed the program to those who did not.

To explore external regulation, a two-way mixed factorial ANOVA was conducted to examine the effects of time (pre-, mid-, and post-program) and condition (intervention vs. control) on external motivation scores. The analysis did not reveal a statistically significant interaction effect, indicating that the change in external motivation over time did not differ significantly between the intervention and control groups. However, a significant main effect of time was found, $F(2, 48) = 31.53$, $p < .001$, $\eta^2 = .57$, suggesting an overall increase in external motivation scores across the three time points. Post hoc tests were conducted to further explore the significant effect of time, identifying significant differences in external regulation, pre- to post- ($p < .001$, CI: [-8.32, -2.76]) and mid- to post-program ($p < .001$, CI: [-8.80, -3.81]) Overall, although there was no significant interaction between time and condition, participants experienced significant increases in external regulation by the end of the program.

Identified regulation scores were also analyzed through a two-way mixed factorial ANOVA to examine the effects of time (pre-, mid-, and post-program) and condition (intervention vs. control). The analysis revealed no statistically significant interaction effect, indicating that the pattern of change in identified regulation over time did not significantly differ between the two groups. However, a significant main effect of time was observed, $F(2, 48) = 18.77$, $p <.001$, $\eta^2 = .44$, suggesting that identified regulation increased meaningfully across time points for all participants. No significant main effect was found for condition, indicating that overall levels of identified regulation did not differ between the intervention and control groups. Post hoc analyses were conducted to further explore the observed effect of time, identifying significance pre- to post- ($p < .001$, CI: [-6.72, -2.74]) and mid- to post-program ($p = .027$, CI: [-5.10, -1.36]). Based on visual inspection, it would appear that the intervention group experienced greater improvements post program, albeit not significantly (see Figure 5). Despite an

insignificant interaction effect, these findings suggest that both groups experienced improvements in identified regulation by the end of the program.

Regarding integrated regulation, a two-way mixed factorial ANOVA was conducted to examine the effects of time (pre-, mid-, and post-program) and condition (intervention vs. control). The analysis did not reveal a statistically significant interaction effect, indicating that changes in integrated regulation did not significantly differ between the intervention and control groups. However, a significant main effect of time was observed, $F(2, 48) = 12.21$, $p < .001$, $\eta^2 = .34$, suggesting a substantial increase in integrated regulation scores across the three time points for all participants. No significant main effect of condition was found, meaning that average integrated regulation scores did not differ between groups regardless of time. Post hoc analyses were conducted to examine scores over time, which identified significance pre- to post- ($p < .001$, CI: [-7.50, -2.27]) and mid- to post-program ($p = .027$, CI: [-.50, 3.89]). While there was no significant interaction effect, the significant main effect of time suggests that participation in the program, regardless of group, was associated with meaningful increases in this form of integrated motivation.

A series of two-way mixed factorial ANOVAs were conducted to examine the effects of time (pre-, mid-, and post-program) and condition (intervention vs. control) on scores for amotivation, intrinsic motivation, and introjected regulation. This indicated that the changes in these motivation types over time did not differ between the intervention and control groups. Additionally, no significant main effect of time or condition was found for any of these variables. This suggests that, across the duration of the program, there were no meaningful changes in amotivation, intrinsic motivation, or introjected regulation. These results imply that

the intervention had no observable impact on these specific forms of motivation and that they were not influenced by time alone in this sample.

Table 5

BREQ-3 Scores

Category	Intervention (n = 13)		Control (n = 13)		Total (n = 26)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Amotivation (Week 1)	3.54	2.11	2.46	2.02	3.00	2.10
External (Week 1)	3.77	2.42	4.23	2.83	4.00	2.59
Introjected (Week 1)	9.15	4.24	6.62	4.98	7.88	4.71
Identified (Week 1)	7.46	2.85	7.23	5.34	7.35	4.19
Integrated (Week 1)	7.46	2.85	7.23	5.34	7.35	4.19
Intrinsic (Week 1)	8.92	2.50	9.92	3.97	9.42	3.29
Amotivation (Week 3)	2.92	1.80	1.54	1.98	2.23	1.98
External (Week 3)	3.77	2.92	2.69	2.32	3.23	2.64
Introjected (Week 3)	9.38	5.53	6.92	3.57	8.15	4.73
Identified (Week 3)	9.00	2.45	8.69	4.33	8.85	3.45
Integrated (Week 3)	9.38	2.87	8.69	4.33	9.04	3.62
Intrinsic (Week 3)	9.38	2.87	8.69	4.33	9.04	3.62
Amotivation (Week 6)	2.23	2.05	1.38	1.61	1.81	1.86
External (Week 6)	10.85	5.40	8.23	4.95	9.54	5.25
Introjected (Week 6)	10.85	5.40	8.23	4.95	9.54	5.25
Identified (Week 6)	13.00	1.91	11.15	4.98	12.08	3.81
Integrated (Week 6)	12.54	2.82	11.92	3.73	12.23	3.25
Intrinsic (Week 6)	10.85	5.40	8.23	4.95	9.54	5.25

Figure 4

BREQ-3 Subscale Scores- Significance

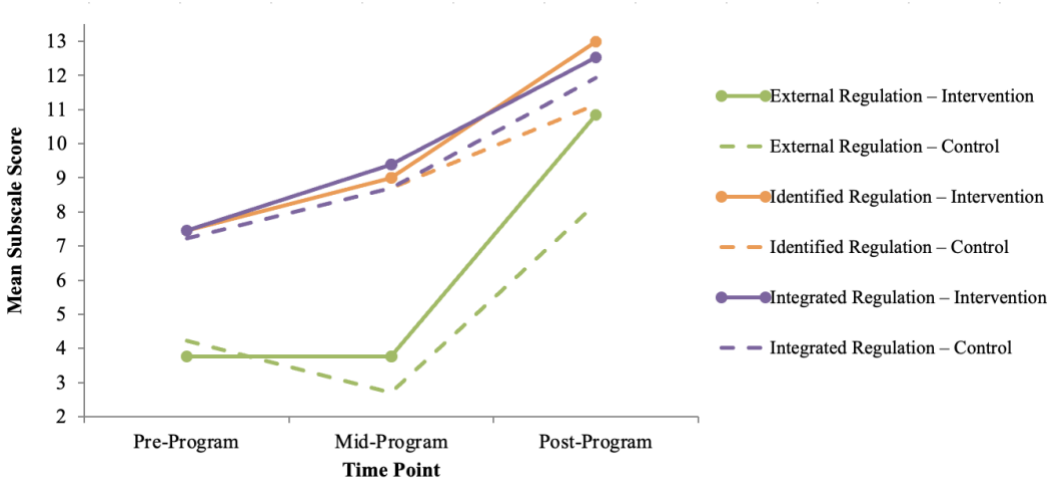
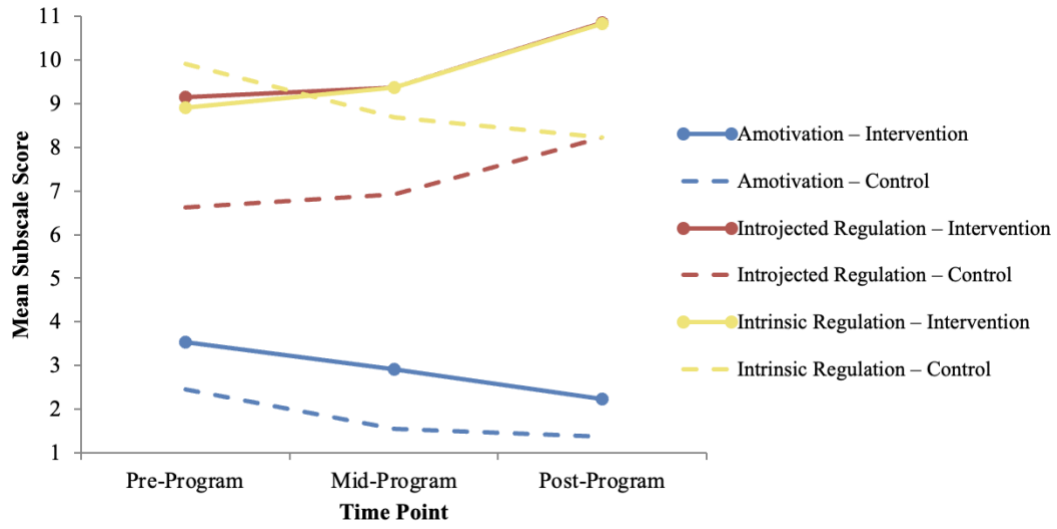


Figure 5

BREQ-3 Subscale Scores- No Significance



Note. The mid- to post-program score for introjected regulation is the same as intrinsic regulation.

Secondary Outcomes

In line with the secondary purpose of exploring behaviour change, mental and physical health indices were quantitatively analyzed using descriptive and inferential statistics.

DASS-21

Descriptive statistics revealed that the intervention and control conditions had similar levels of symptoms related to depression (I: $M = 6.23$, $SD = 3.90$, C: $M = 4.77$, $SD = 4.88$), anxiety (I: $M = 5.86$, $SD = 3.58$, C: $M = 6.54$, $SD = 3.86$) and stress (I: $M = 7.69$, $SD = 3.40$, C: $M = 6.85$, $SD = 4.02$) levels at baseline. This was further verified through Box's and Levene's Test of Equality, which identified that the groups possessed non-significant differences at baseline.

When comparing those who completed the program, an independent samples t-test identified no significant differences at baseline. Among those who did and did not complete the program, no significant differences were found when comparing psychological distress baseline

scores between groups. Table 6 and Figure 6 provide a complete account of descriptive statistics and subscale scores.

To explore depression symptoms, a two-way mixed factorial ANOVA was conducted to examine the effects of time (pre-, mid-, and post-program) and condition (intervention vs. control). The analysis did not reveal a significant interaction effect, indicating that the pattern of change over time did not significantly differ between the two groups. However, a significant within-subjects main effect of time was found, $F(2,48) = 5.42$, $p = .008$, $\eta^2 = .12$, suggesting that scores changed meaningfully across time points. Post hoc analyses were conducted within each group to further explore these time-based changes, identifying that a statistically significant improvement was observed from pre- to mid-program ($p = .013$, CI: [.43, 4.72], indicating early gains. Despite a lack of an interaction effect, the significant main effect of time suggests that participation in the program, regardless of group, was associated with meaningful reductions in depression symptoms.

Anxiety scores were analyzed through a two-way mixed factorial ANOVA, which was conducted to examine the effects of time (pre-, mid-, and post-program) and condition (intervention vs. control). The analysis did not reveal a significant interaction effect, indicating that changes in anxiety over time did not differ significantly between the two groups. However, a significant within-subjects main effect of time was observed, $F(2,48) = 23.04$, $p < .001$, $\eta^2 = .49$, suggesting that anxiety symptoms decreased across time points. No significant between-subjects effect was found, indicating that average anxiety scores did not differ between groups when time was not considered. Post hoc comparisons were conducted to explore within-group changes, identifying significance pre- to mid- ($p< .001$, CI: [1.67, 4.26]) and pre- to post-program ($p< .001$, CI: [1.20, 4.04]). These findings suggest that participants experienced meaningful

decreases in anxiety over the course of the program. Although no interaction was detected, the effect of time indicates that the program, regardless of condition, was associated with reduced anxiety among participants.

Regarding stress scores, a two-way mixed factorial ANOVA was conducted to assess the effects of time (pre-, mid-, and post-program) and condition (intervention vs. control). The analysis revealed no significant interaction effect, indicating that the change in stress levels over time did not differ significantly between the two groups. However, a significant within-subjects main effect of time was observed, $F(2,48) = 11.54$, $p < .001$, $\eta^2 = .32$. This suggests that stress levels decreased throughout the program. No significant between-subjects effect was found, indicating that average stress scores did not differ across the program's intervention and control groups. Post hoc analyses examined changes in stress across time, identifying significance pre- to mid- (p =.007, CI: [.44, 3.18]) and pre- to post-program (p = .001, CI: [1.09, 4.91]). While there was no significant interaction effect, the significant main effect of time suggests that participation in the program, regardless of group, was associated with meaningful reductions in stress symptoms.

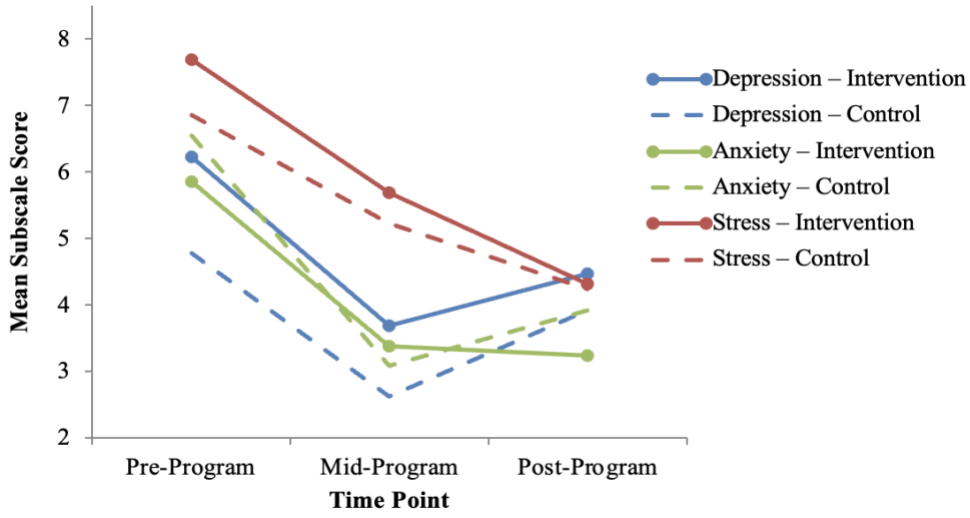
Table 6

DASS-21 Scores

Category	Intervention (n = 13)		Control (n = 13)		Total (n = 26)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Depression (Week 1)	6.23	3.90	4.78	4.88	5.50	4.39
Anxiety (Week 1)	5.85	3.58	6.54	3.86	6.19	3.67
Stress (Week 1)	7.69	3.40	6.85	4.02	7.27	3.67
Depression (Week 3)	3.69	2.56	2.62	3.33	3.15	2.96
Anxiety (Week 3)	3.38	2.87	3.08	2.63	3.23	2.70
Stress (Week 3)	5.69	3.54	5.23	2.42	5.46	2.98
Depression (Week 3)	4.46	3.69	3.92	4.75	4.19	4.18
Anxiety (Week 3)	3.23	2.95	3.92	3.25	3.92	3.25
Stress (Week 3)	4.31	3.84	4.23	2.49	4.27	3.17

Figure 6

DASS-21 Subscale Scores



Exercise Engagement

Descriptive statistics were used to examine differences between the intervention and control conditions for exercise engagement. Regarding program completion, 12 out of 13 participants in the control condition completed the whole program (i.e., tracked exercise weekly, completed three assessments), while only 10 out of 13 participants in the intervention condition did so. Despite the lower completion rate, participants in the intervention condition engaged in more extra activities; as a group, they tracked 12 additional exercise sessions. In contrast, the control group tracked six extra activities.

A Fisher's Exact Test examined the association between condition and program completion. The difference was insignificant, indicating that dropout rates were comparable across conditions. However, the small sample size may have limited the ability to detect a true effect, as dropout rates appeared higher in the control (27.8%) than in the intervention (13.3%) condition.

Descriptive statistics revealed that the intervention and control conditions engaged in similar warm-up durations (I: M = 6.27 minutes, SD = 1.67 minutes, C: M = 6.35 minutes, SD = 1.39 minutes), workout (I: M = 27.09 minutes, SD = 4.81 minutes, C: M = 23.18 minutes, SD = 4.51 minutes), and cool down durations (I: M = 6.42 minutes, SD = 1.04 minutes, C: M = 6.62 minutes, SD = 1.29 minutes) at weeks 1-3.

This was further verified through Box's and Levene's Test of Equality, which identified that the groups possessed non-significant differences at baseline. Table 7 and Figure 7 provide a complete account of descriptive statistics and subscale scores.

Warm-up durations were analyzed through a two-way mixed factorial ANOVA to assess the effects of time (within-subjects: weeks 1-3 and 4-6) and condition (between-subjects: intervention vs. control). Results revealed a statistically significant interaction effect, $F(1, 21)$ = 9.16, p = .006, η^2 = .31, indicating that the duration of warm-ups changed over time across the two groups. Post hoc analyses examined significant differences in warm-up durations amongst conditions at weeks 4-6 (p = .002, CI: [-3.73, -.95]). The intervention group also experienced significant differences from weeks 1-3 and 4-6 (p = .02, CI: [-2.43, -.23]). These findings suggest that, on average, the intervention group experienced a significant increase in their warm-up duration from weeks 1-3 and 4-6, while the control group did not.

A series of two-way mixed factorial ANOVAs were conducted to examine the effects of time (within-subjects: weeks 1-3 and 4-6) and condition (between-subjects: intervention vs. control) on workout and cool-down durations. This indicated that the changes in these durations did not differ between groups over time. Additionally, no significant main effects of time or condition were found for any of these variables. This suggests that, across the duration of the program, there were no meaningful changes in workout or cool-down durations. These results

imply that the intervention had no observable impact on these specific engagement types and that they were not influenced by time alone in this sample. However, in the present study, the focus was more on adherence rates.

Moreover, before and after the program's completion, participants were asked to indicate their self-reported fitness level and exercise knowledge. Compared to baseline, participants in both the intervention and control groups demonstrated improvements in both post-program constructs.

Table 7

Participant Exercise Habits

Category	Intervention (n = 13)			Control (n = 13)		
	Frequency (%)	M	SD	Frequency (%)	M	SD
Warm-up Exercise						
Walk	93 (46%)			118 (54%)		
Stretch	43 (21%)			75 (34%)		
Bike	35 (17%)			8 (4%)		
Row	8 (.04%)			14 (.06%)		
Elliptical	10 (.05%)			3 (1%)		
Stairmaster	6 (.03%)			2 (.009%)		
Run	8 (.04%)			0 (0%)		
Warm-up Location						
Hangar	96 (48%)			95 (43%)		
Wolf Den	88 (43%)			83 (38%)		
Basement	11 (.05%)			31 (14%)		
Aerobics Studio	8 (.04%)			11 (5%)		
Warm-up Duration (minutes)	Range: 2-15	7.0	3.7	Range: 2-15	5.9	2.4
Workout Exercise						
Full body strength training	55 (27%)			34 (15%)		
Upper body strength training	35 (16%)			49 (22%)		
Lower body strength training	35 (16%)			30 (14%)		
Elliptical	17 (.08%)			33 (15%)		
Stairmaster	5 (.02%)			24 (11%)		
Walk	24 (11%)			4 (2%)		
Run	6 (.03%)			19 (8%)		
Yoga	5 (.02%)			2 (.009%)		
Swim	2 (.01%)			2 (.009%)		
Row	2 (.01%)			2 (.01%)		

Zumba	1 (.005%)			1 (.004%)		
Core	1 (.005%)			0 (0%)		
Workout Location						
Hangar	99 (49%)			105 (47%)		
Wolf Den	76 (37%)			95 (42%)		
Basement	13 (.06%)			14 (0.62%)		
Aerobics Studio	15 (.07%)			6 (0.27%)		
Workout Duration (minutes)	Range: 10-67	27.2	11.2	Range: 10-60	24.0	9.40
Cool Down Exercise				0 (0%)		
Stretch	99 (49%)			102 (47%)		
Walk	96 (47%)			104 (48%)		
Bike	9 (0.4%)			5 (.002%)		
Row	3 (.01%)			3 (.001%)		
Stairmaster	1 (.005%)			4 (.002%)		
Elliptical	1 (.005%)					
Cool Down Location						
Hangar	106 (52%)			102 (47%)		
Wolf Den	61 (30%)			70 (32%)		
Aerobics Studio	18 (.09%)			32 (15%)		
Basement	18 (.09%)			15 (7%)		
Cool Down Duration	Range: 2-15	6.5	3.2	Range: 2-15	6.3	2.7

Note. These data are based on the total tracked exercise habits of intervention (n = 10) and control (n = 12) participants who completed the entirety of the program. Intervention participants completed 203 workouts in the gym and 12 workouts externally. Thus, the warm-up and cool-down statistics were equal to 203, and workouts by 215. The control participants completed 220 workouts in the gym and six external workouts. Thus, the warm-up and cool-down statistics were divided by 220, and workouts by 226. Table 8 provides a complete account of participants' fitness levels and exercise knowledge.

Figure 7

Exercise Habits by Time Point

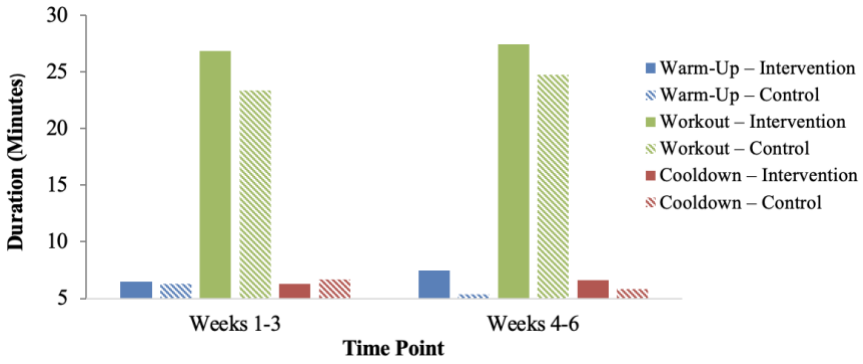


Table 8

Participant Self-Reported Exercise Metrics: Pre- and Post-Program

Category	Timepoint	Intervention (n = 11)		Control (n = 12)		Total (n = 23)	
		M	*SD*	*M*	*SD*	*M*	*SD*
Fitness level /10	Pre	4.3	1.7	4.8	2.2	4.7	1.5
	Post	6.0	1.6	6.7	1.1	6.3	1.4
Exercise knowledge /10	Pre	3.6	2.2	5.0	2.1	4.4	2.1
	Post	6.1	1.9	6.5	1.7	6.2	1.5

Note. A total of 23 out of 26 participants completed the post-program survey, as the last observation carried forward method was implemented on two participants in the intervention and one in the control condition.

Facility Attendance

Descriptive statistics via frequency analysis were used to compare sign-in times at the gym's front desk between intervention and control participants. The most common time of day for gym use across all participants was the evening, reported by 50% of participants. Notably, all 13 intervention participants signed in at least once, while two of the 13 control participants never signed in at the gym; they recorded workouts through Strava. Table 9 provides a complete account of participant exercise habits by group.

In the intervention condition, two participants who completed fewer than three weeks of the program signed in three and four times, respectively. Two others withdrew after completing three weeks and signed in only once and twice. In the control group, two participants signed in four and five times, respectively. Three control participants never signed in; of those, only one reported completing a workout. The remaining two participants in the control group never signed in at all. Table 9 provides a complete account of participant sign-in habits.

Table 9

Participant Sign-In Data

Category	Intervention (n = 13)	Control (n = 11)	Total (n = 24)
	Frequency (%)	Frequency (%)	Frequency (%)
Time of Day			
Morning (6:00 am- 12:00 pm)	3 (23%)	3 (27%)	6 (25%)
Afternoon (12:00- 5:00 pm)	7 (54%)	3 (27%)	11 (45%)
Evening (5:00- 10:00 pm)	3 (23%)	5 (45%)	12 (50%)
Day of the week			
Monday	2 (15%)	1 (.09%)	3 (13%)
Tuesday	0 (0%)	1 (.09%)	1 (.04%)
Wednesday	2 (15%)	1 (.09%)	3 (13%)
Thursday	3 (23%)	4 (36%)	7 (29%)
Friday	3 (23%)	3 (27%)	4 (25%)
Saturday	1 (.08%)	0 (0%)	1 (.04)
Sunday	2 (15%)	1 (.09%)	3 (13%)

Note. These data are based on the participants who completed the program. Of the 13 control participants, two never signed in at the gym. All 13 intervention participants signed in.

Communication Tracking

In line with the tertiary purpose of exploring in-depth insights into program experiences, participants' and mentors' GroupMe conversations were quantitatively analyzed using descriptive statistics to better understand engagement experiences for participants and mentors. Consistent with previous analyses, this analysis includes the three intervention participants who did not complete the program but participated for at least three weeks, to offer a more detailed examination of their communication habits.

In total, intervention participants sent fewer text messages (M = 4.85, SD = 3.33) than their mentors (M = 5.31, SD = 2.91). Message frequency was the highest in Week 1 (M = 6.38, SD = 2.53) and decreased through Week 6 (M = 4.36, SD = 3.35). Additionally, there was an average delay of 18.67 hours (SD = 5.08) between sending and receiving a message across both

mentors and participants. Tables 10 and 11 provide a complete account of participant and mentor communication habits as demonstrated via one-way sent messages.

Table 10

Communication Habits- Intervention Participants

Participant (n = 13)	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Total
7	4	3	5	4	5	4	25
12	4	5	3	5	1	0	18
13	7	4	5	1	1	0	18
1	8	9	3	5	8	3	36
3	10	5	1	4	2	4	26
2	5	1	3	1	1	3	14
11	6	4	4	2	4	7	27
6	5	5	5	4	8	9	36
9	9	3	1	3	3	1	20
4	7	7	6	11	5	6	42
5	9	9	15	11	9	14	67
8	6	4	5	5	5	10	35
10	4	1	4	2	2	1	14
Total	84	60	60	58	54	62	378

Note. Participants 12 and 13 dropped out of the study at week 5; thus, they did not have any communication data for week 6.

Table 11

Communication Habits- Mentors

Mentor (n = 6)	Participant (n = 13)	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Total
1	7	6	3	4	5	4	4	26
	12	5	5	3	7	2	0	22
	13	6	4	6	1	1	0	18
2	1	7	5	3	6	9	3	33
	3	11	4	2	5	3	5	30
3	2	7	3	5	2	2	3	22
	11	7	3	4	6	6	6	32
4	6	5	6	5	5	11	9	36
	9	12	5	4	3	4	1	29
5	4	8	7	7	11	5	8	44
	5	8	8	14	11	7	12	60
	8	6	6	6	4	6	9	37
6	10	3	1	5	3	4	2	18

Total	91	60	68	69	64	62	407

Note. Participants 12 and 13 dropped out of the study at week 5; thus, they do not have any communication data for week 6.

Qualitative Findings

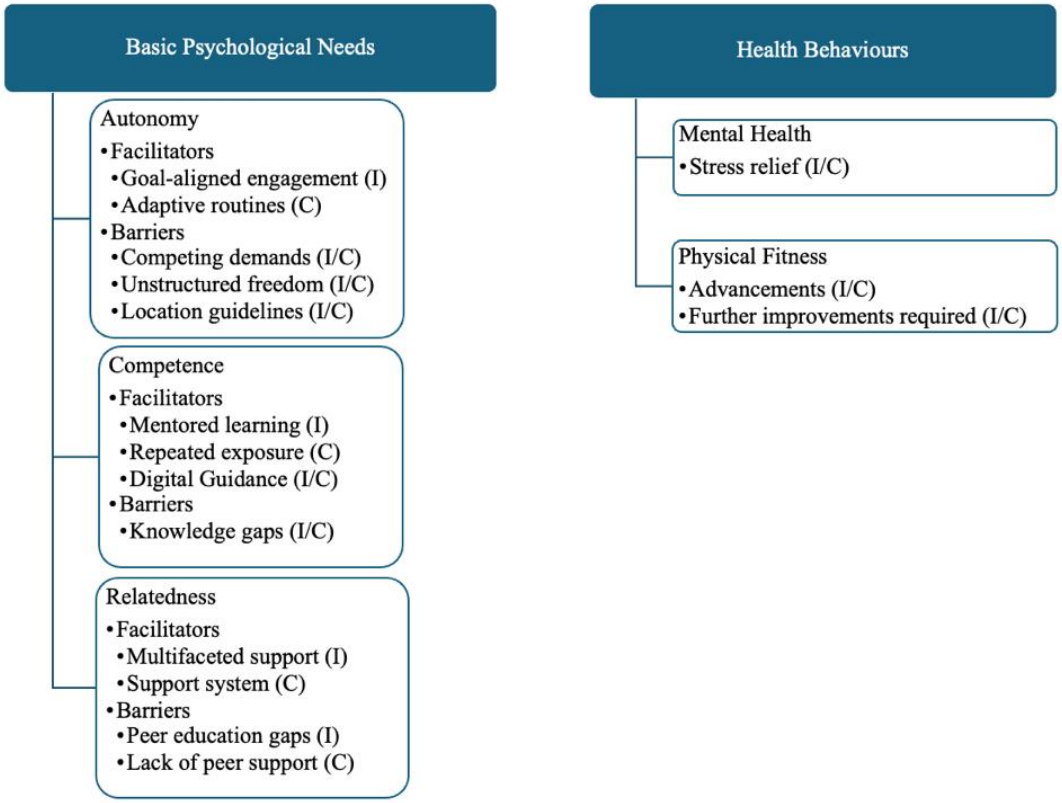
In line with the tertiary purpose of exploring participant experiences, GroupMe conversations and exit questionnaires were analyzed to gain in-depth insights.

Exit-Questionnaire

Analysis of the exit questionnaires unveiled recurring common sentiments within and across participants' responses that related to exercise engagement. In line with the study's purpose, two main categories were used deductively to organize the subthemes, including: 1) BPN, which captured facilitators and barriers to autonomy, competence, and relatedness; and 2) health behaviours, which included physical fitness and mental health outcomes. Figure 8 depicts these qualitative themes and subthemes by group, while Tables 12-14 provide illustrative quotes.

Figure 8

Exit-Questionnaire Themes and Subthemes



Note. The use of 'I' and 'C' have been used to represent which condition the themes applied to, either the intervention, control or both.

Basic Psychological Needs

As previously noted, BPN are key factors that support motivation. Participant responses reflected three core needs: autonomy (choice and control), competence (confidence and skill), and relatedness (social connection). These emerged across intervention and control groups and were consistently linked to enjoyment, motivation, and continued exercise engagement.

Autonomy: Facilitators. According to participants in both groups, the freedom to choose their workouts facilitated engagement. Intervention participants more frequently linked this freedom to alignment with personal goals, while control participants viewed autonomy as beneficial for reducing pressure to engage in certain activities.

Goal-Aligned Engagement. Intervention participants frequently emphasized the importance of having control over their workouts, which allowed them to *align activities with their personal goals* and daily objectives. This can be seen in Participant 3I's quote, “Having control over my exercise choices makes me more excited to be engaged because I know that I am working towards the goals of my choosing.” This flexibility was considered convenient and motivating, allowing participants to feel more ownership over their progress. Nearly all intervention participants described how exercising on their own accord made the experience feel more natural and enjoyable. These participants valued adjusting the intensity of their workouts based on how they felt and appreciated being able to pursue goals on their terms, especially on a daily basis. Participant 5I supported this notion as she shared, “I found that I was more engaged when I had control because some days I was REALLY tired and only wanted to bike [which was common], but it made me still go to the gym and make that effort. So having the control kept me going.”

Adaptive Routines. Participants in the control condition noted that they often emphasized *adaptive routines* and the freedom to create self-directed routines, which reduced the pressure to exercise. Many participants indicated that they mainly relied on personal preferences, such as their physical and emotional well-being, to guide their workouts, which they found meaningful. About half of the control participants reported that choosing when and how to exercise made it easier to stay active, alongside academic or personal demands. This was echoed by Participant 11C, who said, “When I can choose the type of activity, timing, and intensity, I feel more invested and motivated to stick with it. This flexibility also helps me stay consistent because I do not feel forced into a rigid routine that does not fit my lifestyle.” Some also noted that the absence of external pressure encouraged them to try new activities, and one participant shared

that being able to adjust the timing and intensity of workouts contributed to a greater sense of sustained participation. For example, Participant 3C stated, “When I have the freedom to choose how and when I exercise, it feels less like an obligation and more like something I genuinely want to do. I started trying out new [exercises] that used to feel intimidating. That flexibility allowed me to listen to my body and explore new challenges.”

Autonomy: Barriers. Despite these benefits, both conditions reported related challenges associated with independence. While competing academic demands, location guidelines, and unstructured freedom were common across both groups, which all detracted from feelings of autonomy in different ways.

Competing Demands. In the intervention group, competing demands were the most discussed barrier to engagement. *E*ight intervention participants cited increased workloads and lack of time, which limited their ability to exercise at the gym on their own terms. This was reflected in Participant 10I's quote, “Having to balance school, work, and time spent exercising was definitely a challenge.” Likewise, eight control participants noted that their academic workload negatively impacted their ability to exercise, specifically in the absence of structured support. When asked what made it difficult to exercise, Participant 9C discussed her academic workload as “Mostly responsibilities. If I had to study for a test, going to the gym wouldn’t even cross my mind.”

Unstructured Freedom. Intervention and control participants indicated that the informal and unstructured freedom of most or all of their exercise sessions sometimes acted as a barrier to consistent engagement. In the intervention group, three participants reflected that too much freedom in their individual exercise sessions sometimes reduced accountability. To overcome this, these participants recommended using more formal support through exercise classes or

training programs, as reflected by Participant 2, who suggested, “Having some regular scheduled stretch classes, strength training sessions and cardio workouts during this study would have increased my participation.” Among those in the control condition, four participants noted that their self-guided engagement, marked by increased freedom and a lack of accountability, made it harder to stay consistent. This was primarily due to a lack of structured exercise routines. This was evident when Participant 1C mentioned, “I am much more satisfied with my routine [compared to before the study], however, I would like an instructor or someone to help me make a routine. As I feel I may be doing it wrong.”

Location Guidelines. Many participants in both conditions noted that the study’s exercise *location guidelines* occasionally restricted their engagement. Two intervention and three control participants cited limitations in equipment and facilities that hindered their exercise engagement. For example, when Participant 8C was asked what would have enhanced their experience in this study, she stated, “Maybe if there was a women’s only area in the gym, as I sometimes felt a bit self-conscious because there were men around.” Moreover, three intervention and four condition participants indicated that the on-campus gym requirements hindered their engagement, expressing a preference for exercising at home or outdoors, especially as weather-related barriers often made commuting to campus difficult. As represented by Participant 2C, “Sometimes just getting to the gym [was a barrier]. There were a couple days I wished I could have watched an exercise video at home, as getting to the gym was hard due to transportation.”

Table 12

Supplementary Participant Quotes - Autonomy

Theme/Subthemes	Quotes
Facilitator	
Goal-Aligned Engagement (I)	• "[Having control] makes me feel a great sense of autonomy. Additionally, it made me more excited to partake in the program" (P6I). • "[Having control] is important to me because if I hate the exercise activity, I'm simply not going to do it. I will just stop going to the gym if it means that I can't do what I want to do" (P7I) • "It can be a bit nerve-wracking to start out and not know what to do at first. But, having control over my own exercises meant if I was more tired one day then I can do a less intensive workout. And I can try new things when I feel comfortable!" (P9I)! • "Not being told to exercise makes exercising more enjoyable. I feel more motivated when completing the exercises that I want to do" (P10I).
Adaptive Routines (C	• "I feel I am my own boss to choose and have control of what I do. I love this." (P2C). • "Being able to choose my own workouts makes it a lot easier to stay motivated. I actually look forward to exercising because I get to do things I enjoy, and it helps me stay consistent without feeling forced" (P4C). • "It makes me feel less nervous or pressured to exercise. [When I have control over my exercise choices] it comes naturally, which then makes me enjoy it more" (P7C). • "The flexibility to choose my own workouts made it more enjoyable, and I appreciated the push to be more active overall" (P12C).
Barrier	
Competing Demands (I/C)	• "A lot of school commitments, one of the biggest things has been my placement which takes up a lot of hours in my day. Also, it was difficult to exercise with midterms as I wanted to spend all of my time preparing" (P3I). • "How busy I was [made it hard to exercise]. I had a very full schedule and finding time was hard. Not only that but my energy levels have been quite bad so that was a bit of a struggle as well" (P5I). • "Sometimes it's hard to find time to go to the gym because I have a heavy study schedule" (P5C). • "Making time [to exercise] in between class, work and in general, life [made it hard to exercise]" (P11C).
Unstructured Freedom (I/C)	• "Sometimes when I have complete control I tend to slack off a little bit, having someone with me, or taking a more structured class keeps me more engaged" (P3I). • "I prefer joining a class which there is specific schedule that I can follow and an instructor to tell me if I exercise wright or wrong" (P6C). • "Maybe a class or group exercise with instructor provided" (P7C).
Location Guidelines (I/C)	• "I also wasn't a fan of the gym setup because every room is so far apart, it was inconvenient" (P7I).

- "The only thing that was a challenge was coming to the university if I was not already in the area as it could have been easier to work out at home or go for a walk outside" (P4I).
- "I think it could be nice if I could go for a walk in a park with open space and fresh airs for this study" (P7C).
- "Having a women-only gym would be a great idea" (P10C).

Competence: Facilitators. While the degree to which participants experienced competence varied, both conditions noted improvements. For many intervention participants, competence was built through *mentored learning*, gaining skills and confidence with the support of their mentor. In comparison, control participants developed knowledge through *repeated exposure* to the gym. Regardless of condition, participants in both groups accessed *digital guidance* to support engagement.

Mentored Learning. According to most intervention participants, competence was developed through *mentored learning*, through a combination of vicarious learning and exposure to the gym. Eleven participants noted they became more comfortable in the gym and progressed from properly using various machines to creating structured routines. Participant 3I reflected on this as she expressed, "[Post-program] I have a high level of confidence in the gym, and I know my way around a large majority of the gym equipment." This sentiment was echoed by many intervention participants when they were asked to recall the guidance they received from their mentor. Several shared how their mentor supported them by allowing space for independent exercise while providing guidance. This can be seen in Participant 6I's statement, "She was nice and patient when we worked out together, but didn't hover when we had different goals for the day."

Repeated Exposure. Control participants also reported gains in competence, with progress primarily attributed to *repeated exposure* to the campus gym. Eleven participants noted that consistent attendance reduced initial discomfort and helped them become more familiar with

the equipment. This was reflected by Participant 12C, who stated, “The more I go to the gym, the more I know how to operate each equipment” (P10C). Moreover, these participants described that as their exercise habits improved, they became more confident and knowledgeable in navigating the gym and structuring workouts independently. For example, Participant 4C shared, “Before [the study], I was doing higher repetitions, around 10 to 12 per set, but now I usually do 8 to 9, following the guide provided to me.”

Digital Guidance. Participants in both conditions reported using external resources, primarily from social media, as forms of *digital guidance* to support their exercise routines. Three intervention participants noted that they referred to social media to complement the knowledge they gained from peer support. This can be seen in a quote by Participant 9I, who recalled, “I [accessed] workout routines online and guides to [become] more familiar with new workouts and proper form. This also helped me structure my workouts better!” Similarly, eight control participants reported accessing YouTube, Instagram, Pinterest, and TikTok to help use machines and assist with foundational tasks, such as identifying and using equipment. For example, Participant 3C indicated that she often referred to social media to assist with engagement, and she shared, “To check the proper form of an exercise, I would look for videos on TikTok.”

Competence: Barriers. However, participants in both conditions experienced barriers to knowledge specific to exercise structuring. Despite mentor support, intervention participants expressed uncertainty about applying knowledge effectively at times. In contrast, control participants reported lower confidence with proper form, often sticking to familiar routines as a result.

Knowledge Gaps. Two intervention participants noted they occasionally felt uncertain about how to apply their newfound skills effectively due to *knowledge gaps* and would have appreciated increased exercise training. As expressed by Participant 5I: "I think a bit of an educational component would have helped… [regarding] muscle groups and exercises that help muscle growth or flexibility. Just a basic rundown of education on exercise." Similarly, two participants noted that they continued to avoid specific machines due to uncertainty or lack of experience. Moreover, four intervention participants explicitly noted having above-average exercise knowledge but highlighted that more knowledge is still required. This notion was reflected in Participant 10I's statement: "I feel that I can do quite a few exercises that the average person cannot do. However, there are many exercises… that I am less strong in and I feel as though I cannot confidently perform them."

Control participants commonly reported barriers to competence related to form, equipment use, and workout planning. Five preferred to stick with familiar routines to avoid mistakes or injury, which limited variety and skill development. For example, Participant 4C shared that her uncertainty about proper technique led her to avoid free weights altogether, as she stated, "I also do not have much experience with free weight exercises…I am not confident that I would be doing them with the right technique. So while I feel fairly knowledgeable and comfortable in the gym, I know there's still a lot I could learn, especially to feel safer and more confident with form and technique." Four control participants noted low confidence in their ability to plan or perform exercises independently, and five expressed interest in additional support, such as structured classes or instructor guidance, to help them build confidence and expand their routines.

Table 13

Supplementary *Participant Quotes- Competence*

Category	Quotes
Facilitators	
Mentored Learning (I)	
	• "I am a lot more satisfied with my exercise routine now, I feel like it is a lot more effective and I have the ability to target muscles as opposed to just guessing" (P3I). • "I now feel like I know how to use most machines, and I feel confident while using them. The gym is no longer intimidating" (P4I). • "Throughout the study, I started to branch out more and find equipment that I liked. I also moved on to using dumbbells and made an effort to hit more muscle groups. Now that I knew how machines worked and proper form I could do more than before" (P7I).
Repeated Exposure ©	
	• "[Post-program] I am very satisfied [with my exercise routine] it feels like I have been able to have a more balanced routine" (P6C). • "I feel like I'm now familiar with almost all the machines, and I had the chance to try most of them" (P9C). • "From this program my routine has now become more structured. I ensure always doing a warmup which really I didn't do before. I also learnt it doesn't take to much out of my day to actually go to the gym. Before I would make excuses such as work and school and believe it took to much time that I didn't have. However through this program I was able to integrate it into my day such as going after work then going home, even if it was only 30 minutes" (P1C). • "Before the experiment I had little to no knowledge but now I know the [gym] environment well" (P11C).
Digital Guidance (I/C)	
	• "Yes, I watched videos [to support my engagement]" (P1I). • "Yes I had other resources to assist me. My friends, YouTube videos, and Instagram reels were of great assistance to broadening my knowledge about exercising" (P6C). • "I usually used Pinterest to find workout [ideas]" (P1C). • "I had no idea about the names of the gym equipment, so I searched them up on YouTube" (P11C).
Barriers	
Knowledge Gaps (I/C)	
	• "I feel like I have a foundation of knowledge in the gym from previous experience as well as getting comfortable at LU but I also feel like I have so much more to learn in terms of how and which exercises are good for what" (P5I). • "I feel like I know how to do the exercises that I like to do well and use the machines that I like to use well. However, there are many exercises and machines that I do not feel confident doing and using" (P10I). • "I feel still pretty new to the gym. I also tend to do the same thing therefore feel I don't have much knowledge outside of what I normally do" (P1C). • "I usually stick to the same equipment and haven't really taken the time to study or learn more about proper gym techniques or workout plans" (P5C)."

Relatedness: Facilitators. While formal social support was only regularly implemented in the intervention condition, participants in both conditions expressed that their social networks positively influenced their exercise habits. Those in the intervention condition cited *multifaceted support* as key to their improvements. Control participants discussed informal *social support systems* and their value in fostering engagement.

Multifaceted Support. Intervention participants highlighted the role of *multifaceted social support* in promoting exercise engagement. Ten participants reported feeling encouraged and supported by their mentors through emotional validation, gym companionship, or shared enthusiasm for their progress. For example, Participant 3I shared, "My mentor was really good, she taught me a lot of different exercises and provided some good pointers. I really enjoyed working out with her. It also did not feel too structured, like having a trainer, but more like having a workout partner, which was really nice." Mentors were frequently identified as key support systems, with in-person interactions often described as collaborative rather than instructional and virtual check-ins aiding consistency. In addition, five participants reported working out with friends or family, which created a comfortable and supportive environment. This was evident in a response from Participant 9I who stated, "Everyone around me was pretty supportive, whether it be happy that I was engaging in exercise, willing to drive me when I wanted to go to the gym, or even wanting to join me on some days."

Support System. Control participants often recalled the support they received from their external *support system* throughout the study. Eight participants noted that they exercised with their friends or family members at some point during the study, which created a shared motivation and accountability. For example, Participant 1C indicated how their social network provided external support, stating, "I feel I do have a pretty good support system. I like to go to

the gym with my sister and friends." Additionally, some participants emphasized that having someone to talk to about their progress made them feel supported, even if that support was not consistent or hands-on. This was reflected in Participant 4C's quote, "I would not say I receive much direct support, as exercise is something I do on my own. However, my family is happy when I tell them that I'm being consistent with my workouts because they know it's good for me. Their positive reactions motivate me to keep going." One control participant in particular felt supported by study enrollment alone.

Relatedness: Barriers. Both conditions experienced elements that hindered their sense of peer support. Some intervention participants suggested that more formal education and guidance would have improved their study experience. Control participants reported a *lack of peer support*, especially amongst those who exercised alone.

Peer Education Gaps. While many intervention participants described positive connections with their mentors, several also noted learning *gaps* in *peer education.* Four participants suggested that increased peer support, such as having more than one mentor and regular feedback, would have enhanced their engagement. This was shared by Participant 5I, who expressed, "Probably having a mentor more than one day [I know this is difficult because their schedules are also hectic]." Others described barriers related to the virtual format, including difficulty navigating the communication platform and communicating with their mentor due to their older cell phone, causing application malfunctions, affecting their peer-led engagement. For example, Participant 7I shared, "I think the app was kind of wonky to use, but otherwise everything was fine."

Lack of Peer Support. Several participants in the control condition reported a *lack of peer support*, which hindered their ability to structure workouts and associated engagement.

Three participants shared that not having formal peer support to receive feedback on their exercise form and posture made it difficult for them to feel supported in the gym. This was reflected in a quote by Participant 5C as she stated, “Having regular feedback on my progress (e.g., through performance assessments, strength tests, or measurements of endurance) would have been useful. This would allow me to adjust my approach if needed and track my improvements more effectively.” This is reflected in a statement from Participant 4C, “I would not say I receive much direct support, as exercise is something I do on my own.” Others expressed that receiving occasional instructor feedback would have made them feel more connected and reassured. Without structured opportunities for interaction or technical guidance, peer support in this group remained limited for some control participants.

Table 14

Supplementary Participant Quotes - Relatedness

Category	Quotes
Facilitators	
Multifaceted Support (I)	
	• “I felt very supported, it was a judgment free zone, and I felt no fear asking questions and asking for reassurance when I was not sure of things. I also thought it was fun that the SHINE account would like all of the workouts I logged” (P3I).
	• “I had a good sense of support between having my mentor and often going to the gym with many of my friends” (P4I).
	• “My mentor was continuously supportive and made sure to check in on me even after the exercise sessions. This made me feel assisted and seen especially as it was my first time” (P6I).
	• “I would say that she [my mentor] was very supportive in-person. She was always willing to answer any questions about exercise, and she encouraged me and congratulated me when I did a good job” (P10I).”
Social Support (C)	
	• “I felt supported by my [friends I workout with], as everyone was encouraging and motivating each other” (PC5).
	• “I feel supported by others, especially my friends, who encourage me to stay consistent with my exercise routine and share tips along the way” (P9C).
	• “I really appreciated the gym tour and the explanation of each machine, it gave me more confidence in using the equipment and made me feel more comfortable in the gym environment” (P4C).*
Barriers	

Peer Education Gaps (I)	• "The peer support aspect could have been better spent in having those Kinesiology students leading a couple of weekly fitness classes for all study participants" (P2I). • "The virtual support was really good, however I was unfamiliar with the app we were using so I found it a little bit difficult to adjust to that. Overall, I felt supported virtually as well" (P3I). • "Maybe more regular checkups about the study, or reminders? Otherwise I don't have any feedback!" (P9I).*
Lack of Peer Support (C)	• "I would like to go with someone more experienced to show me how to do different exercises and utilize the equipment" (P1C). • "I do wish I had like an instructor or someone to help me make a routine. As I feel I maybe am doing it wrong" (P1C). • "I just [exercise by] myself, there's no external support" (P7C). • "[My sense of social support] was okay" (P10C).

Note. An asterisk (*) is indicative of a general quote that was included in a subtheme.

Health Behaviours

Upon completing the study, participants noted changes in their actions and habits that positively influenced their well-being. These emerged across both conditions and reflected two prominent areas: mental health and physical fitness. See Tables 15 and 16 for illustrative quotes.

Mental Health. At the same time, many participants described how engaging in exercise improved aspects of their mental health, especially during demanding periods. However, the nature of these improvements varied between conditions. Intervention participants often associated mental health benefits with program-related structure and support, such as scheduled exercise and mentor communication. In contrast, control participants more frequently attributed these benefits to self-directed activity and personal motivation.

Stress Relief. Participants in the intervention group consistently linked regular exercise to feelings of improved mental health, particularly to *stress relief*. Comments pertained to reductions in stress, enhanced mood, and a greater sense of emotional stability. Three intervention participants described exercise as a reliable coping mechanism, especially during periods of personal difficulty. This is evident in a quote by Participant 5I, as she mentioned,

"The 'feel good' energy I usually get afterwards… It really helps clear my head when things are really stressful and complicated. It makes me feel better, even if it is only a little that day, or I only do something small like stretching." In comparison, four control participants noted that engagement aided stress management, primarily citing benefits such as improved mood and happiness. Participant 3C echoed this as she reported, "I can unwind more easily, and I am happier than before. The time I spent exercising replaced the time browsing my phone, which is good for my vision and brain. I feel more calm and less stressed."

Table 15

Supplementary Participant Quotes- Mental Health

Category	Quotes
Stress Relief (I/C)	• "The in-person support was awesome, it gave me an opportunity to talk while working out which was very beneficial for my mental health" (P4I). • "I was more willing to participate in different exercises in the middle [of the program]. It wasn't significant changes, but it felt good to get moving again and it helped me clear my head a lot when things have been really difficult" (P5I). • "I had personal things that affected me, being able to routinely exercise helped me process it and get out of the house" (P9I). • "I got to know and interact with others when playing badminton, and I live nearby to get to gym easily. I feel happy after every time I go to gym" (P2C). • "I also enjoyed how exercise was encouraged, as the academic workload can sometimes be overwhelming, and working out helps clear my mind and relieve stress" (P4C). • "[My motivation to engage in exercise] is enhanced physical appearance and metal health" (P5C).

Physical Fitness. By the end of the program, many participants described experiencing meaningful physical transformation in fitness, but many also recognized a need for further improvements. Compared to those in the control condition, most intervention participants reported improvements in fitness levels, linking specific performance gains to their program engagement, in contrast to those in the control group. While control participants noted

improvements from baseline fitness levels, they more commonly framed their experience in terms of future fitness goals.

Advancements. Participants in the intervention and control conditions reflected on their fitness *advancements* due to their engagement in this study. Among those in the intervention condition, several participants described feeling more active and physically capable over time. Eight intervention participants noted enhanced stamina and the ability to engage in a broader range of exercises compared to when they began the program. This was echoed by Participant 4I, who shared, "I enjoyed watching my progress throughout the study. By the end of the study, I was able to lift more weight and run farther than I could at the beginning of the study." As for the control condition, eight participants described fitness improvements they experienced in this study. As shared by Participant 2C, when asked to describe their post-program fitness levels, she mentioned, "I can do weights, running, badminton. I grew some muscles and…I feel good about my physical strength."

Further Improvements Required. In addition to their noted heightened fitness, participants in both conditions expressed that further fitness *improvements were still required,* which they hoped to achieve. While intervention participants generally expressed pride in their progress, two mentioned ongoing challenges, such as limited muscle gains. These intervention participants described how continued engagement is required to enhance their fitness further. This was illustrated by Participant 10I, who shared, "I feel that I can do quite a few exercises that the average person cannot do, but I can do. However, there are many exercises that target muscle groups that I am less strong in." Similarly, four control participants highlighted that they noticed enhancements to their overall fitness levels but continued to cite the need for improvements. As explained by Participant 5C when asked about their post-program fitness levels, she shared, "I

gave myself a six [/10] because I think I am in decent shape and can handle most workouts pretty well. I go to the gym regularly and feel stronger and more energetic, but I still have room to improve my endurance and overall fitness." Three control participants used self-descriptive language, including phrases such as not being 'fully athletic' and expressing a need to be 'more strict' with their habits.

Table 16

Participant Quotes- Physical Health

Category	Quotes
Advancements (I/C)	
	• I'm definitely more satisfied since I was just not going to the gym before. I have plans to get a gym membership elsewhere since I'm graduating and will use what I learned to stay consistent" (P7I). • "I can definitely tell there is a major improvement in being able to do more now compared to when I started out. But, I did start out as someone who did not exercise at all, and hadn't for a long time" (P9I)! • "[After engaging in the study] I also feel stronger, more energetic, and more confident in my ability to stay active, which has increased my overall satisfaction" (P11C). • "I am more satisfied with my exercise routine now compared to before the study. Previously, my workouts felt inconsistent and lacked structure, which made it hard to stay motivated. Since starting the study, I've developed a more balanced and consistent routine that includes a mix of cardio, strength training, and flexibility exercises. I also feel stronger, more energetic, and more confident in my ability to stay active, which has increased my overall satisfaction" (P12C).
Aspirations (I/C)	
	• "I am pretty fit now, however I am still not very strong, and cannot lift a very large amount of weight. However, I have good stamina and am able to participate in a large amount of exercises" (P3I). • "I am overall really weak (I didn't really work on muscle though). I am just not very athletic, not as much as I would like to be" (P5I). • "…Compared to someone with a sedentary lifestyle, I engage in a lot more physical activity. That said, I wouldn't consider myself fully athletic, I don't work out every single day, and sometimes I still get tired quickly depending on the activity. However, my body is capable of handling a good amount of physical effort" (P4C). • "I don't feel much muscular as I expected" (P7C).

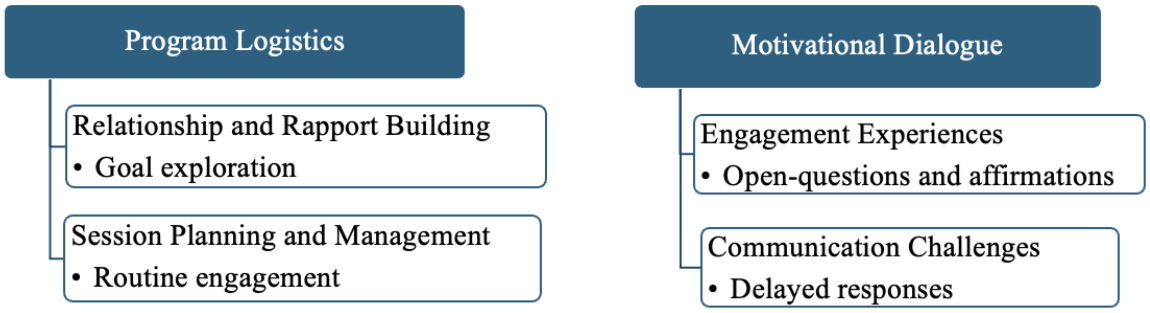
Communication Tracking

An analysis of the mentor-participant conversations revealed qualitative insights into each dyad's communication habits and topics. The qualitative themes were explored within and

across conversations; themes were placed into two categories, program logistics and motivational dialogue, each with related themes and subthemes. Figure 9 depicts these qualitative themes, and Tables 17-20 highlight conversations.

Figure 9

GroupMe Conversation Themes and Subthemes



Program Logistics

Program planning was a primary focus of mentor-participant communication, enabling flexibility and building rapport. Initial interactions often involved mentors exploring program objectives, which were followed by planning and rescheduling exercise sessions.

Relationship and Rapport Building. Mentors typically initiated interactions early by introducing themselves and discussing participants' goals. These initial exchanges facilitated the establishment of communication and the identification of participants' program objectives.

Goal Exploration. Mentors mainly initiated the initial conversations with their participants. All duos began their interactions by introducing themselves, sharing their program of study, discussing their program objectives and associated *goal-exploration* strategies. When exploring participants' goals, many had two to three goals they set for themselves. Seven participants stated that they wanted to improve their overall fitness levels, six to enhance their exercise adherence, and five to improve comfort and confidence. However, one participant set

the broader goal of improving time management. To further explore program goals, one mentor scheduled in-person meetings before exercising with their participants.

Table 17

Participant and Mentor Quotes- Goal Exploration

Quotes	Date and Time
• "So what are some of your goals? Related to this program or outside this program?" (M2)	January 28 5:27 PM
• "I was hoping to become more comfortable in the gym and gain some upper body strength?" (P3I)	January 29 7:02 AM
• "I think those are awesome and very reachable goals. I was hoping we could meet up soon just to talk more and get started. And for the first time we meet we can do that in the gym or not. It's totally up to you." (M2)	January 29 1:31 PM
• "My goals for the program are just to build the habit of going to the gym and being comfortable there!" (P9I)	February 26 3:03 PM
• "Getting comfortable in the gym is a good goal! I know it can be a daunting place sometimes" (M4).	February 26 3:03 PM
• "Also looking forward to hearing more about your goals for the SHINE program! Feel free to share them in this chat" (M6).	March 17 12:59 PM
• "Through the SHINE program I am hoping to get more comfortable going to the gym and to enjoy exercise more. Another goal of mine is to build more muscle" (P13I).	March 17 3:58 PM
• "Those goals sounds great! Looking forward to chatting more about them when we meet up" (M6).	March 17 7:40 PM

Session Planning and Management. Mentor-participant communications primarily focused on coordinating paired exercise sessions. These exchanges often discussed availability, (re)scheduling sessions, and frequently required multiple attempts to finalize plans.

Routine Engagement. Between all dyads, GroupMe conversations were regularly used to plan *routine engagement* exercise sessions. This involved exploring shared availability to find a consistent date, time, and meeting location that worked for both parties, which commonly took two or three attempts. On their own accord, mentors consistently verified with participants a few days or hours before their scheduled sessions to confirm their availability and meeting time. Six dyads did not attend the gym at a consistent date and time each week, often alternating between different days (e.g., Saturday or Sunday) due to inconsistent work schedules, health status, and

academic demands. In contrast, the remaining pairs (n = 7) met consistently on the same day and at almost the same time each week. When rescheduling sessions were required, mentors generally demonstrated greater flexibility as compared to participants and adapted to participants' changing schedules, while participants often provided limited availability. While mentors typically gave more warning of a date or time that required to be changed due to a conflict in scheduling, participants typically gave less of a warning or failed to do so altogether.

Table 18

Participant and Mentor Quotes - Routine Engagement

Quotes	Date and Time
• "I am sorry I took a shift on Thursday from 9-4, forgetting about [our planned session]. [I can meet] either after 4 or on Friday after 2pm or Thursday morning too, at 7am" (P1I).	February 17 10:50 AM
• "What does your Sunday look like? Actually I can do Friday right at 2pm" (M2).	February 17 11:35 PM
• "Ohh okay awesome" (P1I).	February 17 11:35 PM
• "We still good for tomorrow?" (M5)	March 10 4:55 PM
• "Yeah, we are good for tomorrow 4:30" (P4I).	March 10 5:38 PM
• "Where would you like to meet today?" (M5)	March 11 4:30 PM
• "I am right by the white round tables" (P4I).	March 11 4:30 PM
• **"**Hi [Mentor 5]! Do you think it's possible for us to change the date for this week's workout? I have a test on Friday and another one on Saturday, so I have to study tomorrow" (P8I).	April 9 3:34 PM
• "Sure! Would you like to go on Sunday?" (M5)	April 9 3:34 PM
• "Yeah! That works for me :)" (P8I).	April 9 3:34 PM

Motivational Dialogue

Mentors often utilized MI techniques throughout the program to explore participants' engagement. This was frequently achieved by mentors asking open questions regarding barriers and facilitators and providing affirmations and reflections. However, the flow of communication was often interrupted due to delayed responses or unanswered questions.

Engagement Experiences. Mentors typically explored participants' progress and solo exercise engagement experiences through MI skills. This served as a method for mentors to provide virtual guidance and social support.

Open-Questions and Affirmations. In addition to their paired exercise sessions, mentors frequently inquired about participants' independent workouts and overall *engagement experiences.* In the first three weeks of the study, mentors typically asked longer, open-ended questions to explore exercise patterns. If a response was received, participants tended to provide short answers or not fully address the whole statement. Instead, conversations were often longer when participants initiated discussions. In these instances, all participants frequently shared what went well, which equipment they used, and how they felt during the session. Three participants often noted challenges and requested support, occasionally while still at the gym. This allowed mentors to affirm participants, primarily by congratulating them for their efforts and offering guidance, particularly in addressing challenges related to equipment use. Upon viewing conversations throughout the study, most mentors gradually shifted towards using shorter open- or closed-ended questions to explore participants' habits, which appeared to be well-received, due to the increased frequency of responses. Additionally, throughout the program, mentors frequently recalled previous conversations by referencing external events mentioned by participants. This included acknowledging upcoming exams, assignment deadlines, or travel plans. Each mentor initiated such follow-up messages at least two times throughout the program, often wishing participants success on academic tasks or to inquire about vacations, using these references as a basis for continued engagement.

Table 19

Participant and Mentor Quotes- Engagement Experiences

Quotes	Date and Time
• "Just finishing up a leg workout, I was looking [the exercises] up and I am not really comfortable with squats or like hip thrusts could we try that?" (P3I).	February 5 1:26 PM
• "Yes, we can definitely try that! How did today's workout go besides that?" (M2)	February 5 at 3:53 PM
• "It was pretty good, I think I am going to go again tomorrow or Sunday" (P3I).	February 7 10:08 AM
• "I just wanted to check in with how you're feeling so far through this program. Now that it's been a few weeks, how do you feel?! I recall that your goal is to get stronger and be able to lift your own body weight — how has your progress been towards that goal? I also just wanted to tell you how well you've been doing from my perspective, I can how you are becoming more and more comfortable and confident in the gym setting. You've been consistent, showing up when you say you're going to, and you come with a smile on your face every time. I've really enjoyed being your mentor so far, good stuff girly!" (M1)	Mar 27 10:05 AM
• "Hey! Sorry for such a late reply, it's such a busy time of year 😖 I'm definitely making progress towards this goal and I'm happy with the direction I'm going 😊 I also just want to check in and say I'm happy to meet tomorrow depending on the weather. It's quite the storm, so if we could meet tomorrow at 3pm if might be safer to make sure the roads are clear. Let me know :)" (P7I).	April 2 4:41 PM
• "Hey! I'm so happy & proud of you [Participant 7]! You've been killing it these past 5 weeks dude, keep it up!! & tomorrow sounds good, although I will be going earlier because I am going skiing at 3…I hope 12 ish can work!" (M1)	April 2 8:02 PM
• "Hi [Participant 13]! Just checking in to see how you are feeling about your workout physical activity goals for this week? Also just wanted to mention that the LU gym has reduced hours for Easter Weekend, meaning that it does not open until 8AM on Friday. I am thinking I will workout from 8AM to 9AM ish- is there a time within that window that works for you instead of our usual 7:30AM time? (M6)	April 16 12:07 PM
• "Yea that works, I'll be there for 8 tomorrow :)" (P13I).	April 17 10:47 AM
• "Sounds good,, see you soon!" (M6)	April 18 7:27 AM

Communication Challenges. At times, mentor-participant conversations were hindered by a lack of or delayed responses. This made it difficult for mentors to explore engagement experiences and plan future sessions.

Delayed Responses. Delays in responses were observed across most mentor-participant pairs, typically resulting from academic demands, scheduling conflicts, or other personal commitments that created *communication challenges*. Both mentors and participants occasionally left messages unanswered for extended periods (<24 hours) but generally

acknowledged these gaps with brief explanations or apologies upon re-engagement. All mentors often sent follow-up messages after a few days of no responses. However, four participants consistently engaged in delayed communication, often requiring two to three follow-up messages before responding. Delays in communication sometimes led participants to respond only to the most recent message, which sometimes resulted in earlier questions or affirmations being overlooked. In most cases, mentors' questions aimed at exploring participants' engagement experiences were unanswered. While half of the participants attributed their lack of responses to academic demands and work schedules, one participant indicated that they were not receiving GroupMe notifications, delaying their responses. Despite these challenges, all conversations remained professional and respectful, with no expressions of frustration or disappointment noted from mentors or participants.

Table 20

Participant and Mentor Quotes- Communication Challenges

Quotes	Date and Time
• "Good morning! I am just waiting near the couches at the front desk" (M4).	February 15 9:05 AM
• "Good morning. I am incredibly sorry beyond words that I couldn't make it today, last night something an emergency came up that completely disoriented me and kept me up all night. I am so sorry that I wasted your time and kept you waiting as this is NOT in my character at all. I have been preparing for this meeting all week and last minute a family emergency came up and I was unable to update you. Again, I am sincerely and completely sorry that I was unable to make it today, and it will not happen again. Please let me know the next date that works for you and I will ensure that I attend" (P6I).	February 15 11:38 AM
• "No worries, life happens! No need to be sorry. I hope everything is alright" (M5).	February 15 11:38 AM
• "Are you available Saturday around 2:30pm to have our first session? We can talk more about your goals during that time as well" (M5).	February 26 3:16 PM
• "Yes I will be available then!" (P9I)	February 26 4:36 PM
• "Hey [Participant 14]! How did your workout go on Saturday or Sunday?" (M2)	March 18 2:00 pm
• "Hey [Participant 14]! I'm going to the gym tomorrow morning, around 9:10-10:00am! Any chance you can make it?" (M2)	March 21 9:14 PM
• "Hey sorry for not responding earlier. My workout went well. Sure, I can make it to the gym at 10am" (P14I).	March 21 10:04 PM

Discussion

The primary purpose of this study was to evaluate the effectiveness of a six-week, theoretically grounded campus-based PMP on the motivational constructs of UW. Secondary objectives involved assessing general psychological distress and exercise engagement, while a tertiary objective entailed qualitatively exploring participants ' study-related experiences through an open-ended survey post-program. To the best of the researcher's knowledge, this is the first PMP tailored for UW that was conducted during the pandemic recovery era, adding value given their ongoing decline in exercise engagement (Bell et al., 2023; Fabiano & Pearson, 2025; Pellerine et al., 2022). The collection of both quantitative and qualitative data, peer-led structure, and unique features, including a facility tour, virtual mentor-participant communication, and theoretical basis, further enhance the study's novelty. Moreover, my partnership with the host institution's Athletics Department was a valuable means of promoting campus resources and increasing accessibility, consistent with existing literature emphasizing the importance of engaging key stakeholders throughout the research process and translating findings into real-world outcomes (Bauer & Kirchner, 2020; Graham et al., 2006).

In general, the intervention group experienced significant improvements in autonomy and competence throughout the intervention: an important result that may have been due to mentor support, which is known to enhance exercise behaviour (e.g., Keeler et al., 2021; Kirby et al., 2024). In terms of motivational regulations, statistically significant and consistent improvements in external, identified, and integrated regulation were observed in both groups. In terms of psychological distress, significant decreases were found throughout the program for participants in both conditions. While a between-group effect was not found, both conditions experienced statistical significance. While insignificant, visual inspection showed consistently higher scores

across time for those in the intervention group, which may be related, in part, to the peer mentorship component. In addition, the qualitative findings suggested that the peer mentorship component was effective for promoting these constructs and other facets of wellness: not only for the intervention group, but for the participants as a whole which is not surprising given the known benefits of more movement. As for exercise engagement, both groups largely maintained or increased their exercise durations; however, a significant increase was seen amongst the intervention group's warm-up durations.

In terms of exercise behaviour, it is noteworthy that there was a 69.7% retention rate, especially given the known barriers to movement like limited time and low motivation often experienced by this cohort (e.g., Fabiano & Pearson, 2025; Othman et al., 2022; Skinner et al., 2024). This is particularly relevant as past peer-led programs for UW have reported lower adherence rates (15–60%) over 8–10 weeks (Goncalves et al., 2023; Keeler et al., 2021). Taken together, these quantitative results support the effectiveness of PMP in improving motivational constructs, reducing symptoms of psychological distress, and increasing exercise engagement. The following discussion explores participants' experiences of BPN, self-regulation, psychological distress, and exercise engagement, with and without peer mentorship, in line with the quantitative and qualitative findings.

Exercise-Specific Basic Psychological Needs

Autonomy. Both groups experienced statistical significance in their autonomy scores, which occurred in the first half of the program. Thus, suggesting that there was a significant effect of time and condition.

Participants in the intervention condition demonstrated statistically significant improvements in autonomy, which largely occurred in the first half of the program. Visual

inspection of the data indicated that improvements gained tapered off mid- to post-program (see Figure 3). Qualitatively, participants in the intervention group linked their increased autonomy to the ability to set personal goals and, with the help of their mentors, tailor their exercise routines accordingly. This was mirrored in a 10-week PMP grounded in SDT for inactive university students who engaged in weekly exercise with a peer mentor (n = 10) or individually (n = 13; Keeler et al., 2021). Pre- and post-program surveys explored BPN and identified significant improvements in autonomy, which participants qualitatively attributed to increased enjoyment associated with self-governance (Keeler et al., 2021). Prior research has supported peer-mentorship as an effective method to make exercise feel more purposeful and sustainable (Teixeira et al., 2012; Wanwan & Khairani, 2025). Some participants in the present study qualitatively expressed a desire for more structured support during solo workouts, noting that they valued their mentors' guidance so highly that they wished it could be present during all exercise sessions. These findings suggest that the structured, yet flexible, peer-led programs can effectively enhance students' sense of ownership over their exercise engagement (Li et al., 2022; Sylvester et al., 2016; Wanwan & Khairani, 2015), particularly when social support is offered in a way that empowers independence.

While the control group's quantitative results showed statistical significance, they were not all positive changes. These participants experienced improvements in autonomy pre- to mid-program; however, these gains nearly regressed to their initial levels from mid- to post-program.

This was evident in their qualitative feedback, as participants initially reported a heightened sense of autonomy, often linked to the flexibility they had in choosing the timing and format of their exercise sessions. Previous research highlighted that having the freedom to choose is a critical factor in supporting autonomous motivation among university students (Deci

& Ryan, 1980): a particularly important finding considering the constraints of their busy schedules (Deliens et al., 2015; Teixeira et al., 2012). However, participants in this condition cited that travelling to the gym, particularly on days they were not on campus, acted as a barrier to engagement and that the location requirement sometimes discouraged participation due to time constraints. This notion is reinforced by a systematic review by Brown et al. (2024) who examined the barriers and facilitators associated with university students' physical activity engagement, and found that time constraints, often due to competing academic and personal demands, were a significant obstacle to exercise, especially when a commute was required (Khalid & Shah, 2024). Alternatively, some control participants in the present study felt that they had too much autonomy at times and expressed a desire for more guidance, particularly during moments when they felt uncertain in the gym, which has been previously experienced by those with a smaller social network (Deliens et al., 2015; Skinner et al., 2024). These findings align with a recent study that explored factors influencing autonomous exercise engagement among 985 university students through surveys (Li et al., 2023). Researchers found that perceived social support was predictive of autonomous exercise habits as it led to enhanced self-efficacy - that is, their confidence in their ability to accomplish a task (Bandura, 1986), specifically among females.

In the present study, significant differences in post-program scores may have occurred due to a lack of mentorship amongst the control group, causing them to experience a lack of acknowledgements and information provided by knowledgeable individuals, an element previously linked to satisfying autonomy (Pearson, 2013). Future research should explore how to best balance structured support and autonomy in peer-led programs by examining adaptive mentorship models.

Competence. Throughout the program, only the intervention group's competence scores reached statistical significance, which consistently increased at each time point. This may have been attributed to a few factors, including the use of educational components (e.g., facility tour and exercise guide) given their known role in supporting skill development and mastery (Deci & Ryan, 1980) and the role modelling provided through the peer mentor. Indeed, qualitatively, intervention participants often attributed their growth in feelings of competence to the mentored learning and formal support they received. This finding aligns with prior research by deJonge et al. (2021), who implemented a 6-week on-campus exercise program for university students, where they engaged in 30 minutes of MI and exercised with their mentor each week. Qualitative findings explored program experiences, identifying enhanced competence through feedback and knowledge sharing (deJonge et al., 2021). Prior research has suggested that increased competence gains in PMP among university students are often due to peer-led skill building and mastery reinforcement (deJonge et al., 2021; Ginis et al., 2013; Keeler et al., 2021; Kirby et al., 2024) with noted statistical improvements in confidence post-program. Beyond the mentorship component, in the present study, intervention participants also reported using social media to support their engagement, particularly when seeking ideas for workouts, as seen in prior studies (Al Ali et al., 2021; Durau et al., 2022). While they had access to a mentor, some still expressed uncertainty around exercise selection and form, indicating a need for additional educational resources. These findings suggest that even with peer support, gaps in confidence and knowledge may persist, especially for initiates who are navigating exercise independently.

Notably, the control group did not experience significant improvements in competence quantitatively. However, qualitatively participants reported increased competence linked to repeated gym use, as supported by previous research indicating that consistent engagement can

promote familiarity and build foundational confidence over time (Forlico et al., 2024; Ross et al., 2022). It may be the case that these results were less pronounced compared to the intervention group due to the lack of routine peer support to enhance confidence (Keeler et al., 2021; Kirby et al., 2024). Some control participants may have experienced difficulty translating written instructions into practice without additional guidance. While not significant, it is promising that the control group experienced consistent improvements to competence across time, underscoring the potential value of self-directed learning, particularly when paired with an informative baseline assessment combined with an interactive tour and user-friendly resources (Sylvester et al., 2016). Like intervention participants, the control group also used social media to inform their exercise routines. While rising in popularity, this reliance on social media to inform exercise routines is concerning, as it often contains large amounts of misinformation that can lead to unsafe or ineffective behaviours (Chen & Wang, 2021; Kaňkóva et al., 2024). Relatedly, several control participants shared that they avoided using unfamiliar equipment due to low confidence and a lack of instruction, which may have limited their engagement. This barrier was more pronounced than pre-pandemic peer-mentored programs (Keeler et al., 2021; Kirby et al., 2024), indicating a potentially greater post-pandemic knowledge gap among today's UW population.

In the present study, visual observations can identify the varying trajectory of each group's competence levels (see Figure 3). The significant differences in post-program scores may have occurred due to varying mentorship amongst the two conditions, specifically as the control group may have experienced a lack of affirmations and support in the gym, a barrier to engagement previously highlighted by this population (Fabiano & Pearson, 2025). Drawing from these experiences, future programs may benefit from implementing additional educational

workshops, online training modules or recommending social media creators with valid certifications, to reduce exposure to misinformation and enhance post-program engagement.

Relatedness. While an interaction effect was not detected among relatedness, the variances in score trajectories can be visually identified in Figure 3, which suggests that the intervention group experienced improvements in relatedness scores overtime. While insignificant, qualitative findings did support support relatedness improvements over time as intervention participants frequently described a sense of connectedness that they attributed to the consistent encouragement and shared experiences with their mentors, although some desired even more paired exercise sessions.

In an 8-week peer-led exercise intervention for university students conducted by Kirby et al. (2024; n = 19), quantitative and qualitative improvements in relatedness were found upon study completion. These participants engaged in an hour of paired exercise each week (Kirby et al., 2025), which differs from the present study, as participants engaged in paired exercise six times for thirty minutes. Thus, it may be the case that SHINE program participants did not experience significant improvements in relatedness due to a lack of time to establish meaningful relationships, as supported by prior research noting that it often takes 120-160 hours to develop meaningful relationships or over 6 weeks of communication among university students (Hall, 2019). Future studies should examine the dose-response relationship as it relates to improvements in BPN in order to better understand the impact of mentorship in this context.

However, the shared purpose and emotional encouragement experienced among SHINE intervention participants also mirrors research emphasizing the importance of supportive mentor-participant relationships to facilitate behaviour change (deJonge et al., 2021; Gunnel et al., 2014). The value these participants placed on their mentored interactions was evident,

specifically as two participants asked their mentors to continue exercising with them post-program. These results align with the SDT view that connection develops through repeated and quality interactions (Deci & Ryan, 1980), and UW increased desire for social support, especially after the onset of the COVID-19 Pandemic (Fabiano & Pearson, 2025; Hailey et al., 2022).

Qualitatively, control participants highlighted the role of informal and external social networks in providing social support, which may have served as facilitators to satisfying this need to some degree. These findings align with Jiang et al. (2025), who explored the relationship between physical activity engagement and social support in university students through a series of surveys. Their results identified a significant correlation between social support delivered from friends and family members (Jiang et al., 2025). The relatedness levels amongst participants in the present study may not have been as strong as in previous research, as participants mainly described receiving verbal support from family members or occasionally exercising with friends. Moreover, these participants noted challenges related to feeling connected to others, as many emphasized a greater need for peer support, aside from the baseline orientation. Without structured opportunities to build interpersonal connections, control participants may have struggled to satisfy their need for relatedness, as prior research noted that UW value socially supportive environments to maintain motivation and adherence in exercise contexts (Lee et al., 2020; Zhang et al., 2022).

Future studies should examine the optimal balance and frequency of formal and informal social support among UW initiates to enhance their sense of relatedness and promote sustained exercise engagement.

Intrinsic and Extrinsic Exercise Motivation

External Regulation. When examining scores across time, significant increases in external regulation were found by mid- to post- and pre- to post-program. Upon visual inspection of Figure 4, it would appear that the intervention group experienced a greater increase in extrinsic motivation, albeit insignificant differences were found between conditions.

Qualitatively, some of the intervention participants cited being primarily motivated by the guidance and support from their mentor, an outside factor. This aligns with SDT, which suggests that individuals motivated by external influences may engage in behaviours to avoid adverse outcomes (Ryan & Deci, 2000), such as disappointing their mentor by missing an exercise session. This was mirrored in a study by Smith et al. (2024), who evaluated university students' (n = 121) perceptions of their academic mentors through a series of surveys. They found that mentor support increased extrinsic and intrinsic motivation among students, specifically among those who offered psychological and emotional support. Likewise, Kirby et al. (2024) found that university students involved in an 8-week peer-supported exercise program often cited mentor encouragement and perceived expectations as key reasons for participation, even when personal motivation was low. These findings (Kirby et al., 2024), along with the present study, highlight how the presence of a mentor, while beneficial, can also shift the motivational climate toward more externally regulated forms of engagement. While less desired than more intrinsic regulations when it comes to sustaining behaviour, it may be the case that an increase in external regulation is a prerequisite to modification in the more internally driven forms of motivation (Ryan & Deci, 2000).

In the control group, participants qualitatively expressed a desire to work out. However, their motivation appeared to be influenced by external cues, such as observing others exercising

or being influenced by those with ‘great physiques.’ The control group’s heightened focus on body image aligns with existing literature on this population (Hong & Ahmad, 2024; Shang et al., 2021; Zhang et al., 2024). For example, in a 3-week intervention, university students (n = 405) completed weekly online surveys assessing body image flexibility and their capacity to accept positive and negative body-related experiences (Leung et al., 2023). The findings revealed that those with higher flexibility reported lower levels of external motivation, suggesting that this population is susceptible to social perceptions from themselves and others (Leung et al., 2023).

In the present study, it may be the case that both groups experienced increases in external regulation due to the monetary incentives provided; research in this area is mixed but has often attributed such rewards to increased forms of extrinsic motivation for those who are less motivated (e.g., Dorner & Lancsar, 2023; Morris et al., 2022; Strohacker et al., 2015). Thus, future studies could examine the degree to which external monetary incentives impact adherence among UW initiates and if this is a necessary prerequisite for future advances in the more intrinsic regulations.

Identified Regulation. When examining scores across time, significant increases were found mid- to post- and pre- to post-program in identified regulation over the 6-week program. This is promising as a meta-analysis on SDT and exercise interventions found that identified regulation is a stronger predictor of initial exercise adoption than intrinsic regulation, a construct that is more predictive of long-term adherence (Teixeira et al., 2012). These findings align with Rodgers et al. (2010), who compiled data from six studies to examine the self-regulatory habits of exercise initiates for at least 6 months, where they observed significant improvements in identified regulation at 8 weeks. In contrast, the present study found significant changes as early as weeks 3 to 6, potentially reflecting the added impact of value-aligned strategies such as having

the freedom to decide when to exercise and what activities to engage in. This earlier occurrence is a noteworthy finding given the correlation between more intrinsic forms of motivation and sustained exercise behaviour (Ryan & Deci, 2000). Upon visual inspection of Figure 4, it would appear that the intervention group experienced a greater increase in identified regulation mid- to post-program, albeit insignificant differences between conditions suggesting that mentorship may have had an impact, which may be evident in longer programs.

Moreover, post-program participants in both the intervention and control groups qualitatively noted they were motivated to exercise as they valued improving their physical and mental health. These findings are consistent with previous research on UW, which has shown that health-focused and personally endorsed goals are standard drivers of exercise engagement (Fabiano & Pearson, 2025; Othman et al., 2022). However, intervention participants qualitatively referenced their mentors as aids that supported their ability to set and reach realistic goals. This was supported by a qualitative study involving inactive adults aged 20-35 (n = 13) who participated in eight sessions featuring education content and self-exploration of beliefs as delivered by a sports psychologist (Lev-Arey et al., 2024). Findings generated from semi-structured interviews identified that participants felt more motivated to engage in physical activity, particularly when their involvement aligned with personal values and was reinforced by supportive interactions from their social network (Lev-Arey et al., 2024). Thus, in the present study, the support these groups garnered from the baseline orientation, but more specifically, exercising with a mentor or friends and family, may have increased their motivation to exercise. Although in line with prior mentorship studies, the 6-week duration may not have been long enough to truly experience differences between the two conditions in motivation as compared to longer programs (e.g., Keeler et al., 202; Kirby et al., 2024). Based on these findings, future

studies should explore whether early increases in identified regulation are predictive of long-term behaviour maintenance, particularly in peer-supported exercise contexts.

Integrated Regulation. Across time, significant increases in integrated regulation over time, specifically mid- to post-, and pre- to post-program, which suggests that these participants increasingly viewed exercise as personally meaningful and aligned with their values (Ryan & Deci, 2000). A visual examination of Figure 4 indicates that both groups experienced similar improvements in integrated regulation.

Similar results were demonstrated in a cross-sectional study by Duncan et al. (2010), who examined the exercise habits and motivations of 1,054 individuals, primarily university students, who had exercised at least twice a week for the past six months. Questionnaires revealed that integrated regulation was the strongest predictor of exercise frequency, specifically showing the strongest relationship with exercise duration amongst females (Duncan et al., 2010). These researchers suggested that for moderately active individuals, integrated regulation may be enhanced through goal-setting and self-monitoring, which may, in turn, strengthen their exercise identity (Duncan et al., 2010). Thus, since both groups engaged in self-monitoring, this likely contributed to the significance observed in this regulation across time points.

Qualitative accounts provided by the intervention group highlighted that they took pride in building structured and consistent routines, not just to complete the study, but to improve their health by targeting different muscle groups with the support of their mentor. This is in line with a previous MI study, which demonstrated that coaches who use MI techniques can effectively evoke behaviour change by exploring personal values based on their needs and goals (Miller & Rollnick, 2023). For example, in a 12-week telephone-based MI study by Pearson et al. (2013), university students with a BMI >30 kg/m^2 were randomized to receive tailored social support (*n*

= 25) or foundational education on healthy lifestyle habits (n = 20). While both groups found improvements, qualitative data revealed that the intervention group was able to better adapt their habits based on their newfound connections with health behaviours and personal values (Pearson et al., 2013). While 6-weeks was long enough produce improvements qualitatively, it may be the case that the 6-week duration was too short to experience significant differences across time points (e.g., Keeler et al., 2021; Kirby et al., 2024) or that the sample size was too small.

Prior research has supported goal-setting behaviours as an effective method to make exercise feel more purposeful and sustainable (Teixeira et al., 2012; Wanwan & Khairani, 2025). This notion is further supported by the control group's qualitative accounts, where they expressed that despite facing barriers such as academic pressures and fatigue, they chose to exercise because they recognized its benefits and valued developing consistent routines. Future researchers should consider incorporating mentor-supported goal setting alongside self-monitoring in longer programs, as these behavioural strategies are known to enhance integrated regulation and exercise identity. Peer and mentor involvement may be key to overcoming common barriers and fostering sustained exercise motivation, especially when aligned with personal values.

Exercise's Impact on Psychological Distress

While an interaction effect was not detected amongst DASS-21 subscales, effects of time were evident. Unlike previous exercise interventions (e.g., Jeftic et al., 2023; Paré et al., 2023), the present study did not incorporate formal counselling or educational materials to promote coping strategies and mindfulness techniques, which may have hindered the effectiveness. Nevertheless, it still demonstrated the effectiveness of exercise as a tool to improve mental health indices among UW without known diagnoses. This may be attributed to the common

elements of peer support harnessed through facility tours. However, additional research is warranted to examine these effects and their unique contributions.

Depression. Throughout the 6-week program, a significant effect of time was evident across both conditions, as evident in comparable score trends in Figure 6, with significance being identified pre- to mid-program. It is important to note that all participants began the program with scores classified as mild (range: normal = 0 to 4, mild = 5 to 6, moderate = 7 to 10, severe = 11 to 13, extremely severe 14 and above), and normal levels post-program.

Both groups qualitatively noted decreased free time and increased workloads throughout the program, as for many, post-program data collection occurred at the end of the semester. As supported by prior research as increased academic pressures can reduce one's free time for hobbies, causing many to experience increased depressive symptoms (Sprung & Rodgers, 2020). This may work to explain the mid- to post-program increase in scores amongst both groups and lack of differences between the two conditions.

In the intervention group, participants qualitatively noted that while they sometimes struggled with low energy, engaging in exercise helped them feel better overall, improving their mood and helping clear their minds. This was similarly demonstrated in an 8-week exercise-based PMP for university students experiencing mental health challenges by Kirby et al. (2024), in which participants (n = 10) engaged in exercise with a peer mentor (n = 9) once per week, and post-program, reported a reduction in depressive symptoms. However, in the present study, a lack of significant differences were observed between the two groups, which may be attributed to the shorter duration, potentially an important factor. This finding is particularly noteworthy given that the present study was two weeks shorter in duration than Kirby et al. (2024), which may be an important factor when considering the importance of longer programs and resources needed to

implement such initiatives. As for the control group, these participants often expressed more negative self-talk when discussing their exercise habits, noting that low moods made it challenging to stay active. However, some also reported experiencing improvements in mood and energy levels after exercising. These findings align with a previous 8-week exercise-based program for university students, where the non-depressed matched-pair control group (n = 13) did not show significant improvements in depressive symptoms. In contrast, participants paired with a peer mentor (n = 13) demonstrated significant reductions (Keeler et al., 2021).

Despite the lack of quantitative differences between groups, qualitative differences emerged. As such, the perceived qualitative improvements in depression symptoms among the intervention group may be attributed to the increased social connection, exercise engagement, and accountability facilitated by the peer-led format, all known elements that have buffered depressive symptoms (Lederman et al., 2017; Pointon-Haas et al., 2023). It may also be the case that experiencing these early reductions in depressive symptoms could serve as a foundational prerequisite for further engagement, as the literature shows that as mood improves, individuals move more (Mahindru et al., 2023), as compared to the control group, who did not receive formal peer support and did not report as positive improvements. Based on these findings, future research is warranted to explore the use of exercise as a modality to reduce depression symptoms amongst university students should account for participants' potential mental health diagnoses and the presence of external aids to mitigate and manage symptoms.

Anxiety. Among both groups, significant decreases were identified for symptoms of anxiety, although baseline scores were not indicative of significant symptoms, as both conditions were classified as having moderate anxiety levels at baseline (range: normal = 0 to 3, mild = 4, moderate = 5 to 7, severe = 8 to 9, extremely severe 10 and above), while the intervention group

was considered in the normal and control in mild range post-program. Quantitatively, both groups experienced similar improvements, as significance was found for each condition pre- to mid-, and pre- to post-program. These similar trajectories can be viewed in Figure 6.

The lack of significant improvements by conditions was mirrored in an 8-week PMP for university students by Keeler et al. (2021), which may suggest that anxiety requires longer interventions to produce statistically meaningful changes. However, qualitatively, intervention participants noted that they experienced reduced gym-related anxiety, with many highlighting that the facility tour and weekly mentor engagement helped them feel more comfortable and less scared in the gym. This was likewise reflected in a 6-week campus-based mental health and exercise program by Paré et al. (2023), who qualitatively identified reductions in symptoms of anxiety after engaging in exercise with a student trainer (mentor) and counsellor. These findings align with the broader literature on university students, suggesting that socially supportive exercise contexts, such as those with peer mentors, help reduce anxiety by lowering situational stress and increasing confidence (Shi, 2024; Shu et al., 2022). Thus, it supports the utility of the current program due to its ability to reduce symptoms without formal mental health counselling services provided in addition to the exercise program.

As for the control group, these participants qualitatively attributed reduced symptoms of anxiety to the initial gym tour, which helped them become more familiar with the gym environment, causing many to try new machines. This supports the utility of guided faculty tours to provide baseline familiarity amongst new exercisers. However, some participants often cited worries about experiencing injuries, as they did not have someone to monitor their form. This supports the connection between exercise engagement and anxiety symptom management, which is well established, even in the absence of mentorship (Chen et al., 2025; Huang et al., 2024; Lin

& Gao, 2023). This finding was further supported in a cross-sectional study by Quin et al. (2024), which surveyed 997 university students on their physical and mental health indices. The researchers identified that increased physical activity engagement was significantly associated with lower anxiety symptoms. Notably, this relationship was strongest when paired with social support, although students without such support still experienced positive effects (Quin et al., 2024).

Moreover, participants in both conditions were free to choose which on-campus gym they used, which may have allowed them to manage anxiety-related outcomes, such as social physique anxiety, by selecting environments where they felt most comfortable (Hart et al., 1989). Given these significant findings, future studies should aim to identify the specific contributions that have been found to reduce symptoms of anxiety among UW and university students as a whole. Effectively managing symptoms of anxiety has been shown to enhance students' well-being and boost confidence (Shi, 2024; Shu et al., 2022), making it a valuable target for improving both health and academic outcomes in student populations.

Stress. Across both groups, significant decreases were identified for symptoms of stress, although baseline scores were not indicative of significant symptoms, as the intervention condition had mild and control normal levels of stress (range: normal = 0 to 7, mild = 8 to 9, moderate = 10 to 12, severe = 13 to 16, extremely severe 17 and above), and normal levels post-program. Quantitatively, both groups experienced similar improvements, as significance was found for each condition pre- to mid, and pre- to post-program. These similar trajectories can be viewed in Figure 6.

Participants in the intervention group qualitatively attributed their reduction in stress to the combination of routine exercise engagement and consistent peer support, both of which

served as effective coping strategies during challenging periods. This aligns with an 8-week exercise-based PMP implemented by Kirby et al. (2024), where university students (n = 10) exercised with peer-mentors (n = 9) once a week and qualitatively reported reductions in stress levels as a result of paired engagement. These improvements may stem from the social support and structured weekly sessions provided by peer-mentors, which have been shown to reduce stress in university populations (Abdul Aziz et al., 2023; Han et al., 2025; Teuber et al., 2024; DeShaw et al., 2023). This supports previous findings that peer support fosters emotional connections (deJonge et al., 2021; Keeler et al., 2021), a key factor known to mitigate stress (Acoba, 2024; Vicary et al., 2024). However, the present study was only 6 weeks in duration, which may have been too short to reveal differences between groups, as evident in the previous 8-week PMP.

As for the control condition, these participants qualitatively cited mood improvements and stress reductions after routine engagement. This is supported by previous meta-analyses, suggesting that even without a peer mentor, university students' exercise engagement has been associated with reductions in stress (Huang et al., 2024; Teuber et al., 2024). This was supported by a recent exercise intervention, which found that those who regularly exercise are more likely to use exercise as a stress management tool (Lepping et al., 2021). This may have been the case in the present study, as despite not having a peer-mentor, the control participants were asked to exercise regularly, which led to improvements in stress levels.

It is also worth noting that participants in both groups reported increased academic workloads as barriers to engagement. Despite these challenges, stress levels declined over the course of the program. This is especially notable given that many participants completed the

final assessment during the last week of classes, prior to the examination period. This is promising, as end-of-semester demands have often been associated with increased stressors (Garett et al., 2017; Kirby et al., 2024). Therefore, future programs should aim to collect data regarding mental health symptoms before the last few weeks of a university calendar when exploring the protective effects of exercise engagement. Moreover, while the exercise itself may be enough to reduce symptoms of stress at the outset of a program, additional supports might be required to maintain these changes over time, especially for exercise initiates

Exercise Behaviours

Exercise Engagement. While both groups met the minimal program exercise requirements (i.e., 5-minute warm-up, 20-minute workout, and 5-minute cool-down), an interaction effect was only identified for warm-up duration.

Specifically, the intervention group experiences significant differences between weeks 1-3 and 4-6 as their warm-up duration increased. These changes occurred due to the inclusion of mentor guidance, which may have helped to emphasize the importance of such preparatory activities. This was supported by qualitative insights as participants expressed how their mentors enhanced their confidence and knowledge in the gym setting. As compared to the control group, they were more likely to cite a desire for more structured support and educational materials. This finding is well rooted in the PMP literature, as mentors have served as effective tools to evoke behaviour change and enhance knowledge (e.g., deJonge et al., 2021; Keeler et al., 2021; Kirby et al., 2022).

While workout and cool-down durations revealed no significant changes, it is promising that both groups demonstrated general increases in overall activity throughout the 6-week program. Regardless of condition, participants self-reported higher post-program fitness levels

and exercise knowledge, which may be related to the efficacy of program parameters such as the baseline orientation session and, for some, mentor guidance. This level of engagement contrasts with earlier university-based interventions, where self-directed models have often caused control participants to experience greater challenges in improving their exercise habits over 8 weeks during a university semester (e.g., Boyle et al., 2011; Keeler et al., 2013; Keeler et al., 2021). These patterns suggest that the flexible design of the present program, combined with the educational resources and facility tour, may have been sufficient to promote meaningful engagement and motivation amongst both conditions. Qualitatively, both groups reported seeking additional sources to assist them with trying new exercises and equipment, which may also be linked to the foundational knowledge provided at the program's outset. Throughout the program, participants in the present study commonly exercised in the less intimidating campus gyms. This is in line with prior studies identifying that females often perceive the gym environment as intimidating (Othman et al., 2022; Turnock, 2021), which has caused many to avoid areas that are more crowded, specifically those by males (Cown et al., 2018). This was also represented qualitatively, as many noted that including a womens-only space or hours would enhance their exercise adherence.

The intervention group demonstrated greater improvements in exercise behaviours. Specifically, these participants completed additional exercise sessions, showed a progressive increase in activity duration, and tracked more activities external to the program parameters (i.e., engaged in more than three prescribed exercise sessions, including additional gym or external engagement). Qualitative insights supported this notion as intervention participants noted improvements in adherence and physical fitness due to the support they received from their mentor. These trends are consistent with a comparable 6 and 10-week exercise-based PMP with

university students, indicating that peer involvement fosters accountability and routine support while improving exercise adherence (Keeler et al., 2021; Kirby et al., 2022). However, some participants in the present study noted a desire to continue exercising to meet their fitness goals, which were not fully achieved in the 6-week program. This aligns with previous findings suggesting that longer-term interventions are often needed to support sustained behavioural change and physical adaptations (Keeler et al., 2021; Teixeira et al., 2012). Other studies have similarly reported that mentor-led programs have contributed to higher consistency in exercise participation and improved adherence over time compared to self-guided models (Gunnel et al., 2014; Lee et al., 2020). The present results further support the role of peer mentorship as a facilitator of structured engagement, particularly among university students, a population known to benefit from social accountability in health behaviour change interventions.

The control participants in the present study also demonstrated meaningful increases in exercise engagement, particularly through longer workout durations and increased participation in external exercises. These quantitative results are supported by participant quotes, which described enhanced engagement and perceived fitness improvements, albeit self-guided. However, upon visual inspection, it is evident that their warm-up and cool-down durations decreased throughout the program. The reduced adherence to warm-up and cool-downs may be linked to the lack of formal and ongoing social support (e.g., Boyle et al., 2011; Keeler et al., 2013; Keeler et al., 2021). As a result, the informal, passive support of family and friends reported by control participants may have been insufficient to sustain engagement in these often overlooked but important components of their workouts. This aligns with existing qualitative research on UW, which suggests that while self-directed exercise can be beneficial, it often leads to less consistent improvements compared to programs delivered in socially supportive

environments, which UW tend to prefer for sustaining motivation and engagement (Brown et al., 2024; Fabiano & Pearson, 2025; Othman et al., 2022). Notably, more control participants expressed a desire to increase their engagement to meet their fitness goals. While limited comparative data exist, future studies should investigate variations in peer-mentorship, such as variations in meeting frequency, as a potential strategy to enhance university students' exercise engagement.

Facility Attendance. Quantitatively, sign-in data obtained from Lakehead Athletics revealed that most participants exercised later in the day, with many intervention participants preferring afternoon (12:00-5:00 pm) and control participants preferring evening (5:00-10:00 pm) sessions. This mirrors recent research by Su et al. (2024), where they explored exercise habits and smartphone use through questionnaires distributed to 1,334 university students, and 70% identified that they preferred to exercise at night. Similarly, Johannes et al. (2024) explored 534 university students' exercise habits through a questionnaire and identified that most undergraduate students preferred to exercise between 4:00 and 11:59 pm. Since intervention participants were required to exercise with a mentor once per week and match up their schedules, it is possible that their typical sign-in time varied from prior research.

Moreover, participants in the intervention group typically exercised on Thursdays and Fridays, whereas those in the control group mainly exercised on Thursdays. Although literature in this area is limited, these findings are consistent with a study by Clemente et al. (2016), where 126 university students wore accelerometers for a week, and data revealed that this cohort spent more time engaging in moderate to vigorous physical activity and recorded higher step counts during the week. However, it is important to consider that not all participants signed in at the gym, which may limit the accuracy of this data. To the best of the researchers' knowledge, no

literature exists on the sign-in frequency of gym users, and thus comparisons cannot be made with certainty. Given these results, exercise programmes targeting UW may see higher attendance when avoiding morning sessions and those at the start of the week.

Virtual Communication Habits

Quantitatively, communication trends between mentors and participants largely followed a consistent pattern across the 6 weeks. At the beginning of the program, more text messages were sent and received within dyads. This pattern aligns with findings from a previous 8-week PMP aimed at reducing depression symptoms in older adults (n = 23) through virtual communication, who identified that increased communication at the start of a program was often due to initial rapport-building, which declined over time (Joo et al., 2022). In the present study, mentors consistently sent more messages than participants, reflecting their role in initiating and sustaining communication. This is in line with a prior 12-week digital mental health intervention, where mentors sent almost double the number of text messages they received from participants (n = 77; Bernstein et al., 2024). Notably, despite this decrease in message volume throughout the present study, the delay in response time remained elevated as compared to prior digital communication behaviour change studies, where responses ranged from one (Naughton et al., 2016) to 10 hours (Brabyn et al., 2014) after receiving a text message.

Participant Program Experiences. Qualitatively, virtual messaging emerged as a time-efficient tool for facilitating peer engagement. Conversations exploring program experiences were typically longer and more detailed when initiated by participants, often occurring when they voluntarily shared reflections on their exercise sessions. Participants often reported feeling accomplished after exercising, particularly when navigating unfamiliar or intimidating gym areas or trying new equipment. A similar pattern was observed in a text-based intervention via a

messaging application by Milligan et al. (2021) for patients with tuberculosis (texting support = 21, non-texting = 21). In this study, patient-initiated messages centred on personal concerns and experiences, while nurse-led conversations were typically limited to routine check-ins, reminders, or general encouragement (Milligan et al., 2021). Similarly, throughout the SHINE program, participants often reached out for support when they were unsure how to use specific gym equipment to achieve their goals, using the platform to seek guidance or reassurance from their mentor. These interactions helped participants build practical knowledge and likely strengthened their sense of social support (deJonge et al., 2021; Keeler et al., 2021; Kirby et al., 2024; Yan et al., 2023). Specifically, in PMP, participants have been more likely to achieve their goals when they feel supported and able to ask for help, as seen in a 6-week exercise program to evoke behaviour change amongst university students (n = 68) as expressed via one-on-one interviews (deJonge et al., 2021). When asked about their engagement experiences, some participants noted that academic stress and increased workloads occasionally hindered their motivation to engage in exercise. These challenges reflect common barriers identified in prior research on student populations and underscore the importance of flexible, responsive communication within peer-support models (Chim et al., 2020; Terzi et al., 2024). In the present study, virtual communication methods gave mentors an opportunity to apply MI techniques, enabling them to recognize participants' achievements and guide them through challenges, as seen in prior studies (e.g., Fried et al., 2018; Lee et al., 2020; Paré et al., 2023). Future PMP should consider incorporating design elements that actively encourage participant-initiated communication to foster social support and focus on integrating championing and acknowledgements to build self-efficacy and foster motivation for behaviour change (Fabiano & Pearson, 2025).

Barriers to Communication. Mentors frequently used MI strategies to explore participants' engagement experiences. This aligns with previous PMP research highlighting the effectiveness of MI in evoking behaviour change and adherence (Miller & Rollnick, 2023), especially in PMP (e.g., deJonge et al., 2021; Keeler et al., 2013; Lee et al., 2020). However, at times, communication flow was disrupted by delayed or minimal participant responses, mainly when mentors-initiated conversations exploring engagement experiences. In line with MI principles, when participants autonomously sought support and advice, they were more invested in the conversations, causing them to write longer and more detailed responses, rather than being forced to discuss their behaviour (Miller & Rollick, 2023). Delays were often attributed to busy schedules but may also reflect unfamiliarity with the GroupMe platform. This mirrors findings by Uetova et al. (2024), who conducted a thematic analysis of a true experimental design to reduce sedentary behaviour among female employees through virtual communication (Hargreaves et al., 2020). These participants noted that limited pre-program platform usage hindered consistent engagement (Hargreaves et al., 2020; Uetova et al., 2024). To overcome this, mentors made proactive efforts to sustain participant engagement by sending follow-up messages during periods of low communication. The notion of sending nudges was supported by Shimoni et al. (2020), who reviewed data from over 2,600 participants from six clinical trials that used virtual messaging, where they identified that sending follow-up messages one hour after initial contact improved response rates (90-98%) and program adherence through re-engagement. As a result, participants may have felt overwhelmed and only responded to the most recent messages, limiting conversations to explore and evoke behaviour change. Future programs may benefit from using more familiar platforms like WhatsApp, iMessage, or SMS to improve consistency and comfort. Additionally, there may be value in reconsidering the pattern of messaging—

incorporating nudges and other MI strategies could enhance participant engagement and strengthen buy-in.

Strengths and Limitations

Strengths

Despite a relatively short recruitment period (i.e., 7 weeks), nearly 100 students at the host institution expressed interest in the present study. This speaks to the interest in and need for a supportive PMP intervention for this particular population. While many were ineligible due to their status as a graduate or part-time student, the program's strong appeal is apparent, and there is a clear need for future initiatives aimed at promoting exercise engagement within this largely sedentary population (e.g., Alahmadi et al., 2024; Castro et al., 2020). As for those who completed the program, these participants came from very diverse backgrounds, including differences in birth countries, age, academic programs, and year of study, highlighting the program's broad appeal and accessibility across the UW student body.

A key strength of the present program was the on-campus design, which increased accessibility, convenience, and comfort for participants. This proximity likely facilitated consistent attendance and helped build familiarity with navigating the campus gym, as seen in prior studies that promoted ecological validity through on-campus exercise engagement (e.g., Brown et al., 2024; Jeftic et al., 2023; Keeler et al., 2021; McAvoy et al., 2024). Participants qualitatively expressed this as they shared their intentions to continue using the campus gym post-program, reflecting increased confidence and a positive overall experience. Moreover, the partnership with Lakehead Athletics staff supported the collaborative development and delivery of tailored programming, increasing its relevance to students and supporting effective knowledge translation methods (Graham et al., 2006). In turn, these types of collaborations can support the

potential development of new programs at the host institution, particularly because the present study was tailored to the campus facilities and aligned with the needs of both stakeholders and end users, as informed by a previous needs assessment (Fabiano & Pearson, 2025).

More specifically, the present study's design contributed to the limited literature on PMP, demonstrating how a structured, SDT-informed, and mixed-methods approach can be effectively implemented in a campus setting to engage UW in this context. A unique feature of the current program was the orientation session, which included an educational component and a guided facility tour. Participants from both groups emphasized the value of this session, particularly the tour, as it increased their comfort in the gym. This element contributed to the limited literature on effective strategies for promoting exercise engagement among university students and highlights the importance of including pre-program educational components in future programs targeting those looking to improve comfort in the gym. As for the intervention participants, they expressed appreciation for the virtual communication with their mentors, highlighting its meaningful role in building rapport and simplifying scheduling.

Moreover, unlike most prior studies in this area that elicited meaningful changes in 6 to 8 weeks, this program saw significant improvements in as little as 3 weeks. This outcome is especially noteworthy considering the significant barriers to engagement faced by UW, and it underscores the potential effectiveness of the study's design and the value of short-duration interventions in producing early, meaningful results. This is especially notable as improvements were observed across both groups, suggesting that the program's design may have played a meaningful role, regardless of group allocation.

To the best of the researchers' knowledge, this is the first PMP intervention delivered in the pandemic recovery era that used qualitative and quantitative data to capture related

experiences, with the goal of enhancing exercise motivation and adherence in a gym setting amongst UW. By exploring methods to enhance UW exercise engagement in the present study, future larger-scale PMP can now be developed.

Limitations

In the present study, limitations also occurred. Regarding participant demographics, the intervention group was slightly older and less diverse regarding their programs of study and birth countries. This may have impacted the applicability of the findings, as the homogeneity within groups and distinct differences between them could limit the generalizability of the results to more heterogeneous populations. Specifically, most control participants were enrolled in nursing, which may have positively impacted their performance in this program, as their academic and professional focus on health may have influenced their baseline knowledge or motivation to exercise. As a result, they may have experienced stronger outcomes as compared to peers from non-health disciplines, potentially introducing bias and limiting the generalizability of the findings to a broader population.

It is important to recognize the limitations of using self-reported tools, such as Strava, for tracking exercise engagement (Rosenman et al., 2014). Previous research suggests that social desirability bias may have led participants to overreport their engagement (Larson et al., 2018). Although this was partially mitigated by facility data, where in-person attendance was confirmed through a sign-in process, some participants failed to sign in at the gym, limiting the completeness of this verification. To strengthen the measure of exercise adherence in future studies, digital technology (e.g., in-app GPS tracking) may help enhance the reliability and validity of such methods.

While the in-person sessions with mentors helped to enhance social support and allowed mentors to share their knowledge and skills, they posed a limitation for researchers, who had no insights into what occurred during these sessions or the varying mentoring styles that were employed. This was somewhat facilitated by reviewing the virtual conversations between mentors and intervention participants, which offered some insight into the nature of their relationships. However, these insights were occasionally limited by delayed or infrequent responses from participants. While the standardized training was intended to streamline the conversations and approaches used, similar to previous studies (e.g., Fried et al., 2018; Lee et al., 2020; Pearson et al., 2013), future researchers may wish to conduct content analyses or structured debriefing logs to better understand the content and context of these interactions.

Conclusion

Undergraduate women remain an underserved population in the exercise and health promotion literature, despite being disproportionately affected by decreased exercise engagement and psychological distress (e.g., Edelmann et al., 2022; Othman et al., 2022; Wilson et al., 2022), particularly during and throughout the COVID-19 pandemic (e.g., Bell et al., 2023; Fabiano & Pearson, 2025). The SHINE Program aimed to address this gap through an SDT-based PMP, designed to enhance participants' BPN and motivational regulations, while supporting their engagement with campus-based exercise.

This mixed-methods randomized controlled trial provided valuable insights into how peer support and structured exercise programming can influence UW exercise motivation, psychological distress, and adherence. Quantitative results suggested improvements in BPN, motivational regulations, psychological distress, and exercise habits across time with the intervention group experiencing greater statistical improvements in autonomy, competence, and

warm-up durations. Qualitative findings provided in-depth insights into program experiences, with participants citing the benefits of the baseline orientation session and mentor support for intervention participants. Although the qualitative findings did not always align with quantitative results, they revealed differences in experiences between the intervention and control groups.

Given these promising results, future research should build on this work. Peer-supported, time-efficient interventions offer a practical way to promote lasting behaviour change and healthy habits among undergraduate women. Moreover, investigating the impact of digital peer support platforms and structured communication strategies may further enhance engagement and long-term adherence, offering a time-conscious and accessible way to increase social support among university students who often face competing academic, social, and personal demands. Overall, the findings from the present study are promising, and with continued refinement, a larger-scale study is likely to show potential to evoke health behaviour change further.

This research is particularly important for university campuses, where access to mental health resources and tailored exercise programming remains limited, especially for women who face distinct social, psychological, and environmental barriers to participation. By demonstrating the feasibility and appeal of a low-barrier, on-campus intervention that addresses both motivational and emotional well-being, the SHINE Program offers a scalable model that can inform future student wellness initiatives and institutional programming efforts to help UW *shine brighter*.

References

Abdul Aziz, N. A., Baharudin, N. S., & Alias, N. A. (2023). Association between stress and social support perceived among undergraduate health sciences students. *The Malaysian Journal of Medical Sciences*, *30*(3), 176–183. https://doi.org/10.21315/mjms2023.30.3.16

Acoba, E. F. (2024). Social support and mental health: The mediating role of perceived stress. *Frontiers in Psychology*, *15*, 1330720–1330720. https://doi.org/10.3389/fpsyg.2024.1330720

Ahn, J., & Kim, I. (2022). The effect of autonomy and self-control on changes in healthy lifestyles of inactive college students through regular exercise. *International Journal of Environmental Research and Public Health*, *19*(17), 10727. https://doi.org/10.3390/ijerph191710727

Al Ali, N. M., Alkhateeb, E., Jaradat, D., & Bashtawi, M. (2021). Social media use among university students in Jordan and its impact on their dietary habits and physical activity. *Cogent Education*, 8(1). https://doi.org/10.1080/2331186X.2021.1993519

Alahmadi, M. A., Almasoud, K. H., Aljahani, A. H., Alzaman, N. S., Al-Nozha, O. M., Alahmadi, O. M., Jalloun, R. A., Alfadhli, E. M., Alahmadi, J. M., Zuair, A. A., Alzahrani, N. S., Alahmdi, A. A., Alghamdi, M. A., Aldayel, A. A., Aljaloud, S. O., Alharbi, O. M., Al-Nuaim, A., Alshqaq, S. S., Alsaedi, B. S., … Al-Daghri, N. M. (2024). The prevalence of sedentary behavior among university students in Saudi Arabia. *BMC Public Health*, *24*(1), Article 605. https://doi.org/10.1186/s12889-024-18107-7

Allison, K. R. (1996). Predictors of inactivity: An analysis of the Ontario Health Survey. *Canadian Journal of Public Health / Revue Canadienne de Sante'e Publique*, *87*(5), 354–358.

http://www.jstor.org/stable/41993821

Andreasson, J., & Johansson, T. (2018). Glocalised fitness: The franchising of a physical movement, fitness professionalism and gender. *Leisure (Waterloo)*, *42*(3), 301–321. https://doi.org/10.1080/14927713.2018.1535910

Antony, M. M., Bieling, P. J., Cox, B. J., Enns, M. W., & Swinson, R. P. (1998). Psychometric properties of the 42-item and 21-item versions of the Depression Anxiety Stress Scales in clinical groups and a community sample. *Psychological Assessment, 10*(2), 176–181. https://doi.org/10.1037/1040-3590.10.2.176

Auerswald, S., Koddebusch, C., & Hermann, C. (2024). Elevated perceived stress in university students due to the COVID-19 pandemic: Potential contributing factors in a propensity-score-matched sample. *Scandinavian Journal of Psychology*, *65*(4), 715–728. https://doi.org/10.1111/sjop.13013

Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. *Journal of Social and Clinical Psychology*, *4*(3), 359–373. https://doi.org/10.1521/jscp.1986.4.3.359

Bauer, M. S., & Kirchner, J. (2020). Implementation science: What is it and why should I care? *Psychiatry Research*, *283*, Article 112376. https://doi.org/10.1016/j.psychres.2019.04.025

Bell, M., Duncan, M. J., Patte, K. A., Roy, B. D., Ditor, D. S., & Klentrou, P. (2023). Changes in body mass, physical activity, and dietary intake during the COVID-19 pandemic lockdowns in Canadian university students. *Biology (Basel, Switzerland)*, *12*(2), 326-. https://doi.org/10.3390/biology12020326

Benes, S., Oh, S., Peacock, J., & Yan, Z. (2023). Perception of a peer health coaching intervention among college students: Client experience. *American Journal of Health*

Education, *54*(6), 429–438. https://doi.org/10.1080/19325037.2023.2253866

Bernstein, E. E., Greenberg, J. L., Weingarden, H., Snorrason, I., Summers, B., Williams, J., Quist, R., Curtiss, J., Harrison, O., & Wilhelm, S. (2024). The use of coaching in smartphone app-based cognitive behavioral therapy for body dysmorphic disorder. Internet Interventions, *36,* 100743. https://doiorg.ezproxy.lakeheadu.ca/10.1016/j.invent.2024.100743

Bingham, A. J. (2023). From data management to actionable findings: A five-phase process of qualitative data analysis. *International Journal of Qualitative Methods*, *22*. https://doi.org/10.1177/16094069231183620

Bonilla, D. A., Cardozo, L. A., Vélez-Gutiérrez, J. M., Arévalo-Rodríguez, A., Vargas-Molina, S., Stout, J. R., Kreider, R. B., & Petro, J. L. (2022). Exercise selection and common injuries in fitness centers: A systematic integrative review and practical recommendations. *International Journal of Environmental Research and Public Health*, *19*(19), 12710. https://doi.org/10.3390/ijerph191912710

Booth, F. W., Roberta, C. K., Thyfault, J. P., Ruegsegger, G.N., & Toedebusch, R. G. (2017). Role of inactivity in chronic diseases; Evolutionary insights and pathophysiological mechanisms. Physiological reviews, *97*(4), 135-1402. https://doi.org/10.1152/physrev.00019.2016

Bosa, I., Castelli, A., Castelli, M., Ciani, O., Compagni, A., Galizzi, M. M., Garofano, M., Ghislandi, S., Giannoni, M., Marini, G., & Vainieri, M. (2022). Response to COVID-19: was Italy (un)prepared? *Health Economics, Policy and Law*, *17*(1), 1–13. https://doi.org/10.1017/S1744133121000141

Boyle, J., Mattern, C. O., Lassiter, J. W., & Ritzler, J. A. (2011). Peer 2 peer: Efficacy of a course-based peer education intervention to increase physical activity among college

students. *Journal of American College Health*, *59*(6), 519–529. https://doi.org/10.1080/07448481.2010.523854

Brancaccio, M., Mennitti, C., Gentile, A., Correale, L., Buzzachera, C. F., Ferraris, C., Montomoli, C., Frisso, G., Borrelli, P., & Scudiero, O. (2021). Effects of the COVID-19 pandemic on job activity, dietary behaviours and physical activity habits of university population of Naples, Federico II-Italy. *International Journal of Environmental Research and Public Health*, *18*(4), 1502-. https://doi.org/10.3390/ijerph18041502

Brennan, C., O'Donoghue, G., Keogh, A., Rhodes, R. E., & Matthews, J. (2024). "It's what mothers do." A qualitative exploration of mothers' experiences of supporting their daughter to be physically active. *PloS One*, *19*(4), e0299260–e0299260. https://doi.org/10.1371/journal.pone.0299260

Brown, T. C., Volberding, J. L., Baghurst, T., & Sellers, J. (2014). Faculty/staff perceptions of a free campus fitness facility. *International Journal of Workplace Health Management*, *7*(3), 156–170. https://doi.org/10.1108/IJWHM-05-2013-0020

Brown, T. C., Volberding, J., Baghurst, T., & Sellers, J. (2017). Comparing current fitness center members' perceptions of the motivational climate with non-members. *Global Health Promotion*, *24*(1), 5–13. https://doi.org/10.1177/1757975915583478

Brown, C. E. B., Richardson, K., Halil-Pizzirani, B., Atkins, L., Yücel, M., & Segrave, R. A. (2024). Key influences on university students' physical activity: A systematic review using the Theoretical Domains Framework and the COM-B model of human behaviour. *BMC Public Health*, *24*(1), 418–418. https://doi.org/10.1186/s12889-023-17621-4

Buchan, D. S., Ollis, S., Thomas, N. E., & Baker, J. S. (2012). Physical activity behaviour: An

overview of current and emergent theoretical practices. *Journal of Obesity*, *2012*, 546459–11. https://doi.org/10.1155/2012/546459

Buja, A., Lo Bue, R., Mariotti, F., Miatton, A., Zampieri, C., & Leone, G. (2024). Promotion of physical activity among university students with social media or text messaging: A systematic review. *Inquiry: A Journal of Medical Care Organization, Provision and Financing*, *61*, 469580241248131-469580241248131. https://doi.org/10.1177/00469580241248131

Burke, S. M., Carron, A. V., & Eys, M. A. (2006). Physical activity context: Preferences of university students. *Psychology of Sport and Exercise*, *7*(1), 1–13. https://doi.org/10.1016/j.psychsport.2005.03.002

Burke, S. M., Carron, A. V., & Shapcott, K. M. (2008). Cohesion in exercise groups: An overview. *International Review of Sport and Exercise Psychology*, *1*(2), 107–123. https://doi.org/10.1080/17509840802227065

Cahuas A, Marenus MW, Kumaravel V, Murray A, Friedman K, Ottensoser H, Chen W. (2023). Perceived social support and COVID-19 impact on quality of life in college students: An observational study. *Annals of Medicine (Helsinki)*. *55*(1), 136–145. https://doi.org/10.1080/07853890.2022.2154943

Canadian Institute for Health Information. (2022, October 13) *Canadian COVID-19 intervention timeline,* Canadian Institute for Health Information. https://www.cihi.ca/en/canadian-covid-19-intervention-timeline

Canadian Society for Exercise Physiology. (2021). *Canadian society for exercise: Physical activity training for health* (3rd edition). Canadian Society for Exercise Physiology.

Canadian Women and Sport. (2023). *Rally report: A call for better, safer sport for girls*.

https://womenandsport.ca/wp-content/uploads/2022/12/Rally-Report-2022-Dec2-1.pdf

Carballo-Fazanes, A., Rico-Diaz, J., Barcala-Furelos, R., Rey, E., Rodriguez-Fernandez, J. E., Varela-Casal, C., & Abelairas-Gomez, C. (2020). Physical activity habits and determinants, sedentary behaviour and lifestyle in university students. *International Journal of Environmental Research and Public Health*, *17*(9), 3272-. https://doi.org/10.3390/ijerph17093272

Carlin, L., Whelan, M. E., Musson, H., & Adams, E. J. (2021). Impact of a national peer-led training program to increase brief physical activity advice given to patients by health care professionals. *Journal of Physical Activity & Health*, *18*(11), 1364–1371. https://doi.org/10.1123/jpah.2021-0187

Caspersen, C. J., Powell, K. E., Christenson, G. M. (1985). Physical activity, exercise, and physical fitness: Definitions and distinctions for health-related research. *Public Health Reports*, *100*(2), 126–131. http://www.jstor.org/stable/20056429

Castro, O., Bennie, J., Vergeer, I., Bosselut, G., & Biddle, S. J. H. (2020). How sedentary are university students? A systematic review and meta-analysis. *Prevention Science*, *21*(3), 332–343. https://doi.org/10.1007/s11121-020-01093-8

Chen, P., Mao, L., Nassis, G. P., Harmer, P., Ainsworth, B. E., & Li, F. (2020). Coronavirus disease (COVID-19): The need to maintain regular physical activity while taking precautions. *Journal of Sport and Health Science*, *9*(2), 103–104. https://doi.org/10.1016/j.jshs.2020.02.001

Chen, J., & Wang, Y. (2021). Social media use for health purposes: Systematic review. *Journal of Medical Internet Research*, *23*(5), e17917–e17917. https://doi.org/10.2196/17917

Chim, H. Q., Oude Egbrink, M. G. A., Van Gerven, P. W. M., de Groot, R. H. M., Winkens, B.,

& Savelberg, H. H. C. M. (2020). Academic schedule and day-to-day variations in sedentary behavior and physical activity of university students. *International Journal of Environmental Research and Public Health, 17*(8), 2810. https://doi.org/10.3390/ijerph17082810

Cid, L., Monteiro, D., Teixeira, D., Teques, P., Alves, S., Moutão, J., Silva, M., & Palmeira, A. (2018). The behavioral regulation in exercise questionnaire (BREQ-3) Portuguese-version: Evidence of reliability, validity and invariance across gender. *Frontiers in Psychology*, *9*, 1940–1940. https://doi.org/10.3389/fpsyg.2018.01940

Clarke, S., Dekker, J., Habli, N., Macdonald, R., & McCormack, C. (2022). *Measuring the correlation between COVID-19 restrictions and economic activity.* Statistics Canada. https://www150.statcan.gc.ca/n1/pub/11-633-x/11-633-x2022003-eng.htm

Clemente, F. M., Nikolaidis, P. T., Martins, F. M. L., & Mendes, R. S. (2016). Physical activity patterns in university students: Do they follow the public health guidelines? *PloS One*, *11*(3), e0152516–e0152516. https://doi.org/10.1371/journal.pone.0152516

Cocca, A., Kopp, M., Greier, K., Labek, K., Cocca, M., & Ruedl, G. (2024). Validity, reliability, and invariance across sex of a German version of the Behavioral Regulation in Exercise Questionnaire. *Frontiers in Psychology*, *15*, 1355928–1355928. https://doi.org/10.3389/fpsyg.2024.1355928

Coen, S. E., Subedi, R. P., & Rosenberg, M. W. (2016). Working out across Canada: Is there a gender gap? *The Canadian Geographer*, *60*(1), 69–81. https://doi.org/10.1111/cag.12255

Colley, R. C., Garriguet, D., Janssen, I., Craig, C. L., Clarke, J., & Tremblay, M. S. (2011). Physical activity of Canadian adults: Accelerometer results from the 2007 to 2009 Canadian health measures survey. *Health Reports, 22*(1), 7-14.

http://ezproxy.lakeheadu.ca/login?url=https://www.proquest.com/scholarly-journals/physical-activity-canadian-adults-accelerometer/docview/905091866/se-2

Coulter, K. S. (2021). Intimidation and distraction in an exercise context. *International Journal of Sport and Exercise Psychology*, *19*(4), 668–686. https://doi.org/10.1080/1612197X.2020.1739108

Copeland, W. E., McGinnis, E., Bai, Y., Adams, Z., Nardone, H., Devadanam, V., Rettew, J., & Hudziak, J. J. (2021). Impact of COVID-19 pandemic on college student mental health and wellness. *Journal of the American Academy of Child and Adolescent Psychiatry*, *60*(1), 134-141. https://doi.org/10.1016/j.jaac.2020.08.466

Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., & Petticrew, M. (2008). Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ*, *337*(7676), 979–983. https://doi.org/10.1136/bmj.a1655

Cross, M., Lee, S., Bridgman, H., Thapa, D. K., Cleary, M., & Kornhaber, R. (2019). Benefits, barriers and enablers of mentoring female health academics: An integrative review. *PloS one*, *14*(4), e0215319-. https://doi.org/10.1371/journal.pone.0215319

Dafogianni, C., Pappa, D., Mangoulia, P., Kourti, F. E., Koutelekos, I., Dousis, E., Margari, N., Ferentinou, E., Stavropoulou, A., Gerogianni, G., Fradelos, E., & Zartaloudi, A. (2022). Anxiety, stress and the resilience of university students during the first wave of the COVID-19 Pandemic. *Healthcare (Basel), 10*(12), 2573-. https://doi.org/10.3390/healthcare10122573

Danielsen, K. K., Cabral, D., & Sveaas, S. H. (2023). Students moving together, tailored exercise for students facing mental health challenges pilot feasibility study. *International Journal of Environmental Research and Public Health*, *20*(17), 6639.

https://doi.org/10.3390/ijerph20176639

Dasso, N. A. (2019). How is exercise different from physical activity? A concept analysis. *Nursing Forum (Hillsdale)*, *54*(1), 45–52. https://doi.org/10.1111/nuf.12296

Dasgupta, N., Scircle, M. M., & Hunsinger, M. (2015). Female peers in small work groups enhance women's motivation, verbal participation, and career aspirations in engineering. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(16), 4988–4993. https://doi.org/10.1073/pnas.1422822112

Deci, E. L., & Ryan, R. M. (1980). Self-determination Theory: When mind mediates behavior. *The Journal of Mind and Behavior*, *1*(1), 33–43. http://www.jstor.org/stable/43852807

deJonge, M. L., Jain, S., Faulkner, G. E., & Sabiston, C. M. (2021). On campus physical activity programming for post-secondary student mental health: Examining effectiveness and acceptability. *Mental Health and Physical Activity*, *20*, 100391-. https://doi.org/10.1016/j.mhpa.2021.100391

Deliens, T., Deforche, B., De Bourdeaudhuij, I., & Clarys, P. (2015). Determinants of physical activity and sedentary behaviour in university students: a qualitative study using focus group discussions. *BMC Public Health*, *15*(1), Article 201. https://doi.org/10.1016/j.mhpa.2021.100391

DeShaw, K. J., Lansing, J. E., Perez, M. L., Ellingson, L. D., & Welk, G. J. (2023). Effects of a peer health coaching program on college student lifestyle behaviors. *Journal of American College Health*, 1–8. https://doi.org/10.1080/07448481.2022.2155473

Di Bartolomeo, G., & Papa, S. (2019). The effects of physical activity on social interactions: The case of trust and trustworthiness. *Journal of Sports Economics*, *20*(1), 50–71.

https://doi.org/10.1177/1527002517717299

Di Liegro, C. M., Schiera, G., Proia, P., & Di Liegro, I. (2019). Physical activity and brain health. *Genes*, *10*(9), 720-. https://doi.org/10.3390/genes10090720.

Dineen, M., & Condra, M. (2016). M2Peer mentoring program: Training manual. Kingston, ON: Queen's University.

Dorner, Z., & Lancsar, E. (2023). Don't pay the highly motivated too much. *Journal of Behavioral and Experimental Economics*, *103*, Article 101972. https://doi.org/10.1016/j.socec.2022.101972

Dorgo, S., King, G. A., Bader, J. O., & Limon, J. S. (2011). Comparing the effectiveness of peer mentoring and student mentoring in a 35-week fitness program for older adults. *Archives of gerontology and geriatrics*, *52*(3), 344–349. https://doi.org/10.1016/j.archger.2010.04.007

Dorgo, S., King, G. A., Bader, J. O., & Limon, J. S. (2013). Outcomes of a peer mentor implemented fitness program in older adults: A quasi-randomized controlled trial. *International journal of nursing studies*, *50*(9), 1156–1165. https://doi.org/10.1016/j.ijnurstu.2012.12.006

Duncan, L. R., Hall, C. R., Wilson, P. M., & O, J. (2010). Exercise motivation: A cross-sectional analysis examining its relationships with frequency, intensity, and duration of exercise. *The International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 7–7. https://doi.org/10.1186/1479-5868-7-7

Durau, J., Diehl, S., & Terlutter, R. (2022). Motivate me to exercise with you: The effects of social media fitness influencers on users' intentions to engage in physical activity and the role of user gender. *Digital Health*, *8*, 205520762211027–20552076221102769.

https://doi.org/10.1177/20552076221102769

Dyer, O. (2022). Covid-19: Canada outperformed comparable nations in pandemic response, study reports. *BMJ (Online)*, *377*, o1615–o1615. https://doi.org/10.1136/bmj.o1615

Edelmann, D., Pfirrmann, D., Heller, S., Dietz, P., Reichel, J. L., Werner, A. M., Schäfer, M., Tibubos, A. N., Deci, N., Letzel, S., Simon, P., & Kalo, K. (2022). Physical activity and sedentary behavior in university students-The role of gender, age, field of study, targeted degree, and study semester. *Frontiers in Public Health*, *10*, 821703. https://doi.org/10.3389/fpubh.2022.821703

Edwards, E. S., & Sackett, S. C. (2016). Psychosocial variables related to why women are less active than men and related health implications: Supplementary issue: Health disparities in women. *Clinical Medicine Insights: Women's Health*, 9s1, CMWH.S34 668–. https://doi.org/10.4137/CMWH.S34668

Efird, J. (2011). Blocked randomization with randomly selected block sizes. *International Journal of Environmental Research and Public Health*, 8(1), 15–20. https://doi.org/10.3390/ijerph8010015

Egli, T., Bland, H. W., Melton, B. F., & Czech, D. R. (2011). Influence of age, sex, and race on college students' exercise motivation of physical activity. *Journal of American College Health*, *59*(5), 399–406. https://doi.org/10.1080/07448481.2010.513074

Esmaeelzadeh, S., Moraros, J., Thorpe, L., & Bird, Y. (2018). The association between depression, anxiety and substance use among Canadian post-secondary students. *Neuropsychiatric Disease and Treatment*, *14*, 3241–3251. https://doi.org/10.2147/NDT.S187419

Espada, M., Romero-Parra, N., Bores-Garcia, D., & Delfa-De la Morena, J. M. (2023). Gender

Differences in university students' levels of physical activity and motivations to engage in physical activity. *Education Sciences*, 13(4), 340-. https://doi.org/10.3390/educsci13040340

Estabrooks, P. A., Harden, S. M., & Burke, S. M. (2012). Group dynamics in physical activity promotion: What works?: Group dynamics in physical activity promotion. *Social and Personality Psychology Compass*, *6*(1), 18–40. https://doi.org/10.1111/j.1751-9004.2011.00409.x.

Fabiano, M., & Pearson, E. S. (2025). It's hard to become active when you don't know how: Exploring physical activity participation contributors in a pandemic recovery era [Manuscript submitted for publication].

Faulkner, J., O'Brien, W. J., McGrane, B., Wadsworth, D., Batten, J., Askew, C. D., Badenhorst, C., Byrd, E., Coulter, M., Draper, N., Elliot, C., Fryer, S., Hamlin, M. J., Jakeman, J., Mackintosh, K. A., McNarry, M. A., Mitchelmore, A., Murphy, J., Ryan-Stewart, H., Saynor, Z., … Lambrick, D. (2021). Physical activity, mental health and well-being of adults during initial COVID-19 containment strategies: A multi-country cross-sectional analysis. *Journal of Science and Medicine in Sport*, *24*(4), 320–326. https://doi.org/10.1016/j.jsams.2020.11.016

Feng, H., Yang, L., Liang, Y. Y., Ai, S., Liu, Y., Liu, Y., Jin, X., Lei, B., Wang, J., Zheng, N., Chen, X., Chan, J. W. Y., Sum, R. K. W., Chan, N. Y., Tan, X., Benedict, C., Wing, Y. K., & Zhang, J. (2023). Associations of timing of physical activity with all-cause and cause-specific mortality in a prospective cohort study. *Nature Communications*, *14*(1), 930. https://doi.org/10.1038/s41467-023-36546-5

Ferrara, M., Langiano, E., Falese, L., Diotaiuti, P., Cortis, C., & De Vito, E. (2022). Changes in

physical activity levels and eating behaviours during the COVID-19 Pandemic: Sociodemographic analysis in university students. *International Journal of Environmental Research and Public Health*, *19*(9), 5550-. https://doi.org/10.3390/ijerph19095550

Ferreira Silva, R. M., Mendonça, C. R., Azevedo, V. D., Raoof Memon, A., Noll, P. R. E. S., & Noll, M. (2022). Barriers to high school and university students' physical activity: A systematic review. *PloS One*, *17*(4), e0265913–e0265913. https://doi.org/10.1371/journal.pone.0265913

Filip, R., Gheorghita Puscaselu, R., Anchidin-Norocel, L., Dimian, M., & Savage, W. K. (2022). Global challenges to public health care systems during the COVID-19 pandemic: A review of pandemic measures and problems. *Journal of Personalized Medicine*, *12*(8), 1295-. https://doi.org/10.3390/jpm12081295

Forlico, S., Baillie, A., Keys, K. et al. Gym and swim: A co-facilitated exercise program that improves community connection, confidence, and exercise habits in a community mental health service. *Discover Mental Health 4,* 53 (2024). https://doi.org/10.1007/s44192-024-00110-4

Fried, R. R., Karmali, S., Irwin, J. D., Gable, F. L., & Salmoni, A. (2018). Making the grade: Mentors' perspectives of a course-based, smart, healthy campus pilot project for building mental health resiliency through mentorship and physical activity. *International Journal of Evidence Based Coaching and Mentoring*, *16*(2), 84–98. https://doi.org/10.24384/000566.

Gall, T. L,. Evans, D. R., & Bellerose, S. (2000) Transition to first-year university: Patterns of change in adjustment across life domains and time. *Journal of Social and Clinical*

Psychology, *19*(4), 544–567. https://doi.org/10.1521/jscp.2000.19.4.544

Galliart, J. M., Thornton, E., Freeman, R., Bradley Pospisil, S., Csaposs, B., Dorn, K., Eller, J., & Grover, K. S. (2023). Using group messaging to facilitate peer support among early doctoral students: A thematic analysis of one cohort's text messages. In *Adult learning (Washington, D.C.)*, *34*(2), 101–110. SAGE Publications. https://doi.org/10.1177/10451595211050072

García-Campanario, I., Vanlinthout, L. E., Toro, R., Mangas, A., & Lagares-Franco, C. (2022). Impact of COVID-19 on physical activity and lifestyles in post-confinement sports science undergraduates. *International Journal of Environmental Research and Public Health*, *19*(15), 9115. https://doi.org/10.3390/ijerph19159115

Garett, R., Liu, S., & Young, S. D. (2017). A longitudinal analysis of stress among incoming college freshmen. *Journal of American College Health, 65(*5), 331–338. https://doi.org/10.1080/07448481.2017.1312413

Gillison, F. B., Rouse, P., Standage, M., Sebire, S. J., & Ryan, R. M. (2019). A meta-analysis of techniques to promote motivation for health behaviour change from a self-determination theory perspective. *Health Psychology Review*, *13*(1), 110–130. https://doi.org/10.1080/17437199.2018.1534071

Ginis, K. A. M., Nigg, C. R., & Smith, A. L. (2013). Peer-delivered physical activity interventions: An overlooked opportunity for physical activity promotion. *Translational Behavioral Medicine*, *3*(4), 434–443. https://doi.org/10.1007/s13142-013-0215-2.

Glazzard, J., Rose, A., & Ogilvie, P. (2021). The impact of peer mentoring on students' physical activity and mental health. *Journal of Public Mental Health*, *20*(2), 122-131. https://doi.org/10.1108/JPMH-10-2018-0073

Gómez Chacón, R., Nuñez Sánchez, J. M., & Gálvez Ruiz, P. (2024). Effects of physical activity and COVID-19 on healthy student strengths in the university system: Implications for post-pandemic management. *European Journal of Investigation in Health, Psychology and Education, 14*(1), 243–255. https://doi.org/10.3390/ejihpe14010016

Goncalves, A., Deshayes, M., Gisclard, B., Philippe, A. G., Bernal, C., Krawczyk, S., Korchi, K., Nogrette, M., & Charbonnier, E. (2023). Exploring the health effectiveness of a physical activity program co-constructed with students after the COVID-19 pandemic. *Nutrients*, *15*(13), 2913-. https://doi.org/10.3390/nu15132913

Graham, I. D., Logan, J., Harrison, M. B., Straus, S. E., Tetroe, J., Caswell, W., & Robinson, N. (2006). Lost in knowledge translation: time for a map?. *The Journal of Continuing Education in the Health Professions*, *26*(1), 13–24. https://doi.org/10.1002/chp.47

Graves, B. S., Hall, M. E., Dias-Karch, C., Haischer, M. H., & Apter, C. (2021). Gender differences in perceived stress and coping among college students. *PloS One*, *16*(8), e0255634–e0255634. https://doi.org/10.1371/journal.pone.0255634

Gronseth, S., & Hebert, W. (2019). GroupMe: Investigating use of mobile instant messaging in higher education courses. *TechTrends*, *63*(1), 15–22. https://doi.org/10.1007/s11528-018-0361-y

Goodyear, V. A., Wood, G., Skinner, B., & Thompson, J. L. (2021). The effect of social media interventions on physical activity and dietary behaviours in young people and adults: A systematic review. *The International Journal of Behavioral Nutrition and Physical Activity*, *18*(1), 72-. https://doi.org/10.1186/s12966-021-01138-3

Gordon-Larsen, P., Nelson, M. C., & Popkin, B. M. (2004). Longitudinal physical activity and sedentary behavior trends: Adolescence to adulthood. *American Journal of Preventive*

Medicine, *27*(4), 277–283. https://doi.org/10.1016/j.amepre.2004.07.006

Government of Canada. (2023, August 24). *Tracking health through daily movement behaviour: Data blog.* https://health-infobase.canada.ca/datalab/pass-blog.html#

Government of Ontario. (2023, February 15). *Published plans and annual reports 2022-2023: Ministry of the Solicitor General.* https://www.ontario.ca/page/published-plans-and-annual-reports-202202023-ministry-solicitor-general

Gunnell, K. E., Crocker, P. R. E., Mack, D. E., Wilson, P. M., & Zumbo, B. D. (2014). Goal contents, motivation, psychological need satisfaction, well-being and physical activity: A test of self-determination theory over 6 months. *Psychology of Sport and Exercise*, *15*(1), 19–29. https://doi.org/10.1016/j.psychsport.2013.08.005

Hailey, V., Fisher, A., Hamer, M., & Fancourt, D. (2022). Perceived social support and sustained physical activity during the COVID-19 pandemic. *International Journal of Behavioral Medicine*. https://doi.org/10.1007/s12529-022-10125-2

Hall, J. A. (2019). How many hours does it take to make a friend? *Journal of Social and Personal Relationships*, *36*(4), 1278-1296. https://doi.org/10.1177/0265407518761225

Han, X., Li, H., & Niu, L. (2025). How does physical education influence university students' psychological health? An analysis from the dual perspectives of social support and exercise behavior. *Frontiers in Psychology*, *16*, 1457165-. https://doi.org/10.3389/fpsyg.2025.1457165https://doi.org/10.3389/fpsyg.2025.1457165

Hargreaves, E. A., Hayr, K. T., Jenkins, M., Perry, T., & Peddie, M. (2020). Interrupting sedentary time in the workplace using regular short activity breaks: Practicality from an employee perspective. *Journal of Occupational and Environmental Medicine*,

62(4), 317–324. https://doi.org/10.1097/JOM.0000000000001832

Hart, E. A., Leary, M. R., & Rejeski, W. J. (1989). Tie measurement of social physique anxiety. *Journal of Sport & Exercise Psychology*, *11*(1), 94–104. https://doi.org/10.1123/jsep.11.1.94

Hearing, C. M., Chang, W. C., Szuhany, K. L., Deckersbach, T., Nierenberg, A. A., & Sylvia, L. G. (2016). Physical exercise for treatment of mood disorders: A critical review. *Current Behavioral Neuroscience Reports*, *3*(4), 350–359. https://doi.org/10.1007/s40473-016-0089-y

Henry, J. D., & Crawford, J. R. (2005). The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *British Journal of Clinical Psychology, 44*(2), 227–239. https://doi.org/10.1348/014466505X29657

Hernández-Segura, N., Botella-Juan, L., Amezcua-Prieto, C., Morales-Suárez-Varela, M., Mateos-Campos, R., Fernández-Villa, T., Ortiz-Moncada, R., Almaraz, A., Narciso-Rufo, A., Ayán-Pérez, C., Molina, A. J., & UniHcos Project Working Group. (2023). Excess weight in relation to lifestyle habits in Spanish first-year university students: Differences between pre- and post-COVID-19: A serial cross-sectional study based on uniHcos project. *Healthcare (Basel)*, *11*(11), 1547-. https://doi.org/10.3390/healthcare11111547

Huang, K., Beckman, E. M., Ng, N., Dingle, G. A., Han, R., James, K., Winkler, E., Stylianou, M., & Gomersall, S. R. (2024). Effectiveness of physical activity interventions on undergraduate students' mental health: systematic review and meta-analysis. *Health Promotion International*, *39*(3). https://doi.org/10.1093/heapro/daae054

Hurley, K. S., Flippin, K. J., Blom, L. C., Bolin, J. E., Hoover, D. L., & Judge, L. W. (2018).

Practices, perceived benefits, and barriers to resistance training among women enrolled in college. *International Journal of Exercise Science*, *11*(5), 226–238. https://doi.org/10.70252/ZRMT3507

Jeftic, I., Furzer, B. J., Dimmock, J. A., Wright, K., Boyd, C., Budden, T., Rosenberg, M., Kramer, B., Buist, B., Fitzpatrick, I., Sabiston, C., de Jonge, M., & Jackson, B. (2023). Structured exercise programs for higher education students experiencing mental health challenges: background, significance, and implementation. *Frontiers in public health, 11,* 1104918. https://doi.org/10.3389/fpubh.2023.1104918

Jenkinson, Kate. A., Naughton, G., & Benson, A. C. (2013). Peer-assisted learning in school physical education, sport and physical activity programmes: A systematic review. *Physical Education and Sport Pedagogy*, *19*(3), 253–277. https://doi.org/10.1080/17408989.2012.754004

Joo, J. H., Hwang, S., Gallo, J. J., & Roter, D. L. (2018). The impact of peer mentor communication with older adults on depressive symptoms and working alliance: A pilot study. *Patient Education and Counselling, 101*(4), 665–671. https://doi.org/10.1016/j.pec.2017.10.012

Johannes, C., Roman, N. V., Onagbiye, S. O., Titus, S., & Leach, L. L. (2024). Relationship between psychosocial factors and physical activity among Undergraduate students from a South African University. *International Journal of Environmental Research and Public Health*, *21*(4), 441-. https://doi.org/10.3390/ijerph21040441

Juwono, I. D., & Szabo, A. (2020). The efficacy of Self Determination Theory-based interventions in increasing students' physical activity: A systematic review. *Physical Activity Review (Częstochowa)*, *8*(1), 74–86. https://doi.org/10.16926/par.2020.08.09

Kabiri L. S., Perkins-Ball, A. M., Diep, C. S., Kelavkar, U., Rodriguez, A. X. (2022). Physical activity mentoring in schools: An undergraduate-mentored running intervention for elementary students. *Recent Progress in Nutrition*, 2(1). https://doi:10.21926/rpn.2201009

Kanters, M. A., & Forester, S. (1997). The motivations and self-esteem of intramural sports participants. *Recreational Sports Journal*, *21*(3), 37. https://doi.org/10.1177/155886619702100302

Karcher, M. J., & Berger, J. R. M. (2017). One-to-one cross-age peer mentoring. *National Mentoring Resource Center (NMRC), Office of Juvenile Justice and Delinquency Prevention (OJJDP).* https://nationalmentoringresourcecenter.org/wp-content/uploads/2017/09/One-to-One_Cross-Age_Peer_Mentoring_Model_Review.pdf

Keeler, L. A., Clifford, D. E., Buck, A., Kowalski, P., & Morris, M. N. (2013). Examination of a peer-led, non-diet nutrition and exercise adherence pilot program on a college campus: FitU. *Californian Journal of Health Promotion*, *11*(1), 84-96. https://doi.org/10.32398/cjhp.v11i1.1521

Keeler, L. A., Skidmore, B., Leenstra, T., MacDonald, J. R., & Stewart, D. (2021). Treating university students' depression using physical activity with peers: Two field-based quasi-experiments grounded in the self-determination theory. *Journal of College Student Psychotherapy*, *35*(3), 205–223. https://doi.org/10.1080/87568225.2019.1660293

Kettle, V. E., Madigan, C. D., Coombe, A., Graham, H., Thomas, J. J. C., Chalkley, A. E., &

Daley, A. J. (2022). Effectiveness of physical activity interventions delivered or prompted by health professionals in primary care settings: systematic review and meta-analysis of randomised controlled trials. *BMJ (Online)*, *376*, e068465–e068465. https://doi.org/10.1136/bmj-2021-068465

Khalid, Jawaria & Shah, Syed. (2024). Exploring the reasons for not prolonging gym participation. *ResearchGate. 5*. 27-36. https://www.researchgate.net/publication/387559345_Exploring_the_Reasons_for_Not_Prolonging_Gym_Participation

Kia-Keating, M., No, U., Moore, S., Furlong, M. J., Liu, S., & You, S. (2018). Structural validity of the depression, anxiety, and stress scales-21 adapted for U.S. undergraduates. *Emerging Adulthood (Thousand Oaks, CA)*, 6(6), 434–440. https://doi.org/10.1177/2167696817745407

Kirby, J. B., Babkes Stellino, M., Lewis, C., Humphrey, K., Gordon, K., & Lindsay, K. G. (2022). You've got a friend in me: Fostering social connection among college students through peer-led physical activity. *Health Promotion Practice*, *23*(6), 907–911. https://doi.org/10.1177/15248399211072535

Kirby, J. B., Lindsay, K. G., Visscher, L. E., Townsend, R., Stellino, M. B., & Kulakowski, E. (2024). Impact of a peer-led campus recreation program to improve student wellbeing: Exploring participation outcomes of the fitness buddies program. *Recreational Sports Journal*, *49*(1), 16–32. https://doi.org/10.1177/15588661241257478

Kohl, H. W., Craig, C. L., Lambert, E. V., Inoue, S., Alkandari, J. R., Leetongin, G., & Kahlmeier, S. (2012). The pandemic of physical inactivity: Global action for public health. *The Lancet (British Edition)*, *380*(9838), 294–305.

https://doi.org/10.1016/S0140-6736(12)60898-8

Koralesky, K. E., von Keyserlingk, M. A. G., & Weary, D. M. (2025). Assessing construct reliability through open-ended survey response analysis. *PloS One*, *20*(4), e0320570-. https://doi.org/10.1371/journal.pone.0320570

Korn, L., Gonen, E., Shaked, Y., & Golan, M. (2013). Health perceptions, self and body image, physical activity and nutrition among undergraduate students in Israel. *PloS One*, *8*(3), e58543–e58543. https://doi.org/10.1371/journal.pone.0058543

Kowalski, K. C., McHugh, T.-L., Sabiston, C. M., & Ferguson, L. J. (2018). *Research methods in Kinesiology*. Oxford University Press.

Kwak, Y. S., Han, K., Lee, J., & Kim, J. (2023). Physical exercise-intervention can be valuable therapy for COVID-19 confinement and post-COVID-19 periods. *Physical Activity and Nutrition*, *27*(3), 17–19. https://doi.org/10.20463/pan.2023.0024

Kwan, M. Y. W., Faulkner, G. E. J., Arbour-Nicitopoulos, K. P., & Cairney, J. (2013). Prevalence of health-risk behaviours among Canadian post-secondary students: descriptive results from the National College Health Assessment. *BMC Public Health*, *13*(1), 548–548. https://doi.org/10.1186/1471-2458-13-548

Kwasnicka, D., Dombrowski, S. U., White, M., & Sniehotta, F. (2016). Theoretical explanations for maintenance of behaviour change: a systematic review of behaviour theories. *Health Psychology Review*, *10*(3), 277–296. https://doi.org/10.1080/17437199.2016.1151372

Lachin, J. M. (2017). Fallacies of last observation carried forward. *Clinical Trials*, *13*(2), 161-, 168. https://doi.org/10.1177/1740774515602688

Lacombe, J., Armstrong, M. E. G., Wright, F. L., & Foster, C. (2019). The impact of physical activity and an additional behavioural risk factor on cardiovascular disease, cancer and

all-cause mortality: A systematic review. *BMC Public Health*, *19*(1), 900–900. https://doi.org/10.1186/s12889-019-7030-8

Langhammer, B., Bergland, A., & Rydwik, E. (2018). The importance of physical activity exercise among older people. *BioMed Research International*, *2018*, 7856823–3. https://doi.org/10.1155/2018/7856823

Larson, R. B. (2018). Controlling social desirability bias. *International Journal of Market Research*, *61*(5), 534-547. https://doi.org/10.1177/1470785318805305

Lavelle, M. A., Knopp, M., Gunther, C. W., & Hopkins, L. C. (2023). Youth and peer mentor-led interventions to improve biometric, nutrition, physical activity, and psychosocial-related outcomes in children and adolescents: A systematic review. *Nutrients*, *15*(12), 2658-. http://dx.doi.org.ezproxy.lakeheadu.ca/10.3390/nu15122658

Lee, S.-M., Li, S., Newland, A., Leedeman, J., Clifford, D. E., & Keeler, L. A. (2020). A peer-led non-diet behaviour change intervention: FitU. *Health Education Journal*, *80*(1), 67–80. https://doi.org/10.1177/0017896920954470

Leenstra, T., Keeler, L., Arthur-Cameselle, J., & Russell, K. (2019). The peer mentor experience In a physical activity intervention for mental health. *Mentoring & Tutoring*, *27*(1), 68–87. https://doi.org/10.1080/13611267.2019.1583410

Legey, S., Aquino, F., Lamego, M. K., Paes, F., Nardi, A. E., Neto, G. M., Mura, G., Sancassiani, F., Rocha, N., Murillo-Rodriguez, E., & Machado, S. (2017). Relationship among physical activity level, mood and anxiety states and quality of life in physical education students. *Clinical Practice and Epidemiology in Mental Health*, *13*(1), 82–91. https://doi.org/10.2174/1745017901713010082

Lepping, K. M., Bailey, C. P., Mavredes, M. N., Faro, J. M., & Napolitano, M. A. (2021).

Physical activity, stress, and physically active stress management behaviors among university students with overweight/obesity. *American Journal of Lifestyle Medicine*, *17*(4), 601–606. https://doi.org/10.1177/15598276211020688

Ler, H. Y., Wee, E. H., & Ling, S. K. (2017). Differences in psychosocial determinants by gender and physical activity index among undergraduates. *Rev de Psicol del Deporte*. *226*, 127–131. https://www.redalyc.org/pdf/2351/235152047023.pdf

Leslie, E., Owen, N., Salmon, J., Bauman, A., Sallis, J. F., & Lo, S. K. (1999). Insufficiently active Australian college students: Perceived personal, social, and environmental influences. *Preventive Medicine*, *28*(1), 20–27. https://doi.org/10.1006/pmed.1998.0375

Lesser, I. A., & Nienhuis, C. P. (2020). The impact of COVID-19 on physical activity behavior and well-being of Canadians. *International Journal of Environmental Research and Public Health*, *17*(11), 3899-. https://doi.org/10.3390/ijerph17113899

Leung, K. K., Sick, K., Huellemann, K. L., & Pila, E. (2023). Body image flexibility and exercise motivation: A two-sample replication study. *Body Image*, *46*, 212–222. https://doi.org/10.1016/j.bodyim.2023.06.006

Lev-Arey, D., Gutman, T., & Levental, O. (2024). Empowering movement: Enhancing young adults' physical activity through self-determination theory and acceptance and commitment therapy-based intervention. *Behavioral Sciences, 14*(2), 130-. https://doi.org/10.3390/bs14020130

Li, N., Zhao, S., Liu, C., Dai, K., & Huang, W. (2023). Exploring the relationship between perceived social support and college students' autonomous fitness behavior: Chain mediating effect test. *Frontiers in Psychology, 13,* 1036383–1036383. https://doi.org/10.3389/fpsyg.2022.1036383

Liao, C., Nong, L., Wu, Y., Wu, Y., & Ye., J. (2023). The relationship between university students' physical activity needs, involvement, flow experience and sustainable well-being in the post-pandemic era. *Sustainability, 15*(11), 8719. https://doi.org/10.3390/su15118719

Lin, G., Murase, J. E., Murrell, D. F., Godoy, L. D. C., & Grant-Kels, J. M. (2021). The impact of gender in mentor-mentee success: Results from the Women's Dermatologic Society Mentorship Survey. *International Journal of Women's Dermatology*, *7*(4), 398–402. https://doi.org/10.1016/j.ijwd.2021.04.010

Lin, Y., & Gao, W. (2023). The effects of physical exercise on anxiety symptoms of college students: A meta-analysis. *Frontiers in Psychology*, *14*, 1136900–1136900. https://doi.org/10.3389/fpsyg.2023.1136900

Líška, D., Rutkowski, S., Oplatková, L., Sýkora, J., Pupiš, M., Novák, J., Urbářová, E., Rutkowska, A., Busch, A., & Kobesova, A. (2024). Comparison of the level of physical activity after the COVID-19 pandemic in Poland, Slovakia and the Czech Republic. *BMC Sports Science, Medicine & Rehabilitation*, *16*(1), Article 47. https://doi.org/10.1186/s13102-024-00833-5

Lloyd, C. (2008). Recruiting for fitness: qualifications and the challenges of an employer-led system. *Journal of Education and Work*, *21*(3), 175–195. https://doi.org/10.1080/13639080802214019

Losch, S., Traut-Mattausch, E., Mühlberger, M. D., & Jonas, E. (2016). Comparing the effectiveness of individual coaching, self-coaching, and group training: How leadership makes the difference. *Frontiers in Psychology*, *7*, 629–629. https://doi.org/10.3389/fpsyg.2016.00629

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, *33*(3), 335–343. https://doi.org/10.1016/0005-7967(94)00075-U

Lubker, J. R., & Etzel, E. F. (2007). College adjustment experiences of first-year students: Disengaged athletes, nonathletes, and current varsity athletes. *Journal of Student Affairs Research and Practice*, *44*(3), 855–878. https://doi.org/10.2202/1949-6605.1831

Madtha, Lisha & Joseph, Jubee & Joy, Magi & Reji, Maneesha & S., Mariya & Sabu, Linta. (2022). Peer influence on lifestyle behaviors among undergraduate students of professional colleges. *Journal of Health and Allied Sciences* 13. https://doi.org/10.1055/s-0042-1757444

Mahindru, A., Patil, P., & Agrawal, V. (2023). Role of physical activity on mental health and well-being: A review. *Curēus (Palo Alto, CA)*, *15*(1), e33475–e33475. https://doi.org/10.7759/cureus.33475

Maillet, M. A., & Grouzet, F. M. E. (2023). Understanding changes in eating behavior during the transition to university from a self-determination theory perspective: A systematic review. *Journal of American College Health*, *71*(2), 422–439. https://doi.org/10.1080/07448481.2021.1891922

March-Amengual, J.-M., Cambra Badii, I., Casas-Baroy, J.-C., Altarriba, C., Comella Company, A., Pujol-Farriols, R., Baños, J.-E., Galbany-Estragués, P., & Comella Cayuela, A. (2022). Psychological distress, burnout, and academic performance in first year college students. *International Journal of Environmental Research and Public Health*, *19*(6), 3356-. https://doi.org/10.3390/ijerph19063356

Markland, D., & Tobin. (2004). A modification to the behavioural regulation in exercise questionnaire to include an assessment of amotivation. *Journal of Sport & Exercise Psychology*, *26*(2), 191–196. https://doi.org/10.1123/jsep.26.2.191

Marenus, M. W., Murray, A., Friedman, K., Sanowski, J., Ottensoser, H., Cahuas, A., Kumaravel, V., & Chen, W. (2021). Feasibility and effectiveness of the web-based WeActive and WeMindful Interventions on Physical Activity and Psychological Well-Being. *BioMed Research International*, *2021*, 8400241–11. https://doi.org/10.1155/2021/8400241

Martínez-Sánchez, S. M., Martínez-Sánchez, L. M., & Martínez-García, C. (2024). Gender differences in barriers to physical exercise among university students studying physical activity and sports sciences. *Health Education Journal*, *83*(2), 192–204. https://doi.org/10.1177/00178969231226383

Maselli, M., Ward, P. B., Gobbi, E., & Carraro, A. (2018). Promoting physical activity among university students: A systematic review of controlled trials. *American Journal of Health Promotion*, *32*(7), 1602–1612. https://doi.org/10.1177/0890117117753798

Mazereel, V., Vansteelandt, K., Menne-Lothmann, C., Decoster, J., Derom, C., Thiery, E., Rutten, B. P. F., Jacobs, N., van Os, J., Wichers, M., De Hert, M., Vancampfort, D., & van Winkel, R. (2021). The complex and dynamic interplay between self-esteem, belongingness and physical activity in daily life: An experience sampling study in adolescence and young adulthood. *Mental Health and Physical Activity*, *21*, 100413-. https://doi.org/10.1016/j.mhpa.2021.100413

McAvoy, C. R., Dahl, A. A., Hoon Lim, J., Bauer, P., & Brunner Huber, L. R. (2024). A collective agenda: A qualitative study on Exercise is Medicine® On Campus gold-level

institutions. *Preventive medicine reports*, *44*, 102785. https://doi.org/10.1016/j.pmedr.2024.102785

McArthur, L. H., & Raedeke, T. D. (2009). Race and sex differences in college student physical activity correlates. *American Journal of Health Behavior*, *33*(1), 80–90. https://doi.org/10.5993/ajhb.33.1.8

McCarthy, C., & Warne, J. P. (2022). Gender differences in physical activity status and knowledge of Irish University staff and students. *Sport Sciences for Health*, *18*(4), 1283–1291. https://doi.org/10.1007/s11332-022-00898-0

McCarthy, H., Potts, H. W. W., & Fisher, A. (2021). Physical activity behavior before, during, and after COVID-19 restrictions: Longitudinal smartphone-tracking study of adults in the United Kingdom. *Journal of Medical Internet Research*, *23*(2), e23701–e23701. https://doi.org/10.2196/2370

McCoy, E. (2017). Understanding the intention-to-treat principle in randomized controlled Trials. *The Western Journal of Emergency Medicine*, *18*(6), 1075–1078. https://doi.org/10.5811/westjem.2017.8.35985

McHale, F., Ng, K., Taylor, S., Bengoechea, E., Norton, C., O'Shea, D., & Woods, C. (2022). A systematic literature review of peer-led strategies for promoting physical activity levels of adolescents. *Health education & behavior: The Official Publication of the Society for Public Health Education*, *49*(1), 41–53. https://doi.org/10.1177/10901981211044988

McLaughlin, P., Holland, M., Dodgson, S., & Khair, K. (2021). Project GYM: A randomized feasibility study investigating effect on motivation of personal trainer-led exercise in young men with hemophilia. *Research and Practice in Thrombosis and Haemostasis*, *5*(8), e12613–e12613. https://doi.org/10.1002/rth2.12613

Michie, S., & Prestwich, A. (2010). Are interventions theory-based? Development of a theory coding scheme. *Health Psychology*, *29*(1), 1–8. https://doi.org/10.1037/a0016939

Miller, W. R., & Rollnick, S. (2023). *Motivational interviewing: Helping people change* and grow (4th ed.). The Guilford Press.

Milligan, H., Iribarren, S. J., Chirico, C., Telles, H., & Schnall, R. (2021). Insights from participant engagement with the tuberculosis treatment support tools intervention: Thematic analysis of interactive messages to guide refinement to better meet end user needs. *International Journal of Medical Informatics* (Shannon, Ireland), *149,* 104421–104421. https://doi.org/10.1016/j.ijmedinf.2021.104421

Milne, M.L., Rodgers, W. M., Hall, C. R., & Wilson, P. M. (2008). Starting up or starting over: The role of intentions to increase and maintain the behaviour of exercise initiates. *Journal of Sport & Exercise Psychology*, *30*(3), 285-301. https://doi.org/10.1123/jsep.30.3.285

Milton, K., Bauman, A. E., Faulkner, G., Hastings, G., Bellew, W., Williamson, C., & Kelly, P. (2020). Maximizing the impact of global and national physical activity guidelines: The critical role of communication strategies. *British Journal of Sports Medicine*, *54*(24), 1463–1467. https://doi.org/10.1136/bjsports-2020-102324

Morris, L. S., Grehl, M. M., Rutter, S. B., Mehta, M., & Westwater, M. L. (2022). On what motivates us: A detailed review of intrinsic v. extrinsic motivation. *Psychological Medicine*, 52(10), 1801–1816. https://doi.org/10.1017/S0033291722001611

Myers, J., Kaykha, A., George, S., Abella, J., Zaheer, N., Lear, S., Yamazaki, T., & Froelicher, V. (2004). Fitness versus physical activity patterns in predicting mortality in men. *The American Journal of Medicine*, *117*(12), 912–918. https://doi.org/10.1016/j.amjmed.2004.06.047

Naughton, F., Riaz, M., & Sutton, S. (2016). Response parameters for SMS text message assessments among pregnant and general smokers participating in SMS cessation trials. *Nicotine & Tobacco Research*, 18(5), 1210–1214. https://doi.org/10.1093/ntr/ntv266

Ng, R., Sutradhar, R., Yao, Z., Wodchis, W. P., & Rosella, L. C. (2020). Smoking, drinking, diet and physical activity—modifiable lifestyle risk factors and their associations with age to first chronic disease. *International Journal of Epidemiology*, *49*(1), 113–130. https://doi.org/10.1093/ije/dyz078

Othman, M. S., Mat Ludin, A. F., Chen, L. L., Hossain, H., Abdul Halim, I. I., Sameeha, M. J., & Tahir, A. R. M. (2022). Motivations, barriers and exercise preferences among female undergraduates: A need assessment analysis. *PloS One*, *17*(2), e0264158–e0264158. https://doi.org/10.1371/journal.pone.0264158

Ouyang, Y., Wang, K., Zhang, T., Peng, L., Song, G., & Luo, J. (2020). The influence of sports participation on body image, self-efficacy, and self-esteem in college students. *Frontiers in Psychology*, *10*, 3039–3039. https://doi.org/10.3389/fpsyg.2019.03039

Palombi, T., Lucidi, F., Chirico, A., Alessandri, G., Filosa, L., Tavolucci, S., Borghi, A. M., Fini, C., Cavicchiolo, E., Pistella, J., Baiocco, R., & Alivernini, F. (2023). Is the behavioral regulation in exercise questionnaire a valid measure in older people?. *Healthcare (Basel, Switzerland)*, *11*(20), 2707. https://doi.org/10.3390/healthcare11202707

Pannor Silver, M. P., Easty, L. K., Sewell, K. M., Georges, R., & Behman, A. (2019). Perspectives on exercise participation among Canadian university students. *Health Education Journal*, *78*(7), 851–865. https://doi.org/10.1177/0017896919850206

Paré, M. A., Muir, I. L., & Munroe-Chandler, K. J. (2023). Mental health and exercise:

university students' insight into the UWorkItOut UWin Program. *International Journalof Kinesiology in Higher Education*, *7*(2), 109–121. https://doi.org/10.1080/24711616.2022.2081826

ParticipACTION. (2022). *Moving towards a better normal; ParticipAction report card on physical activity for adults.* ParticipACTION. https://www.participaction.com/wp-content/uploads/2022/09/2021-ParticipACTION Report-Card-on-Physical-Activity-for-adults.pdf

Pearson, E. S. (2011). The "how-to" of health behaviour change brought to life: A theoretical analysis of the Co-Active coaching model and its underpinnings in self-determination theory. *Coaching: An International Journal of Theory, Research & Practice*, *4*(2), 89–103. https://doi.org/10.1080/17521882.2011.598461

Pearson, E. S., Irwin, J. D., Morrow, D., Battram, D. S., & Melling, C. W. J. (2013). The CHANGE Ppogram: Comparing an interactive vs. prescriptive approach to self-management among university students with obesity. *Canadian Journal of Diabetes*, *37*(1), 4–11. https://doi.org/10.1016/j.jcjd.2012.12.002

Peirson, L. (1993). *The development of a preventive peer mentoring program for students: Grounded theory at work*. Wilfrid Laurier University.

Pekmezi, D., Jennings, E., & Marcus, B. H. (2009). Evaluating and enhancing self-efficacy for physical activity. *ACSM's Health & Fitness Journal*, *13*(2), 16–21. https://doi.org/10.1249/FIT.0b013e3181996571

Pellerine, L. P., Bray, N. W., Fowles, J. R., Furlano, J. A., Morava, A., Nagpal, T. S., & O'Brien, M. W. (2022). The influence of motivators and barriers to exercise on attaining physical activity and sedentary time guidelines among Canadian undergraduate students.

International Journal of Environmental Research and Public Health, *19*(19), 12225-. https://doi.org/10.3390/ijerph191912225

Peng, B., Ng, J. Y. Y., & Ha, A. S. (2023). Barriers and facilitators to physical activity for young adult women: A systematic review and thematic synthesis of qualitative literature. *The International Journal of Behavioral Nutrition and Physical Activity*, *20*(1), 23–23. https://doi.org/10.1186/s12966-023-01411-7

Persaud, N., Woods, H., Workentin, A., Adekoya, I., Dunn, J. R., Hwang, S. W., Maguire, J., Pinto, A. D., O'Campo, P., Rourke, S. B., Werb, D., & MAP Task Force to Promote Health Equity during Pandemic Recovery (2021). Recommendations for equitable COVID-19 pandemic recovery in Canada. *Canadian Medical Association Journal*, *193*(49), E1878–E1888. https://doi.org/10.1503/cmaj.210904

Petrella, A. R., Hughes, L., Fern, L. A., Monaghan, L., Hannon, B., Waters, A., & Taylor, R. M. (2021). Healthcare staff well-being and use of support services during COVID-19: a UK perspective. *General Psychiatry*, *34*(3), e100458–e100458. https://doi.org/10.1136/gpsych-2020-100458

Peters, N. A., Schlaff, R. A., Knous, J. L., & Baruth, M. (2019). Barriers to resistance training among college-aged women. *Journal of American College Health*, *67*(1), 4–9. https://doi.org/10.1080/07448481.2018.1462815

Petosa, R. L., & Smith, L. H. (2014). Peer mentoring for health behavior change: A systematic review. *American Journal of Health Education*, *45*(6), 351–357. https://doi.org/10.1080/19325037.2014.945670

Pointon-Haas, J., Waqar, L., Upsher, R., Foster, J., Byrom, N., & Oates, J. (2023). A systematic review of peer support interventions for student mental health and well-being in higher

education. *BJPsych open, 10*(1), e12. https://doi.org/10.1192/bjo.2023.603

Purc-Stephenson, R. J., Zimmerman, T. M. J., & Edwards, R. (2022). Motivation to train during a pandemic: The role of fitness resources, mental health, and motivational profiles among student-athletes in team sports. *Frontiers in Sports and Active Living*, *4*, 954086–954086. https://doi.org/10.3389/fspor.2022.954086

Reyes-Molina, D., Zapata-Lamana, R., Nazar, G., Cigarroa, I., Ruiz, J. R., Parrado, E., Losilla, J. M., & Celis-Morales, C. (2025). Conceptual and evidence update on incidental physical activity: A scoping review of experimental and observational studies. *Scandinavian Journal of Medicine & Science in Sports*, *35*(1), e70015. https://doi.org/10.1111/sms.70015

Rimmer, J. H., Riley, B., Wang, E., & Rauworth, A. (2004). Development and validation of AIMFREE: Accessibility instruments measuring fitness and recreation environments. *Disability and Rehabilitation*, *26*(18), 1087–1095. https://doi.org/10.1080/09638280410001711432

Riseth, L., Ivar Lund Nilsen, T., Mittet, Ø., & Steinsbekk, A. (2021). The effect of initial support on fitness center use in new fitness center members. A randomized controlled trial. *Preventive Medicine Reports*, *24*, 101605. https://doi.org/10.1016/j.pmedr.2021.101605

Rodgers, W. M., Hall, C. R., Duncan, L. R., Pearson, E., & Milne, M. I. (2010). Becoming a regular exerciser: Examining change in behavioural regulations among exercise initiates. *Psychology of Sport and Exercise*, *11*(5), 378–386. https://doi.org/10.1016/j.psychsport.2010.04.007

Rodríguez-Romo, G., Acebes-Sánchez, J., García-Merino, S., Garrido-Muñoz, M., Blanco-García, C., & Diez-Vega, I. (2022). Physical activity and mental health in

undergraduate students. *International Journal of Environmental Research and Public Health*, *20*(1), 195-. https://doi.org/10.3390/ijerph20010195

Rollo, S., Lang, J. J., Roberts, K. C., Bang, F., Carson, V., Chaput, J.-P., Colley, R. C., Janssen, I., & Tremblay, M. S. (2022). Health associations with meeting the Canadian 24-hour movement guidelines for adults: Results from the Canadian Health Measures Survey. *Health Reports*, *33*(1), 16–26. https://doi.org/10.25318/82-003-x202200100002-eng

Romero-Blanco, C., Rodriguez-Almagro, J., Onieva-Zafra, M. D., Parra-Fernandez, M. L., Prado-Laguna, M. del C., & Hernandez-Martinez, A. (2020). Physical activity and sedentary lifestyle in university students: Changes during confinement due to the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, *17*(18), 6567-. https://doi.org/10.3390/ijerph17186567

Rosenman, R., Tennekoon, V., & Hill, L. G. (2011). Measuring bias in self-reported data. *International Journal of Behavioural & Healthcare Research*, *2*(4), 320–332. https://doi.org/10.1504/IJBHR.2011.043414

Ross, C. (2022). Fitness v fatness? Bodies, boundaries and bias in the gym. *Qualitative Research in Sport, Exercise and Health, 15*(1), 104–122. https://doi.org/10.1080/2159676X.2022.2098808

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, *25*(1), 54–67. https://doi.org/10.1006/ceps.1999.1020

Sabo, A., Kueh, Y. C., Musa, R. M., Lu, F. J. H., & Kuan, G. (2022). Factorial validity and measurement invariance of the psychological need satisfaction in exercise scale across

gender. *PLoS ONE*, *17*(6), e0269155. http://dx.doi.org.ezproxy.lakeheadu.ca/10.1371/journal.pone.0269155

Saha, C., & Jones, M. P. (2009). Bias in the last observation carried forward method under informative dropout. *Journal of Statistical Planning and Inference*, *139*(2), 246–255. https://doi.org/10.1016/j.jspi.2008.04.017

Salvatore, J., & Marecek, J. (2010). Gender in the gym: Evaluation concerns as barriers to women's weight lifting. *Sex Roles*, *63*(7–8), 556–567. https://doi.org/10.1007/s11199-010-9800-8

Schaefer, D. R., Van Woerden, I., Hruschka, D., & Bruening, M. (2021). Finding and keeping friends in college and their influence on alcohol use: A network analysis. *Journal of Studies on Alcohol and Drugs*, *82*(1), 121–131. https://doi.org/10.15288/jsad.2021.82.121

Schmidt, M. (2012). Predictors of self-rated health and lifestyle behaviours in Swedish university students. *Global Journal of Health Science*, *4*(4), 1–14. https://doi.org/10.5539/gjhs.v4n4p1

Seo, Y.-J., & Ha, Y. (2019). Gender differences in predictors of physical activity among Korean college students based on the health promotion model. *Asian/Pacific Island Nursing Journal*, *4*(1), 1–10. https://doi.org/10.31372/20190401.1000

Shang, Y., Xie, H.-D., & Yang, S.-Y. (2021). The relationship between physical exercise and subjective well-being in college students: The mediating effect of body image and self-esteem. *Frontiers in Psychology*, *12*, 658935–658935. https://doi.org/10.3389/fpsyg.2021.658935

Sheill, G., Hennessy, M., Neill, L. O., Reynolds, S., Towns, J., Gill, M., & Guinan, E. (2022). Exercise and chronic health conditions in the community: A qualitative Study of Patients

and Fitness instructors. *Health & Social Care in the Community*, *30*(3), 1025–1034. https://doi.org/10.1111/hsc.13288

Shi, H. (2024). The effect of social support on home isolation anxiety and depression among college students in the post-pandemic era: the mediating effect of perceived loss of control and the moderating role of family socioeconomic status. *Frontiers in Public Health*, *12*, 1288848–1288848. https://doi.org/10.3389/fpubh.2024.1288848

Shifman, R., Moss, K., D'Andrade, G., Eichel, J., & Forrester, S. (2012). A comparison of constraints to participation in intramural sports between international and noninternational students. *Recreational Sports Journal*, *36*(1), 2–12. https://doi.org/10.1123/rsj.36.1.2

Shimoni, N., Nippita, S., & Castaño, P. M. (2020). Best practices for collecting repeated measures data using text messages. *BMC Medical Research Methodology*, 20(1), Article 2. https://doi.org/10.1186/s12874-019-0891-9

Shu, Y., Lin, W., Yang, J., Huang, P., Li, B., & Zhang, X. (2022). How social support predicts anxiety among university students during COVID-19 control phase: Mediating roles of self-esteem and resilience. *Analyses of Social Issues and Public Policy*, *22*(2), 490–505. https://doi.org/10.1111/asap.12314

Sjøgaard, G., Christensen, J. R., Justesen, J. B., Murray, M., Dalager, T., Fredslund, G. H., & Søgaard, K. (2016). Exercise is more than medicine: The working age population's well-being and productivity. *Journal of Sport and Health Science*, *5*(2), 159–165. https://doi.org/10.1016/j.jshs.2016.04.004

Skinner, G., Teychenne, M., & Murphy, J. (2024). Barriers and facilitators to engaging in a university-based exercise programme delivered to students experiencing mental health

difficulties: A pilot study. *Cogent Mental Health*, *3*(1), 1–29. https://doi.org/10.1080/28324765.2024.2380500

Smith, L. H., & Petosa, R. L. (2016). A structured peer-mentoring method for physical activity behavior change among adolescents. *The Journal of School Nursing: The Official Publication of the National Association of School Nurses*, *32*(5), 315–323. https://doi.org/10.1177/1059840516644955

Smith, E. (2024). The association between student-mentor relationships and college student's' motivation and academic success. *CSB/SJU Distinguished Thesis*. 32. https://digitalcommons.csbsju.edu/ur_thesis/32

Sprung, J. M., & Rogers, A. (2021). Work-life balance as a predictor of college student anxiety and depression. *Journal of American College Health: J of ACH*, *69*(7), 775–782. https://doi.org/10.1080/07448481.2019.1706540

Stoewen, D. L. (2017). Dimensions of wellness: Change your habits, change your life. *Canadian Veterinary Journal*, *58*(8), 861–862. https://pmc-ncbi-nlm-nih-gov.ezproxy.lakeheadu.ca/articles/PMC5508938/

Strohacker, K., Galarraga, O., & Williams, D. M. (2015). The impact of incentives on exercise behavior: A systematic review of randomized controlled trials. *Annals of behavioral medicine : A publication of the Society of Behavioral Medicine*, 48(1), 92–99. https://doi.org/10.1007/s12160-013-9577-4

Su, Y., Li, H., Jiang, S., Li, Y., Li, Y., & Zhang, G. (2024). The relationship between nighttime exercise and problematic smartphone use before sleep and associated health issues: A cross-sectional study. *BMC Public Health*, *24*(1), Article 590. https://doi.org/10.1186/s12889-024-18100-0

Sylvester, B. D., Standage, M., McEwan, D., Wolf, S. A., Lubans, D. R., Eather, N., Kaulius, M., Ruissen, G. R., Crocker, P. R. E., Zumbo, B. D., & Beauchamp, M. R. (2016). Variety support and exercise adherence behavior: Experimental and mediating effects. *Journal of Behavioral Medicine*, *39*(2), 214–224. https://doi.org/10.1007/s10865-015-9688-4

Tai, X. Y., Chen, C., Manohar, S., & Husain, M. (2022). Impact of sleep duration on executive function and brain structure. *Communications Biology*, *5*(1), 201–201. https://doi.org/10.1186/s12889-024-18100-0

Teixeira, P. J., Carraça, E. V., Markland, D., Silva, M. N., & Ryan, R. M. (2012). Exercise, physical activity, and self-determination theory: A systematic review. *The International Journal of Behavioral Nutrition and Physical Activity*, *9*, 78. https://doi.org/10.1186/1479-5868-9-78

Telama R. (2009). Tracking of physical activity from childhood to adulthood: A review. *Obesity facts*, *2*(3), 187–195. https://doi.org/10.1159/000222244

Tesch, F. E. (1977). Debriefing research participants: Though this be method there is madness to it. *Journal of Personality and Social Psychology, 35*(4), 217-224. https://doi.org/10.1037/0022-3514.35.4.217

Teuber, M., Leyhr, D., & Sudeck, G. (2024). Physical activity improves stress load, recovery, and academic performance-related parameters among university students: A longitudinal study on daily level. *BMC Public Health*, *24*(1), Article 598. https://doi.org/10.1186/s12889-024-18082-z

Terzi, E., Isik, U., Inan, B. C., Akyildiz, C., & Ustun, U. D. (2024). University students' free time management and quality of life: the mediating role of leisure satisfaction. *BMC Psychology*, *12*(1), Article 239. https://doi.org/10.1186/s40359-024-01745-2

Thabane, L., Ma, J., Chu, R., Cheng, J., Ismaila, A., Rios, L. P., Robson, R., Thabane, M., Giangregorio, L., & Goldsmith, C. H. (2010). A tutorial on pilot studies: The what, why and how. *BMC Medical Research Methodology*, *10*(1). https://doi.org/10.1186/1471-2288-10-1

Thomas, A. M., Beaudry, K. M., Gammage, K. L., Klentrou, P., & Josse, A. R. (2019). Physical activity, sport participation, and perceived barriers to engagement in first-year Canadian university students. *Journal of Physical Activity and Health*, 16, 437-446. https://doi.org/10.1123/jpah.2018-0198

Thompson, M., Pawson, C., & Evans, B. (2021). Navigating entry into higher education: The transition to independent learning and living. *Journal of Further and Higher Education*, *45*(10), 1398–1410. https://doi.org/10.1080/0309877X.2021.1933400

Towne, J., Ory, M. G., Smith, M. L., Peres, S. C., Pickens, A. W., Mehta, R. K., & Benden, M. (2017). Accessing physical activity among young adults attending a university: The role of sex, race/ethnicity, technology use, and sleep. *BMC Public Health*, *17*(1), 721–721. https://doi.org/10.1186/s12889-017-4757-y

Turnock, L. A. (2021). "There"s a difference between tolerance and acceptance': Exploring women's experiences of barriers to access in UK gyms. *Wellbeing, Space and Society*, *2*, 100049–. https://doi.org/10.1016/j.wss.2021.100049

Uetova, E., Hederman, L., O'Sullivan, D., Ross, R., & Oppezzo, M. (2024). Chatting for Change: Insights into and directions for using online peer support groups to interrupt prolonged workplace sitting. Proceedings of the 17th International Conference on Health Informatics – HEALTHINF, 166–174. *SciTePress.* https://doi.org/10.5220/0012423400003657

Van der Ploeg, H. P., Merom, D., Chau, J. Y., Bittman, M., Trost, S. G., & Bauman, A. E. (2010). Advances in population surveillance for physical activity and sedentary behavior: Reliability and validity of time use surveys. *American Journal of Epidemiology*, *172*(10), 1199–1206. https://doi.org/10.1093/aje/kwq265

Van Luchene, P., & Delens, C. (2021). The influence of social support specific to physical activity on physical activity among college and university students: A systematic review. *Journal of Physical Activity and Health*, *18*(6), 737-747. https://doi.org/10.1123/jpah.2020-0713

Van Rijen, D., & ten Hoor, G. A. (2023). A qualitative analysis of facilitators and barriers to physical activity among patients with moderate mental disorders. *Journal of Public Health*, *31*(9), 1401–1416. https://doi.org/10.1007/s10389-022-01720-4.

Vasudevan, A., & Ford, E. (2022). Motivational factors and barriers towards initiating and maintaining strength training in women: A systematic review and meta synthesis. *Prevention Science*, *23*(4), 674–695. https://doi.org/10.1007/s11121-021-01328-2

Vicary, E., Kapadia, D., Bee, P., Bennion, M., & Brooks, H. (2024). The impact of social support on university students living with mental illness: A systematic review and narrative synthesis. *Journal of Mental Health (Abingdon, England), 1*–13. https://doi.org/10.1080/09638237.2024.2408237

Vlachopoulos, S. P., Kapralou, A., & Bebetsos, E. (2024). Capturing exercise psychological need satisfaction among older adults: The BPNES. *Activities, Adaptation, & Aging*, 48(4), 723–749. https://doi.org/10.1080/01924788.2024.2317012

Vučković, V., Krejač, K., & Kajtna, T. (2022). Exercise motives of college students after the

COVID-19 lockdown. *International Journal of Environmental Research and Public Health*, *19*(12), 6977–. https://doi.org/10.3390/ijerph19126977

Wanjau, M. N., Dalugoda, Y., Oberai, M., Möller, H., Standen, C., Haigh, F., Milat, A., Lucas, P., & Veerman, J. L. (2023). Does active transport displace other physical activity? A systematic review of the evidence. *Journal of Transport & Health*, *31*, 101631-. https://doi.org/10.1016/j.jth.2023.101631

Wanwan, Z., & Khairani, A. Z. (2025). The influence of perceived autonomy support on physical activity among high school students: The mediating roles of basic psychological needs. *Behavioral sciences (Basel, Switzerland)*, 15(4), 536. https://doi.org/10.3390/bs15040536

Wilson, O. W. A., Colinear, C., Guthrie, D., & Bopp, M. (2022). Gender differences in college student physical activity, and campus recreational facility use, and comfort. *Journal of American College Health*, *70*(5), 1315–1320. https://doi.org/10.1080/07448481.2020.1804388

Wilson, P., Rodgers, W., Loitz, C., & Sclme, G. (2006a). "It's who I am...really!" The importance of integrated regulation in exercise contexts'. *Journal of Applied Biobehavioral Research*, *11*(2), 79–104. https://doi.org/10.1111/j.1751-9861.2006.tb00021.x

Wilson, P. M., Rogers, W. T., Rodgers, W. M., & Wild, T. C. (2006b). The psychological need satisfaction in exercise scale. *Journal of Sport & Exercise Psychology*, *28*(3), 231–251. https://doi.org/10.1123/jsep.28.3.231

Wood, L., & Danylchuk, K. (2015). The impact of constraints and negotiation strategies on involvement in intramural sport. *Managing Sport and Leisure*, *20*(3), 157–173.

https://doi.org/10.1080/23750472.2015.1010279

World Health Organization. (2022, October 5). *Physical Activity.* https://www.who.int/news-room/fact-sheets/detail/physical-activity

World Health Organization. (n.d.-a). *Coronavirus disease (covid-19) pandemic*. https://www.who.int/europe/emergencies/situations/covid-19

World Health Organization. (n.d.-b). *The true death toll of COVID-19: Estimating global excess mortality*. https://www.who.int/data/stories/the-true-death-toll-of-covid-19-estimating-global-excess-mortality

Worsley, J. D., Harrison, P., & Corcoran, R. (2021). Bridging the gap: Exploring the unique transition from home, school or college into university. *Frontiers in Public Health*, *9*, 634285–634285. https://doi.org/10.3389/fpubh.2021.634285

Wu, D. J., Thiem, K. C., & Dasgupta, N. (2022). Female peer mentors early in college have lasting positive impacts on female engineering students that persist beyond graduation. *Nature Communications*, *13*(1), 6837–6837. https://doi.org/10.1038/s41467-022-34508-x

Yan, Z., Peacock, J., Cohen, J. F. W., Kurdziel, L., Benes, S., Oh, S., & Bowling, A. (2023). An 8-week peer health coaching intervention among college students: A pilot randomized study. *Nutrients*, *15*(5), 1284. https://doi.org/10.3390/nu15051284

Yang Y. J. (2019). An overview of current physical activity recommendations in primary care. *Korean Journal of Family Medicine*, *40*(3), 135–142. https://doi.org/10.4082/kjfm.19.0038

Yangdon, K., Sherab, K., Choezom, P., Passang, S., & Deki, S. (2021). Well-Being and academic workload: Perceptions of science and technology students. *Educational Research and Reviews*, *16*(11), 418-427. https://doi.org/10.5897/ERR2021.4197

Yasunaga, A., Kawano, Y., Kamahori, Y., & Noguchi, K. (2014). Individual and environmental factors related to stage of change in exercise behavior: a cross-sectional study of female Japanese undergraduate students. *Journal of Physical Activity & Health*, *11*(1), 62–67. https://doi.org/10.1123/jpah.2011-0210

Zarowski, B., Giokaris, D., & Green, O. (2024). Effects of the COVID-19 Pandemic on university students' mental health: A literature review. *Curēus (Palo Alto, CA)*, *16*(2), e54032–e54032. https://doi.org/10.7759/cureus.54032

Zhang, Y., Hasibagen, & Zhang, C. (2022). The influence of social support on the physical exercise behavior of college students: The mediating role of self-efficacy. *Frontiers in Psychology*, *13*, 1037518–1037518. https://doi.org/10.3389/fpsyg.2022.1037518

Zhao, S., Zhang, Y., Yu, C., Zhang, H., Xie, M., Chen, P., & Lin, D. (2023). Trajectories of Perceived stress among students in transition to college: Mindset antecedents and adjustment outcomes. *Journal of Youth and Adolescence*, *52*(9), 1873–1886. https://doi.org/10.1007/s10964-023-01788-5

Zhang, R., Liu, F., Wang, X., & Wang, S. (2024). Towards active health: A study on the relationship between physical activity and body image among college students. *Heliyon*, *10*(19), Article e38465. https://doi.org/10.1016/j.heliyon.2024.e38465

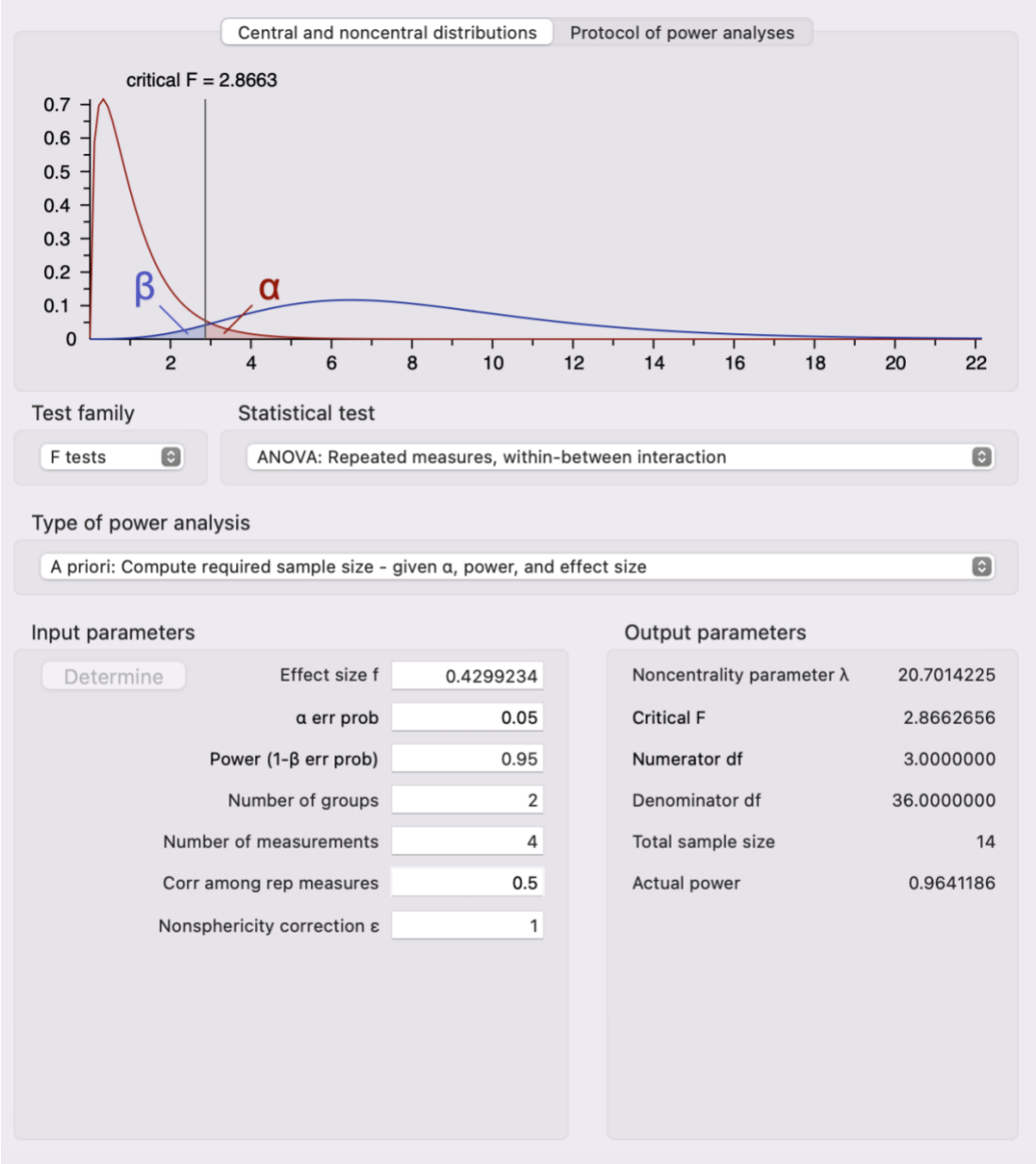
Appendix A

CONSORT Guidelines

Section/topic	No	CONSORT 2025 checklist item description	Reported on page no.
Title and abstract			
Title and structured abstract	1a	Identification as a randomised trial	1
	1b	Structured summary of the trial design, methods, results, and conclusions	4-5
Open science			
Trial registration	2	Name of trial registry, identifying number (with URL) and date of registration	51
Protocol and statistical analysis plan	3	Where the trial protocol and statistical analysis plan can be accessed	49-68
Data sharing	4	Where and how the individual de-identified participant data (including data dictionary), statistical code and any other materials can be accessed	56-57
Funding and conflicts of interest	5a	Sources of funding and other support (eg, supply of drugs), and role of funders in the design, conduct, analysis and reporting of the trial	2
	5b	Financial and other conflicts of interest of the manuscript authors	N/A
Introduction			16-49
Background and rationale	6	Scientific background and rationale	
Objectives	7	Specific objectives related to benefits and harms	N/A
Methods			
Patient and public involvement	8	Details of patient or public involvement in the design, conduct and reporting of the trial	53-55
Trial design	9	Description of trial design including type of trial (eg, parallel group, crossover), allocation ratio, and framework (eg, superiority, equivalence, non-inferiority, exploratory)	49-51
Changes to trial protocol	10	Important changes to the trial after it commenced including any outcomes or analyses that were not prespecified, with reason	N/A
Trial setting	11	Settings (eg, community, hospital) and locations (eg, countries, sites) where the trial was conducted	50
Eligibility criteria	12a	Eligibility criteria for participants	51-52
	12b	If applicable, eligibility criteria for sites and for individuals delivering the interventions (eg, surgeons, physiotherapists)	N/A
Intervention and comparator	13	Intervention and comparator with sufficient details to allow replication. If relevant, where additional materials describing the intervention and comparator (eg, intervention manual) can be accessed	57-60
Outcomes	14	Prespecified primary and secondary outcomes, including the specific measurement variable (eg, systolic blood pressure), analysis metric (eg, change from baseline, final value, time to event), method of aggregation (eg, median, proportion), and time point for each outcome	61-65
Harms	15	How harms were defined and assessed (eg, systematically, non-systematically)	N/A
Sample size	16a	How sample size was determined, including all assumptions supporting the sample size calculation	52
	16b	Explanation of any interim analyses and stopping guidelines	N/A
Randomisation:			57-58
Sequence generation	17a	Who generated the random allocation sequence and the method used	
	17b	Type of randomisation and details of any restriction (eg, stratification, blocking and block size)	
Allocation concealment mechanism	**18**	**Mechanism used to implement the random allocation sequence (eg, central computer/telephone; sequentially numbered, opaque, sealed containers), describing any steps to conceal the sequence until interventions were assigned**	**Reported on page no. 58-59**
Implementation	19	Whether the personnel who enrolled and those who assigned participants to the interventions had access to the random allocation sequence	58-59
Blinding	20a	Who was blinded after assignment to interventions (eg, participants, care providers, outcome assessors, data analysts)	58-59
	20b	If blinded, how blinding was achieved and description of the similarity of interventions	58=59
Statistical methods	21a	Statistical methods used to compare groups for primary and secondary outcomes, including harms	66-67
	21b	Definition of who is included in each analysis (eg, all randomised participants), and in which group	68-71
	21c	How missing data were handled in the analysis	69-70
	21d	Methods for any additional analyses (eg, subgroup and sensitivity analyses), distinguishing prespecified from post hoc	66-67
Results			
Participant flow, including flow diagram	22a	For each group, the numbers of participants who were randomly assigned, received intended intervention, and were analysed for the primary outcome	68-71
	22b	For each group, losses and exclusions after randomisation, together with reasons	68-71
Recruitment	23a	Dates defining the periods of recruitment and follow-up for outcomes of benefits and harms	N/A
	23b	If relevant, why the trial ended or was stopped	N/A
Intervention and comparator delivery	24a	Intervention and comparator as they were actually administered (eg, where appropriate, who delivered the intervention/comparator, how participants adhered, whether they were delivered as intended (fidelity))	N/A
	24b	Concomitant care received during the trial for each group	N/A
Baseline data	25	A table showing baseline demographic and clinical characteristics for each group	68-73
Numbers analysed, outcomes and estimation	26	For each primary and secondary outcome, by group: • the number of participants included in the analysis • the number of participants with available data at the outcome time point • result for each group, and the estimated effect size and its precision (such as 95% confidence interval) • for binary outcomes, presentation of both absolute and relative effect size	
Harms	27	All harms or unintended events in each group	N/A
Ancillary analyses	28	Any other analyses performed, including subgroup and sensitivity analyses, distinguishing pre-specified from post hoc	N/A
Discussion			
Interpretation	29	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	114-138
Limitations	30	Trial limitations, addressing sources of potential bias, imprecision, generalisability, and, if relevant, multiplicity of analyses	139-142

Appendix B

Sample Size Calculation



Appendix C

Ethical Approval

Thunder Bay Regional Health Sciences Centre | Thunder Bay Regional Health Research Institute

Research Ethics & Authorization Office
Room 2167 – Level 2
980 Oliver Road
Thunder Bay, ON P7B 6V4
(807) 684-6422
TBRHSC.REO@tbh.net

January 23, 2025

Dr. Erin Pearson
Lakehead University

File No: 100315
Project Title: The SHINE (Supporting Her In Navigating Exercise) Program: A Pilot Study Examining Peer Support as an Exercise Promotion Tool Among Undergraduate Women Initiates
Approval Date: January 23, 2025
Expiry Date: January 23, 2026

Dear Dr. Erin Pearson,

Thank you for your submission to the Thunder Bay Regional Health Sciences Centre Research Ethics Board (TBRHSC REB). The above noted application has been reviewed and approved through the delegated review process for the TBRHSC REB. This REB approval is granted until the expiry date noted above. The delegated approval for this study will be reported to the full REB at their next meeting. TBRHSC REB approval is granted based on the following documentation:

- SHINE Study Protocol with appendices A-Q dated 22-Jan-2025
- SHINE ICF dated 03-Jan-2025

Continuing ethics review is the responsibility of the Principal Investigator. During the course of this research, all requests for modifications, re-approvals, and serious adverse event reports are submitted via the Research Portal. To continue your proposed research beyond the expiry date, you must submit an Annual Re-approval Form within 30 days of expiry. Upon completion of the project, you are required to submit a Research Completion Report.

The ROMEO Research Portal is available at: https://tbrhsc-tbrhri.researchservicesoffice.com/Romeo.Researcher.Admin

Sincerely,

Dr. Bill J. Gregorash
Chair, TBRHSC REB

Thunder Bay Regional Health Sciences Centre | Thunder Bay Regional Health Research Institute

Research Ethics & Authorization Office
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980 Oliver Road
Thunder Bay, ON P7B 6V4
(807) 684-6422
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The TBRHSC Research Ethics Board operates in compliance with and is constituted in accordance with the requirements of:

- TCPS 2 - 2022 Tri-Council Policy Statement: Ethical conduct for Research Involving Humans,
- ICH Good Clinical Practice: Consolidated Guideline (ICH E6)
- Part C division 5 of the *Food and Drug Regulations* of Health Canada
- The provisions of the Personal Health Information Protection Act, 2004 and its applicable regulations
- TBRHSC REB is registered with the US department of Health and Human services under IRB registration #00004396

Appendix D

Recruitment Posters

Figure D1

Participant Recruitment Poster

Figure D2

Mentor Recruitment Poster

Appendix E

Eligibility Questionnaire

Table E1

Participant Screening Form

Thank you for expressing interest in the SHINE Program! The SHINE program aims to explore the use of an exercise program designed for women by women. Participants will be asked to engage in exercise three times per week for 30 minutes at the campus gym for six weeks. Please complete this form to determine your eligibility.
Section 1 of 13
Full Name: _____ Do you identify as a woman? ☐ Yes ☐ No
Section 2 of 13 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.
Are you a full-time undergraduate student at Lakehead University? ☐ Yes ☐ No
Section 3 of 13 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.
Do you engage in one or fewer bouts of planned exercise sessions per week in the gym? ☐ Yes ☐ No

Section 4 of 13 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.
Do you want to become more physically active? ☐ Yes ☐ No
Section 5 of 13 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.
In the past 6 months, have you experienced any of the following? ☐ A diagnosis of or treatment for heart disease or stroke ☐ High blood pressure (≥160/90 mmHg) or treatment for hypertension ☐ Chest pain during daily activities or physical activity ☐ Dizziness or lightheadedness during physical activity ☐ Shortness of breath at rest ☐ Loss of consciousness or fainting ☐ Concussion ☐ None of the above
Section 6 of 13 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.

Do you currently have pain or swelling (e.g., injury, arthritis, back pain) that affects your ability to be physically active? ☐ Yes ☐ No
Section 7 of 13 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.
Has a healthcare provider advised you to avoid or modify certain types of physical activity? ☐ Yes ☐ No
Section 8 of 13 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.
Do you have any other medical or physical conditions (e.g., diabetes, cancer, osteoporosis, asthma, spinal cord injury) that affect your ability to be physically active? ☐ Yes ☐ No
Section 9 of 13 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.
Can you commute to Lakehead University's Thunder Bay campus? ☐ Yes ☐ No
Section 10 of 13 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.

Do you have access to online technology (e.g., phone, computer, Wi-Fi)? ☐ Yes ☐ No
Section 11 of 13 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.
Are you fluent in English? ☐ Yes ☐ No
Section 12 of 13 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.
Are you comfortable using social media platforms (e.g., Strava, GroupMe, Gmail)? ☐ Yes ☐ No
Section 13 of 13
Please select your preferred orientation session time: (sample times provided) ☐ SHINE Orientation – Feb 12, 2025, 5:45 PM ☐ SHINE Orientation – Feb 13, 2025, 8:15 AM ☐ SHINE Orientation – Feb 13, 2025, 1:00 PM ☐ SHINE Orientation – Feb 14, 2025, 6:30 AM ☐ SHINE Orientation – Feb 14, 2025, 10:00 AM ☐ Other: _____

Table E2

Mentor Screening Form

Thank you for expressing interest in the SHINE Program. Please complete this form to determine your eligibility. **If considered ineligible, you will be prompted to submit the form.**
Section 1 of 7
1. Full Name: _____
Section 2 of 7 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.
2. Do you identify as a woman? ☐ Yes ☐ No 3. Are you 18 years of age or older? ☐ Yes ☐ No 4. Are you a senior (3rd year or higher) undergraduate or graduate student at Lakehead University? ☐ Yes ☐ No
Section 3 of 7 Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.

5. Are you currently enrolled in or have you graduated from a health-based or exercise-based discipline?

   ☐ Yes ☐ No

6. Do you engage in regular exercise/physical activity?

   ☐ Yes ☐ No

Section 4 of 7

Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.

6. Are you willing to attend a two-hour workshop on January 17th from 1:00 PM – 3:00 PM?

   ☐ Yes ☐ No

7. Are you willing to engage in one-on-one exercise with a maximum of three participants once a week at the campus gym?

   ☐ Yes ☐ No

Section 5 of 7

Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.

8. Have you experienced any of the following in the past six months?
    - A. Heart disease or stroke, or related chest pain
    - B. High blood pressure (≥160/90 mmHg)
    - C. Dizziness/lightheadedness during physical activity
    - D. Shortness of breath at rest
    - E. Fainting/loss of consciousness
    - F. Concussion

    ☐ Yes ☐ No

9. Do you have any other medical or physical conditions (e.g., diabetes, cancer, osteoporosis, asthma, spinal cord injury) that may affect your ability to be physically active?

    ☐ Yes ☐ No

10. Do you currently have pain or swelling (e.g., injury, arthritis, back pain) affecting physical activity?

    ☐ Yes ☐ No

11. Has a health care provider advised you to avoid or modify specific physical activity?

    ☐ Yes ☐ No

Section 6 of 7

Please answer the following questions; if deemed ineligible, you will be prompted to submit the form.

12. Can you commute to Lakehead University's Thunder Bay campus?

    ☐ Yes ☐ No

13. Do you have access to online technology?

    ☐ Yes ☐ No

14. Are you fluent in English?

    ☐ Yes ☐ No

Section 7 of 7

Please select a time you are available to meet and answer a few questions and discuss your study involvement. New timeframes are available every 6 hours, with Thursday Jan 16th, being the last day for recruitment

15. What is your preferred meeting location for a pre-program session?

    ☐ In-person ☐ Zoom

16. Pre-program individual meeting (choose one): (sample times provided)

    ☐ Pre-program meeting, 10:15 AM, Dec 16, 2024

    ☐ Pre-program meeting, 11:15 AM, Dec 16, 2024

    ☐ Pre-program meeting, 12:15 PM, Dec 16, 2024

    ☐ Pre-program meeting, 1:15 PM, Dec 16, 2024

17. Questions or alternative time preferences: _____

Appendix F

Standardized Ineligibility Email

Subject: Thank You for Your Interest in the SHINE Program

Dear [Participant's Name],

Thank you for your interest in participating in our study. We truly appreciate the time and effort you took to apply and share your information with us.

After careful review, we regret to inform you that you do not meet the eligibility criteria for this study.

We understand this news may be disappointing, and we hope you know how much we value your willingness to contribute to our research efforts.

Thank you again for your interest, and best of luck this school year!

Warm regards,

The SHINE Team,
Mmfabian@lakeheadu.ca (Madeline Fabiano, Student Researcher)

Erin.pearson@lakeheadu.ca (Dr. Erin Pearson, Principal Investigator)

SHINEProgramLU@gmail.com (Research Team).

Appendix G

Pre-Program Mentor Interview

1. What program are you currently enrolled in?
    a. What year are you in?
    b. Within this program, can you describe your experience with formal exercise training, if any?
    c. Can you describe any additional exercise training you have experienced?
2. Can you tell me about your personal history with exercise engagement?
3. Can you share your experiences with competitive athletics, if any?
    a. What was the highest level you competed at?
4. What do your current exercise habits look like in a typical week?
5. What were some of the most challenging obstacles to engagement you have faced?
    a. How have you overcome barriers to exercise engagement?
6. What attracted you to engage in the study?
7. What do you believe you can offer participants who are new to exercising in this study?

Appendix H

Letter of Information

Figure H1

Mentor Letter of Information

School of Kinesiology
t: (807)343-8544
f: (807)343-8544

Version date: April 1st, 2025

I. Research Participant Information and Consent Form

The SHINE (Supporting Her In Navigating Exercise) Program: A Pilot Study Examining Peer Support as an Exercise Promotion Tool Among Undergraduate Women Initiates

Principal Investigator:	Dr. Erin Pearson Lakehead University 807-343-8010 ext. 8481
Co-Investigators:	Dr. Aislin Musquash, Lakehead University Dr. John Gotwals, Lakehead University
Research Team:	Madeline Fabiano, Lakehead University
Funding provided by:	Faculty Student Grant

Dear SHINE Program Mentor,

You are being invited to take part in a post-program one-on-one interview with the student researcher for the research study titled: **The SHINE (Supporting Her In Navigating Exercise) Program: A Pilot Study Examining Peer Support as an Exercise Promotion Tool Among Undergraduate Women Initiates.**

It is important for you to know that taking part in this interview is completely voluntary. You may refuse to take part or stop taking part at any time. Your decision will not affect your standing as a student or employee at Lakehead University in any way. Before you decide whether or not you would like to take part, please read this letter carefully to understand what is involved. After you have read the letter, please feel free to ask any questions you may have.

This information and consent form has been reviewed and approved by the Thunder Bay Regional Health Sciences Centre Research Ethics Board.

What is the purpose of this study?
As you're aware, the purpose of the SHINE program is to better understand how an exercise program with and without peer mentorship may enhance exercise motivation and engagement over the course of a 6-week program for undergraduate women at Lakehead University. The purpose of this particular study portion is to better understand your own experiences as a mentor. For example, what did you enjoy or find challenging about participating? What recommendations do you have for future programs like this?

Who can participate in this study?
Mentors will be deemed eligible to participate if they; 1) had at least one participant complete the program, and; 2) are available to meet virtually or on campus for an estimated 30-45-minute one-on-one interview with the student researcher. Those who do not meet the criteria will be considered ineligible.

This study aims to recruit 6 mentors to participate in the interviews, which are set to occur in early May 2025.

What will participation involve from me?
After meeting the inclusion criteria, participants will be asked to meet at a mutually agreed upon time at Lakehead University's C.J. Sanders Fieldhouse or via Zoom with the student researcher. During this meeting,

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Version date: April 1st, 2025

you will receive an overview of interview procedures, have an opportunity to ask questions, and then provide voluntary consent. Those who provide consent will then engage in a one-on-one semi-structured interview exploring program experiences. This process is expected to take an estimated 45-60 minutes in total.

How long will I be involved in the study?
The interview is expected to take an estimated 30-45 minutes following the end of the 6-week exercise program.

What are the alternatives to taking part?
If you choose not to participate, you will continue to maintain the same affiliation you previously held at Lakehead University. Your decision to take part in this study will in no way affect your standing with Lakehead University.

Are there any benefits to being in this study?
Those who participate may experience a heightened awareness regarding their own health behaviours and the potential impact they had on the exercise habits of their participants. This may have translated into enhanced exercise engagement and confidence in the gym setting for both mentors and their participants.

In terms of societal benefits, mentors' experiences in this study may help us understand how exercise participation can be enhanced via peer-mentorship programs. This information may be used to inform individuals who work with this group at other Canadian university campus wellness and athletic centers.

Are there any potential harms involved with participating?
Participants will not be faced with any direct physical harm by participating in this study. However, by engaging in this study, they may experience indirect harm.

Psychological risks- While not anticipated, it is possible that mentors may experience discomfort when sharing information about their movement behaviours in the program and their experiences working with participants. To support mentors, a list of mental health resources is provided at the end of this letter. Mentors will be informed and continually reminded that they can refuse to answer questions and withdraw from the study at any time.

Privacy risks- Any access to identifiable information has the potential risk to your privacy. Every effort will be made to ensure your confidentiality is always protected. All audio recordings and interview transcripts will be stored on a password-protected device, and any identifying information will be removed.

Confidentiality:
Your privacy is very important to us. All information derived from this study will be kept strictly confidential (private).

The interview will take place in a private room at Lakehead University's C.J. Sanders Fieldhouse or via Zoom, involvement will not be shared by anyone in the research team.

To protect your identity, a random identification number will be assigned to your interview, which will be used on all research-related forms. The link between your personal information and identification number will be only available to qualified members of the research team and will not leave Lakehead University. The

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Thunder Bay Regional Health Sciences Centre Research Ethics Board may require access to study records to monitor the conduct of the research. No identifiable information will be copied or taken.

Throughout the study, all information will be stored on the student researcher's password-protected computer. Following the study, all information will be securely locked and stored at Lakehead University in the principal investigator's office for a minimum of seven years following this program.

Participation & Withdrawal:
It is important for you to know that participation is entirely **voluntary.** You may refuse to participate, refuse to answer questions or choose to withdraw from the study at any time. You do not waive any legal rights by signing this consent form.

Withdrawing from this study will not result in any penalty or compromise your standing with Lakehead University. If you wish to withdraw from the study, please contact Dr. Erin Pearson (erin.pearson@lakeheadu.ca).

Mentors can withdraw from the study at any point and can have their information retracted up until the data collection phase of the study is over.

Costs:
To thank mentors for their engagement, they will receive cash compensation following the interview ($18).

Conflicts of Interest:
There are no conflicts of interest to declare.

Commercialization:
There is no direct potential for commercialization in this study.

Copy of Information Letter and Consent Form:
You will be given a copy of this signed consent form to keep.

Questions:
If you have any questions about this study, you are encouraged to contact Dr. Erin Pearson (erin.pearson@lakeheadu.ca).

Psychological Resources for Participants
Student Health & Wellness (Lakehead University)- 807-343-8361
- Provides health services to students including medical and counselling services

Thunder Bay Crisis Response- 807-346-8282
- Confidential 24/7 mental health hotline for Northwestern Ontario Region

Immediate Help
- Emergency Response Personnel; Call 911
- Suicide and Crisis Lifeline: Call 1-800-273-8255

If you have any concerns regarding your rights as a research participant or wish to speak to someone other than a research team member about this project, you are welcome to contact:

Chair, Research Ethics Board, Thunder Bay Regional Health Sciences Centre

School of Kinesiology
t: (807)343-8544
f: (807)343-8544

Version date: April 1st, 2025

Phone: 807-684-6422
Email: TBRHSC.ResearchEthicsChair@tbh.net

Dr. Erin Pearson, Principal Investigator
Associate Professor, School of Kinesiology, Lakehead University
Email: erin.pearson@lakeheadu.ca

Madeline Fabiano, Student Researcher
Master of Science Candidate, School of Kinesiology, Lakehead University
Email: mmfabian@lakeheadu.ca

Figure H2

Participant Letter of Information

School of Kinesiology
t: (807)343-8544
f: (807)343-8544

Version date: Jan 3rd, 2025

I. Research Participant Information and Consent Form

The SHINE (Supporting Her In Navigating Exercise) Program: A Pilot Study Examining Peer Support as an Exercise Promotion Tool Among Undergraduate Women Initiates

Principal Investigator:	Dr. Erin Pearson Lakehead University 807-343-8010 ext. 8481
Co-Investigators:	Dr. Aislin Musquash, Lakehead University Dr. John Gotwals, Lakehead University
Research Team:	Madeline Fabiano, Lakehead University
Funding provided by:	Faculty Student Grant

Dear Potential Participant:

You are being invited to take part in a research study titled: **The SHINE (Supporting Her In Navigating Exercise) Program: A Pilot Study Examining Peer Support as an Exercise Promotion Tool Among Undergraduate Women Initiates.**

It is important for you to know that taking part in this study is voluntary. You may refuse to take part or stop taking part at any time. Your decision will not affect your standing as a student or employee at Lakehead University in any way. Before you decide whether or not you would like to take part, please read this letter carefully to understand what is involved. After you have read the letter, please feel free to ask any questions you may have.

This information and consent form has been reviewed and approved by the Thunder Bay Regional Health Sciences Centre Research Ethics Board.

What is the purpose of this study?

The purpose of this research is to better understand how an exercise program may enhance exercise motivation and engagement over the course of a 6-week program for undergraduate women at Lakehead University. This research will also help determine if peer mentorship is helpful for university students seeking to improve their exercise habits.

Who can participate in this study?

Participants will be deemed eligible to participate in the study if they; 1) identify as women; 2) are full-time undergraduate students at Lakehead University; 3) are 17 years of age or older; 4) report one or fewer bouts of exercise per week; 5) report an absence of health risks that would interfere with exercise engagement as determined by the Get Active Questionnaire; 6) can commute to Lakehead's campus; 7) want to become more active; 8) have access to online technology; 9) can speak, read, and write in English fluently; and 10) feel comfortable using social media platforms (ex. Strava, GroupMe, Gmail).

Our goal is to invite 24 study participants. The study is intended to run from January to May 2025.

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f: (807)343-8544

Version date: Jan 3rd, 2025

What will participation involve from me?

After meeting the inclusion criteria, participants will be asked to meet at a mutually agreed upon time at Lakehead University's C.J. Sanders Fieldhouse with the student researcher. During this meeting, you will receive an overview of program procedures, have an opportunity to ask questions, and then provide voluntary consent. Those who provide consent will then virtually complete four surveys regarding exercise behaviour, mental health, well-being, and personal characteristics (e.g., sex, height, program of study etc.). Once completed they will receive a tour of Lakehead's fitness facilities and a demonstration of how to use the equipment. This process is expected to take an estimated 60-90 minutes.

Participants will be encouraged to engage in exercise at least three times a week for 30 minutes at the on-campus gym for 6-weeks. Before exercising, participants will be asked to sign in at the front desk and track engagement via Strava, a virtual exercise-tracking platform.

You will then be randomly placed in one of two groups:

1) **6-week exercise intervention**
   Participants will receive an exercise guide to assist them in structuring workouts and completing data collection methods at baseline, week 3 (about 15 minutes), and week 6 (about 25 minutes), aside from ongoing tracking methods (see next section for more details). Participants will be asked to engage in exercise 3 times a week for 30 minutes each time using the Lakehead facility for 6 weeks.

2) **6-week exercise intervention with support**
   Similar to group 1, participants will receive an exercise guide to assist them in structuring workouts and completing data collection methods at baseline, week 3 (about 15 minutes), and week 6 (about 25 minutes), aside from ongoing tracking methods (see next section for more details). In addition, participants will be paired with a study staff peer mentor, who will support them in their exercise journey. The mentor will attend one exercise session per week and provide virtual support through an online texting platform in between sessions. Participants will be invited to join a GroupMe or Gmail chat, an online communication platform, to foster communication with their mentor, which will be monitored by the student researcher.

Group assignments will involve the use of an online randomizer to generate an assignment order, which will be prepared by the student researcher. This means that individuals will be randomly assigned to one of two groups. The student researcher will then create 24 numbered opaque envelopes containing the randomization order. After the baseline assessment is completed, the student researcher will open an envelope to reveal the corresponding group for each participant (e.g., for the first participant, the student researcher will open the envelope titled 'one').

To maintain the integrity of the study, we kindly request that all participants keep their group assignments confidential and not share them with anyone outside of the research team.

How long will I be involved in the study?

Participants will be encouraged to engage in exercise three times a week for at least 30 minutes each week for 6-weeks.

Participants will complete a baseline assessment estimated to take 60-90 minutes, about 15 minutes of data collection at the end of week 3, and about 25 minutes of data collection at the end of week 6. Participants will engage in ongoing data collection methods throughout the study by uploading workouts to Strava and

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signing in at the front desk, estimated to take 10 minutes each week. Participants with peer-mentors will spend an estimated 40 minutes virtually communicating with their mentor each week.

What are the alternatives to taking part?

If you choose not to participate, you will continue to maintain the same affiliation you previously held at Lakehead University. Your decision to take part in this study will in no way affect your standing with Lakehead University.

Are there any benefits to being in this study?

Those who participate may experience a heightened awareness of their health behaviours, which could translate into enhanced exercise engagement and confidence in the gym setting. The benefits of engaging in regular exercise are abundant and include a reduced risk of developing chronic diseases, alleviating symptoms of depression and anxiety, and improving weight management.

In terms of societal benefits, participant experiences in this study may help us understand how exercise participation can be enhanced. This information may be used to inform individuals who work with this group at other Canadian university campus wellness and athletic centers.

Are there any potential harms involved with participating?

Participants will not be faced with any direct physical harm by participating in this study. However, by engaging in this study, they may experience indirect harm.

Psychological risks- Participants may experience discomfort when sharing personal information about health and movement behaviours. To support participants, a list of mental health resources is provided at the end of this letter. Participants will be informed and continually reminded that they can refuse to answer questions and withdraw from the study at any time.

Physical risks- When engaging in exercise, participants may experience discomfort or injuries. However, physical risks will be lowered as compared to engaging outside of the study due to the use of a personal facility tour, equiptment demonstration, and an exercise handout to support proper engagement (e.g., common terms, sample workout guide).

Agreeing to participate in the study means the participant is accepting the risks inherent with engaging in exercise. In the event a participant is injured during the research process, they will not be compensated beyond the scope of the study.

Privacy risks- Any access to identifiable information has the potential risk to your privacy. Every effort will be made to ensure your confidentiality is always protected. You will not be identified by members in non-research settings. Participants may be recognized by other program participants while engaging in the study with their shared mentor, hindering complete privacy.

Confidentiality:

Your privacy is very important to us. All information derived from this study will be kept strictly confidential (private).

The baseline personal meeting will take place in a private room at Lakehead University's C.J. Sanders Fieldhouse, involvement will not be shared by anyone in the research team.

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f: (807)343-8544

Version date: Jan 3rd, 2025

To protect your identity, all participants will generate an identification number at the start of the study, which will be used on all research-related forms. All data (questionnaires, surveys, scales, exercise tracking) will only contain this identification number. The link between your personal information and identification number will be only available to qualified members of the research team and will not leave Lakehead University. The Thunder Bay Regional Health Sciences Centre Research Ethics Board may require access to study records to monitor the conduct of the research. No identifiable information will be copied or taken.

Personal health information is information that could be used to identify you. It includes information such as your name, age, sex, email address, program and year of study. Exercise engagement will be tracked through a private Strava account, where your identification number will serve as your username. Participants will friend the SHINE program account, run by the student researcher to enable easy exercise tracking and monitoring. Facility usage information will be monitored through Lakehead University's Fusion platform, where Lakehead Athletics will send the researchers logs of participants' engagement parameters (dates and times they signed in at the gym) throughout the study. The GroupMe or Gmail conversations between participants and their peer mentors will be monitored by the student researcher, as they will have access to these messages during and after the study.

Throughout the study, all information will be stored on the student researcher's password-protected computer. Following the study, all information will be securely locked and stored at Lakehead University in the principal investigator's office for a minimum of seven years following this program. All personal health information will be kept confidential.

The survey tools used (SurveyMonkey and Google Forms) are hosted on a U.S.-based server. Under the U.S. Patriot Act, law enforcement may access personal records without your knowledge for antiterrorism purposes. As a result, we cannot fully guarantee the confidentiality of your data. By consenting to participate, you acknowledge this.

Participation & Withdrawal:
It is important for you to know that participation is entirely **voluntary.** You may refuse to participate, refuse to answer questions or choose to withdraw from the study at any time. You do not waive any legal rights by signing this consent form.

Withdrawing from this study will not result in any penalty or compromise your standing with Lakehead University. If you wish to withdraw from the study, please contact Dr. Erin Pearson (erin.pearson@lakeheadu.ca). Participants can withdraw from the study at any point and can have their information retracted up until the data collection phase of the study is over.

Costs:
To thank participants for their engagement, they will receive cash compensation following each data collection assessment timepoint ($20 baseline; $20 mid; $20 post). Participants enrolled in introductory psychology courses will have the option to receive bonus points (up to 6%) that can be added to their final grade for compensation in lieu of this monetary compensation.

Conflicts of Interest:
There are no conflicts of interest to declare.

Commercialization:
There is no direct potential for commercialization in this study.

School of Kinesiology
t: (807)343-8544
f: (807)343-8544

Version date: Jan 3rd, 2025

Copy of Information Letter and Consent Form:
You will be given a copy of this signed consent form to keep.

Questions:
If you have any questions about this study, you are encouraged to contact Dr. Erin Pearson (erin.pearson@lakeheadu.ca).

Psychological Resources for Participants
Student Health & Wellness (Lakehead University)- 807-343-8361
- Provides health services to students including medical and counselling services

Thunder Bay Crisis Response- 807-346-8282
- Confidential 24/7 mental health hotline for Northwestern Ontario Region

Immediate Help
- Emergency Response Personnel; Call 911
- Suicide and Crisis Lifeline: Call 1-800-273-8255

If you have any concerns regarding your rights as a research participant or wish to speak to someone other than a research team member about this project, you are welcome to contact:

Chair, Research Ethics Board, Thunder Bay Regional Health Sciences Centre
Phone: 807-684-6422
Email: TBRHSC.ResearchEthicsChair@tbh.net

Dr. Erin Pearson, Principal Investigator
Associate Professor, School of Kinesiology, Lakehead University
Email: erin.pearson@lakeheadu.ca

Madeline Fabiano, Student Researcher
Master of Science Candidate, School of Kinesiology, Lakehead University
Email: mmfabian@lakeheadu.ca

Appendix I

Consent Form

Figure I1

Mentor Consent Form

School of Kinesiology
t: (807)343-8544
f: (807)343-8544

Version date: April 1st, 2025

Research Participant Information and Consent Form

The SHINE (Supporting Her In Navigating Exercise) Program: A Pilot Study Examining Peer Support as an Exercise Promotion Tool Among Undergraduate Women Initiates

I_____(name) I have read the consent form and have had the details of the study explained to me. I understand the risks and benefits of the study. I also understand that I have certain rights as a participant. I recognize that as a volunteer, I may withdraw from the study at any time and refuse to answer any questions. I understand that I am free to withdraw and can have my data retracted at any time without any effect on my current or future standing with Lakehead University. I acknowledge that the findings recorded in this study will be securely stored on a password-protected device throughout the study and in the principal investigator's office for a minimum of seven years following this program. I have been informed that the results from this study will be made available to me via email once the study is completed if I choose to receive them. I understand that any personal information used will remain anonymous and will only be seen and used by the researchers conducting the study. I agree that my personal health and study information may be used as described in the cover letter. I am aware that by participating in a one-on-one semi-structured interview it will be audio-recorded to enable transcription at a later date. I understand that I am being asked to provide honest and accurate responses throughout the study to the best of my ability. I acknowledge that my anonymity will be preserved (e.g., we will not use identifying information) and I will be protected in any publications or public presentations of the research findings. I give permission for my anonymous data to be published and presented publicly. All of my questions have been answered satisfactorily. I understand that I am free now and, in the future, to ask any questions about the study. I agree to participate in this study. By consenting to participate, I have not waived any rights to legal recourse in the event of harm.

_____ _____ _____/_____/_____
Name of Research Participant *(print)* Signature of Research Participant Day Month Year

Signature of Person Obtaining Consent
I have explained the terms of this information and consent form to the research participant and I have answered the questions he/she asked me.

_____ _____ _____/_____/_____
Name of Person Obtaining Consent *(print)* Signature of Person Obtaining Consent Day Month Year

Results Summary Form
Upon completion of this study, please indicate if you would like a copy of the overall results
I do / do not (circle one) want a copy of the study's results emailed to me.

Figure I2

Participant Consent Form

School of Kinesiology
t: (807)343-8544
f: (807)343-8544

Version date: Jan 3rd, 2025

Research Participant Information and Consent Form

The SHINE (Supporting Her In Navigating Exercise) Program: A Pilot Study Examining Peer Support as an Exercise Promotion Tool Among Undergraduate Women Initiates

I_____(name) I have read the consent form and have had the details of the study explained to me. I understand the risks and benefits of the study and engaging in exercise. I also understand that I have certain rights as a participant in this study. I recognize that as a volunteer, I may withdraw from the study at any time and refuse to answer any questions. I understand that I am free to withdraw at any time without any effect on my current or future standing with Lakehead University. I understand that I can have my data retracted before the data collection period ends. I acknowledge that the findings recorded in this study will be securely stored on a password-protected device throughout the study and in the principal investigator's office for a minimum of seven years following this program. I have been informed that the results from this study will be made available to me via email once the study is completed if I choose to receive them. I understand that any personal information used will remain anonymous and will only be seen and used by the researchers conducting the study. I understand that the Assistant Director of Lakehead Athletics will be aware of my participation in this study, as they will provide researchers with the dates and times I signed in at Lakehead's on-campus gym. I agree that my personal health and study information may be used as described in the consent form. I understand that I will be required to provide honest and accurate responses throughout the study. I acknowledge that my anonymity will be preserved (e.g., we will not use identifying information) and I will be protected in any publications or public presentations of the research findings. I give my permission for my anonymous data to be published and presented publicly. All of my questions have been answered satisfactorily. I understand that I am free now and, in the future, to ask any questions about the study. I agree to participate in this study. By consenting to participate, I have not waived any rights to legal recourse in the event of harm.

_____ _____ _____/_____/_____
Name of Research Participant *(print)* Signature of Research Participant Day Month Year

Signature of Person Obtaining Consent
I have explained the terms of this information and consent form to the research participant and I have answered the questions he/she asked me.

_____ _____ _____/_____/_____
Name of Person Obtaining Consent *(print)* Signature of Person Obtaining Consent Day Month Year

Results Summary Form
Upon completion of this study, please indicate if you would like a copy of the overall results
I do / do not (circle one) want a copy of the study's results emailed to me.

Appendix J

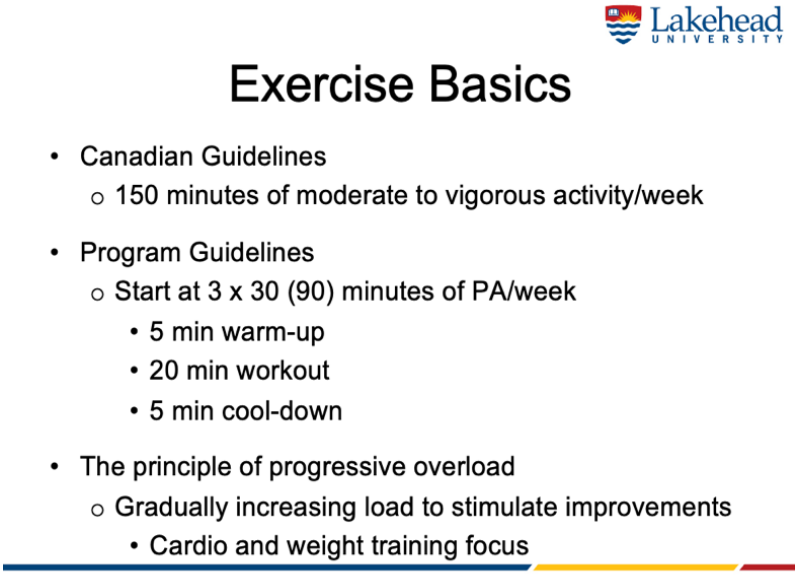
Mentor Workshop Slides

Figure J1

Sample Motivational Interviewing Slides

Figure J2

Sample Exercise Slides



Appendix K

Communication Resources

GroupMe Set-up Procedures

1. Click the link sent to you from the student researcher; this will prompt you to download the GroupMe app or use a web browser. It is recommended that you download the app to enable you to receive notifications from the app.
2. You will be presented with three different sign-in options; choose the sign-in option for your desired account.
3. Enter your first name and, if desired, a profile picture. Followed by an email and phone number.
4. You will then scan a QR code to be added to a group chat with your mentee or mentor.
5. For additional support, reach out to the student researcher or watch the following video https://www.youtube.com/watch?v=ejqlca67yOM

Communication Guidelines

When communicating with your mentor, it is important to remember that they may not always be able to provide immediate responses. As a reminder, it is important that all online communication takes place over GroupMe to maintain professional relationships.

If an issue arises (e.g., mentor/participant not responding to text messages or attending planned sessions), the student researcher will have access to the GroupMe group chats. To troubleshoot any complaints brought up by either party, the conversations may be monitored to ensure communication guidelines are being followed.

Appendix L

Mentor Predicted Weekly Availability

Please indicate when you can engage in exercise with your mentees.

MON	TUES	WED	THURS	FRI	SAT	SUN

How many participants would you like to have_____. How many at once___

Appendix M

Participant and Mentor Identification Code Scheme

To remain anonymous in the data collection process, please create an ID by following the outlined steps

1. Enter your two-digit birth month (ex. March, 0.3).
2. Enter the last two digits of your phone number (ex. 807-123-4567, 67).
3. Enter the first and last letters of your last name (ex. AB)

Sample ID: 0367AB

Appendix N

Strava Set-Up

Creating a New Account on Strava

1. Download the Strava App: Mobile: Go to the App Store (iOS) or Google Play Store (Android) and download the Strava app. Open Strava and launch the app
2. Create a New Account: Click on 'Sign Up,' choose to sign up with your email address, Google account, or Facebook account. You must create a new account for this program.
3. Enter Your Information: Fill in the required information (name, email, password). Accept the terms of service and privacy policy.
4. Complete Registration: Click 'Sign Up' or 'Create Account' to finalize your registration.

Friend the SHINE Program

1. Search for the SHINE Program: Mobile App: Tap on the 'Explore' tab (compass icon) at the bottom or website: Click on the 'Explore' option in the top menu.
2. Find Friends: Tap on 'Find Friends'. Search for SHINE Program: In the search bar, type 'SHINE Program'.
3. Send a Friend Request: Once you find the SHINE Program, click on their profile and select 'Follow' or 'Add Friend'.

*Please note the SHINE Program account will follow you, but will not accept your follow request to maintain participant confidentiality.

Tracking a Workout in Strava

1. Open Strava: Launch the Strava app on your smartphone and sign in to your account.
2. Start a Workout: Tap on the 'Record' button (usually a red circle) at the bottom center of the screen. Select the type of activity you want to track (running, cycling, walking, etc.).

3. Adjust Settings (Optional): Before starting, you can customize your settings: Privacy Controls: Choose who can see your activity. GPS Settings: Ensure your GPS is turned on for accurate tracking.
4. Begin Tracking: Tap the 'Start' button to begin recording your workout.
5. During the Workout: You can pause the workout at any time by tapping the 'Pause' button. Monitor your pace, distance, time, and other metrics on the screen.
6. Finish the Workout: When you're done, tap the 'Finish' button. You'll be prompted to save your activity, ensure you do so, track the perceived intensity and add any additional notes or details about the workout, then tap 'Save'.

Please complete this tracking log as thoroughly as possible. If you engage in multiple activities in a single day, please enter the information for each. See examples below of how to enter this into Strava.

Type of workout (elliptical, upper body, bike etc.): _____

Warm-up duration (min): _____

Warm-up exercise(s): _____

Space(s) used: _____ (e.g., Fieldhouse, Hangar, Wolf Den)

Workout duration (min): _____

Workout exercise(s): _____

Space(s) used: _____ (e.g., Fieldhouse, Hangar, Wolf Den)

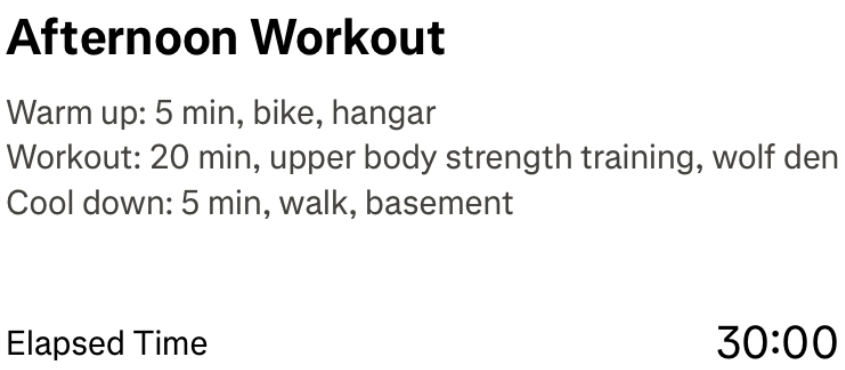
Cool-down duration (min): _____

Cool-down exercise(s): _____

Space(s) used: _____ (e.g., Fieldhouse, Hangar, Wolf Den)

Figure N1

Sample Strava Exercise Session



Uploading a Workout to Strava (if you have a watch)

1. Open Strava: Launch the Strava app and sign in to your account.
2. Go to Upload Activity: Tap the '+' icon at the bottom center of the app, then select 'Upload Activity'. Choose 'File' or 'Upload a File' option. Find the GPX or TCX file of your workout that you previously downloaded or created and select it.
3. Add Details: Fill in any details like activity type, and title, or description if needed, and click 'Save' or 'Upload' to complete the process.

Appendix O

Exercise Guide

Figure O1

Guide to a Quality Workout

Figure O2

Sample Warm-Up and Cool-Down Activity Resources

Note. Participants received a PDF containing active links to YouTube videos demonstrating how to perform each exercise.

Table O1

Sample Workout Guide

Day 1 (TUES)	Day 2 (THURS)	Day 3 (SAT)
	Week 1	
Upper Body Warm-up (5 min) • Shoulder rolls • Arm circles • Jumping jacks • Row machine (2 min) Workout (20 min) • Chest press 2x6 @ 80lbs • Triceps extensions 2x6 @ 30lbs • Lat pull down 3x6 @ 70lbs • Assisted dips 2x6 @-30lbs Cool down (5 min) • Overhead triceps • Cross body • Hand clasp • Seated twist • Pigeon Pose • Downward dog • Childs pose • Light walk (2 min)	Cardio Warm-up (5 min) • Hamstring sweeps • Toe touches • Jumping jacks • High knees • Light jog (2 min) Workout (20 min) • Elliptical @ level 5 Cool down (5 min) • Hand clasp • Calf extension • Overhead triceps • Cross body • Toe touch • Pigeon pose • Childs pose • Light walk (2 min)	Lower Body Warm-up (5 min) • Walking lunges • Hamstring sweeps • Toe touches • Skaters • Light bike (2 min) Workout (20 min) • Leg press 3x6 @ 100lbs • Kickbacks 2x6 @ 80lbs • Adductors 2x6 @ 90lbs • Abductors 2x6 @ 90lbs Cool down (5 min) • Calf extension • Cross body • Toe touch • Downward dog • Pigeon pose • Childs pose • Light walk (2 min)
	Week 2	
Cardio Warm-up (5 min) • Hamstring sweeps • Toe touches • Jumping jacks • High knees • Light jog (2 min) Workout (20 min) • Bike @ level 6 Cool down (8 min) • Hand clasp • Calf extension • Overhead triceps • Cross body • Toe touch • Pigeon pose • Childs pose • Light walk (5 min)	Full Body Warm-up (5 min) • Walking lunges • Arm circles • Hamstring sweeps • Toe touches • Arm swings • Skaters • Jumping jacks • High knees Workout (23 min) • Chest press 2x6 @ 85lbs • Leg press 3x8 @ 100lbs • Lat pull down 4x6 @ 70lbs • Kickbacks 2x8 @ 80lbs • Seated row 2x4 @ 50lbs	Cardio Warm up (5 min) • Hamstring sweeps • Toe touches • Jumping jacks • High knees • Light jog (2 min) Workout (20 min) • Run (10 min) • Stairmaster (10 min) Cool down (8 min) • Hand clasp • Calf extension • Overhead triceps • Cross body • Toe touch • Pigeon pose • Childs pose • Light walk (5min)

Cool down (5 mins)
- Overhead triceps
- Cross body
- Hand clasp
- Seated twist
- Pigeon Pose
- Downward dog
- Childs pose

Light walk (2 min)

Week 3

Upper Body	Cardio	Lower Body
Warm up (5 min) • Shoulder rolls • Arm circles • Jumping jacks • Row machine (2 min)	Warm up (5 min) • Hamstring sweeps • Toe touches • Jumping jacks • High knees • Light jog (2 min)	Warm up (5 min) • Walking lunges • Hamstring sweeps • Toe touches • Skaters • Light bike (2 min)
Workout (23 min) • Chest press 2x8 @ 80lbs • Triceps extensions 2x5 @ 40lbs • Lat pull down 2x8 @ 70lbs • Assisted dips 3x6 @ 30lbs • Seated row 2x4 @ 55lbs	Workout (25 min) • Elliptical @ level 4 (5 min) • Elliptical @ level 5 (15 min) • Elliptical @ level 6 (5 min)	Workout (20 min) • Leg press 3x9 @ 90bs • Kickbacks 2x8 @ 85lbs • Adductors 2x8 @ 90lbs • Abductors 2x8 @ 90lbs
Cool down (5 min) • Overhead triceps • Cross body • Hand clasp • Seated twist • Pigeon Pose • Downward dog • Childs pose • Light walk (2 min)	Cool down (10 min) • Hand clasp • Calf extension • Overhead triceps • Cross body • Toe touch • Pigeon pose • Childs pose • Light walk (5 min)	Cool down (5 min) • Calf extension • Cross body • Toe touch • Downward dog • Pigeon pose • Childs pose • Light walk (2 min)

Appendix P

Facility Tour

1. Starting Point: The tour will begin by walking from the booked room in the C.J. Sanders Fieldhouse. An email will be sent to participants to inform them of the meeting room upon the student researcher booking the room and remind them to bring their student card and gym clothes if possible.
2. Gym Check-In: Participants will be shown how to scan their student card at the front desk. Participants will be reminded that their gym membership is included in their student fees, but lockers require an additional purchase.
3. The Wolf Den: The tour will proceed to the newest fitness facility at the host institution. The two-level gym features weight training on the lower level and cardio equipment on the upper level. The cardio area offers a view of the new basketball court, where sports such as badminton and basketball are played during free-court time. Equipment for both sports can be checked out at the front desk.
    a. Cardio- Elliptical
        i. Step 1. Step on the machine, start moving your hands and/or legs
        ii. Step 2. Select the type of workout you would like to perform
        iii. Step 3. Enter your height and weight
        iv. Step 4. Select the duration and level(s) of choice
        v. Step 5. In a cyclical motion, move your respective right and left limbs in opposition to each other continually. Maintain an upright posture with a slight bend in your elbows and knees. Repeat
        vi. Step 6. Clean machine, grab a paper towel and cleaning spray

b. Cardio- Stair Master
    i. Step 1. Step on machine, press ‘start’
    ii. Step 2. Select the type of workout you would like to perform
    iii. Step 3. Select the duration and level(s) of choice
    iv. Step 5. In a cyclical motion, continually walk upwards as if climbing stairs. Use the handrails for stability if needed but avoid relying on them excessively to ensure proper form. Repeat.
    v. Step 6. Clean machine, grab a paper towel and cleaning spray
c. Weight- Leg Extensions Machine
    i. Step 1. Adjust the seat and backrest so that your knees align with the machine’s pivot point. Position the leg pad just above your ankles, with your legs bent at a 90-degree angle.
    ii. Step 2. Select your desired handle and weight
    iii. Step 3. With your back against the backrest with your spine in a neutral position, hold the machine’s handles to stabilize your upper body. Slowly extend your legs, pushing the leg pad upwards by straightening your knees. Avoid locking your knees at the top to reduce joint strain. Repeat
    iv. Step 4. Clean machine, grab a paper towel and cleaning spray
d. Weights- Chest Press Machine
    i. Step 1. Adjust the seat so that the handles are at chest level when seated. Sit against the pad with your feet flat on the ground.
    ii. Step 2. Select your desired weight

iii. Step 3. Grip the handles with your palms facing forwards and elbows at a 90-degree angle. Push the handles forward until your arms are fully extended, keeping a slight bend in your elbows. Slowly return handles to the starting position to maintain control. Repeat

iv. Step 4. Clean machine, grab a paper towel and cleaning spray

4. Modo Yoga Studio: After leaving the foyer, participants will be informed about the Modo Yoga studio, which offers classes several times each week. These sessions require payment, but students receive discounted rates.
5. C.J. Sanders Fieldhouse Gyms: The tour will continue to the other two gyms within the fieldhouse. The gym on the left is dedicated to weight training, while the other focuses on cardio machines with a few barbells.
    a. Cardio- Stationary Bike
        i. Step 1. Sit on the machine and adjust the bottom of the seat to your desired height. When sitting, the leg should be at a 45-degree angle.
        ii. Step 2. Start pedaling and press ‘start
        iii. Step 3. Select the type of workout you would like to perform
        iv. Step 4. Select the duration and level(s) of choice
        v. Step 5. In a cyclical motion, continually pedal the bike, if uncomfortable adjust
        vi. Step 6. Clean machine, grab a paper towel and cleaning spray
    b. Cardio- Treadmill
        i. Step 1. Press the “start” button to turn the machine on
        ii. Step 2. Attach clip to shirt or pants/shorts for safety

iii. Step 3. Select the type of workout you would like to perform

iv. Step 4. Select the duration and level(s) of choice

v. Step 5. In a cyclical motion, continually pump opposing arms and legs

vi. Step 6. Clean machine, grab a paper towel and cleaning spray

c. Weight- Shoulder Fly Machine

i. Step 1. Adjust the seat so that your shoulders are level with the machine's arm pads/handles. Sit with your back firmly against the backrest, and your feet flat on the ground

ii. Step 2. Select your desired weight

iii. Step 3. Grip the handles with your elbows at a 90-degree angle. With slightly bent arms, push outwards and upwards by raising your elbows to the sides. Lift until your upper arms are parallel to the floor at shoulder height. Briefly hold the position, and then lower your arms back to the starting position. Repeat

iv. Step 4. Step 6. Clean the machine, grab a paper towel and cleaning spray

d. Weights- Leg Press Machine

i. Step 1. Adjust the seat angle to ensure you are sitting with your back comfortably while maintaining a full range of motion.

ii. Step 2. Select your desired weight

iii. Step 3. Place your feet on the footplate shoulder-width apart, with your toes slightly pointed out. The placement of your feet will impact the muscles being targeted (high= glutes and hamstrings, low= quadriceps). Sitting with your back against the backrest, grasp the handles to stabilize

yourself and bend your legs at a 90-degree angle at your knees, with your feet flat on the platform. Your knees should be in line with your toes.

iv. Step 4. By pressing through your heels, extend your legs to push the platform away from you. Extend your legs, but do not lock your knees. Lower the platform by bending your knees in a controlled manner. Repeat

v. Step 5. Clean machine, grab a paper towel and cleaning spray

6. Changerooms and Pool: The tour will proceed to the pool, informing participants that they will have access to the eight-lane swimming pool. The external and change room entrances/exits will be displayed. Walking through the change room to show them where they can access washrooms, showers, and saunas.
7. Basketball Court: After leaving the changerooms, the tour will head to one of the two basketball courts on campus. These courts can be booked for activities or used during free time.
8. The Hangar: The final stop on the tour is the Hangar, the most versatile workout area on campus. It includes a 200m track, a field, various machines, free weights, and an aerobics studio. This space is ideal for warming up and cooling down or participating in campus rec sports. Participants are reminded to run in the same direction as the other runners on the track, with the inner lane being reserved for running only, and outermost for walking.
    a. Cardio- Row machine
        i. Step 1. Place shoes in straps, and adjust until secure
        ii. Step 2. Turn the machine on, select a resistance on the right side of the machine
        iii. Step 3. Select the type of workout or game you would like to perform

iv. Step 4. With bent legs and sitting upright, grab the handle with fully extended arms. Pull the handle towards your body, keeping your elbows close to your body. Avoid leaning too far back or using momentum to keep your torso steady. Slowly extend your arms back to the starting position. Repeat.

v. Step 5. Clean machine, grab a paper towel and cleaning spray

b. Weights- Seated Row

i. Step 1. Select your desired handle and weight.

ii. Step 2. Sitting upright and straddling the bench, grab the handle with fully extended arms. Pull the handle towards your body, keeping your elbows close to your body. Avoid leaning too far back or using momentum to keep your torso steady. Slowly extend your arms back to the starting position. Repeat.

iii. Step 3. Clean machine, grab a paper towel and cleaning spray

c. Weights- Leg Adductor Machine

i. Step 1. Adjust the seat and backrest to ensure you are sitting comfortably with your back supported. Alter the range of motion by starting in a wide or narrow position.

ii. Step 2. Select your desired weight.

iii. Step 3. Sit down on the chair, grab the handles on each side of the seat and pull to move the feet rests closer together. Slowly release the handle, and your legs will become spread apart. Squeeze your inner thighs to bring the pads together, while keeping your feet flat on the pads. The movement

should be controlled. Slowly allow your legs to move back to the starting position by releasing tension. Repeat

iv. Step 4. Clean machine, grab a paper towel and cleaning spray

9. Equipment Use: Participants will receive a demonstration of how to use the weight and cardio machines in the Hangar. These machines include a leg abductor and adductors, leg press, leg extension, glue kickback, seated row, lat pull-downs, chest press, chest and shoulder fly's, assisted dip and pull-up, multipurpose cables, and ab crunch machine. They will watch and participate in the demonstration exercises to educate them on the proper form. The participant will then be encouraged to engage in a workout.

Appendix Q

Post-Orientation Standardized Emails

Figure Q1

Participant Educational Resources Email

Hi [Participant name],

Thank you for participating in my study.

As promised, attached below are the virtual resources to get you started!

In the meantime, don't forget to sign-in at the gym and record your workouts via Strava.

Be sure to include
-Location for each warm-up/workout/cooldown
-Activity(s) for each warm-up/workout/cooldown
-Duration for each warm-up/workout/cooldown
Ex. Warm-up: Bike in the Hangar (5min), Workout: upper body weights in the Wolfden (20min), Cool-down; Walk in the Hangar (5min)

I will reach out in 3ish weeks' time to send you the second set of surveys.

If you have any questions, feel free to reach out.

Best,
-Madeline

Figure Q2

Mentor Assignment Email

Hi [Mentor name],

You have been paired with [Intervention participant name] and have been added to a group chat with her.

She is aware that she has been asked to share her goals/program/year of study with you in 1-2 days. Feel free to reach out first to break the ice!

Her availability is as follows:
[Add availability]

If you have any questions, feel free to reach out.

Best,
-Madeline

Appendix R

Debriefing information

Thank you for engaging in the study entitled *The SHINE (Supporting Her In Navigating Exercise) Program: An Experimental Study Examining Peer Support as an Exercise Promotion Tool Among Undergraduate Women Initiates.* We sincerely appreciate your engagement in the SHINE Program. Your time and efforts were essential, and we are grateful for your contribution to this research.

The purpose of this study was to explore the impact of a 6-week exercise program on motivation and comfort in gym settings for undergraduate women at Lakehead University. Based on previous research in this area, it was estimated that engagement would be associated with increased exercise habits and motivation in the gym setting, especially amongst those paired with a peer mentor. We believe this would occur due to the use of a facility tour and exercise guide, along with in-person and virtual peer support from a peer mentor throughout the study.

By engaging in this study, it was predicted that participants would become more comfortable engaging in exercise at Lakehead University's fitness facilities. Participants learnt how to use exercise equipment and structure workouts throughout this study. We are pleased to share the insights students can gain from participating in our study.

1. The experience of being a research participant: By participating in our research study, you had the opportunity to experience the research process firsthand. This unique experience will help clarify the roles of research participants and the importance of participants in research studies.
2. Experience with survey research and laboratory studies: By participating in our research study, you were able to gain firsthand experience in data collection and analysis through surveys, scales, and questionnaires. Moreover, you observed how experiments are conducted and the significance of scientific research.

3. Knowledge about exercise engagement: By participating in our research study, you learned more about exercise engagement, specifically structuring workouts in a gym setting.

Additionally, we would like to provide you with some "Questions for Thought" regarding this study.

1. Why is it important to promote exercise engagement?
2. How might motivation influence exercise engagement?
3. Why is it important to establish exercise habits in university?

Here are some references if you would like to read more in this area

DeShaw, K. J., Lansing, J. E., Perez, M. L., Ellingson, L. D., & Welk, G. J. (2023). Effects of a peer health coaching program on college student lifestyle behaviors. *Journal of American College Health*, *ahead-of-print*(ahead-of-print), 1–8. https://doi.org/10.1080/07448481.2022.2155473

Kirby, J. B., Babkes Stellino, M., Lewis, C., Humphrey, K., Gordon, K., & Lindsay, K. G. (2022). You've got a friend in me: Fostering social connection among college students through peer-led physical activity. *Health Promotion Practice*, *23*(6), 907–911. https://doi.org/10.1177/15248399211072535

Deception has not been used in this study.

Mental Health Resources
Student Health & Wellness (Lakehead University) 807-343-8361
- Provides health services to students, including medical and counselling services

Thunder Bay Crisis Response- 807-346-8282
- Confidential 24/7 mental health hotline for Northwestern Ontario Region

Immediate Help
- Emergency Response Personnel; Call 911
- Suicide and Crisis Lifeline: Call 1-800-273-8255

Thank you again for participating in the SHINE Program. Your contribution has been essential to our research, and we hope you found the experience valuable and insightful. If you have any further questions, you are welcome to contact us.

Warm regards,
Dr. Erin Pearson, Principal Investigator
Associate Professor, School of Kinesiology, Lakehead University
Email: erin.pearson@lakeheadu.ca

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Appendix S

Data Collection Standardized Email

Dear [Participant Name],

I hope this message finds you well.

First off, I just wanted to congratulate you on consistently engaging in exercise for nearly [duration] full weeks!

This is a friendly reminder that the next data collection period for the SHINE Program is approaching. Your participation is vital to the success of our research and the future programming available at Lakehead University.

Details of the data collection period:
-Due Date: [Add date]
-Duration: [Add duration]
-Link: [Add link]

Please see the attached link to complete the survey; by doing so before [days], you will receive $20 or 2% bonus.

If you have any questions or need assistance, please feel free to reach out.

Thank you once again for your commitment and valuable contribution to the SHINE Program. Your participation is vital to the success of our research and the future programming available at Lakehead University.

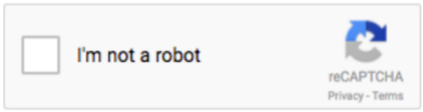
Warm regards,
Madeline Fabiano

Appendix T

Demographic Questionnaire

Table T1

Participant Baseline Data Collection

Question 1.
To remain anonymous in the data collection process, please create an identification code by following the outlined steps: 1. Enter your two-digit birth month 2. Enter the last two digits of your phone number 3. Enter the first and last letter of your last name Ex. Jane Doe was born in March, and her phone number is 807-123-4567. Her code is 03367JD. _____
Question 1.1.
Please verify that you are not a robot 
Section 1.
Please answer each question as it applies to you: Sex: _____ Age: _____ Birth country: _____ Undergraduate program: _____

Year of study: _____ Ethnicity (e.g., Italian, British): _____ Living status (e.g., with parents, on own): _____ Main mode of transportation (e.g., personal vehicle, bus): _____ Employment status (e.g., unemployed, part-time, full-time): _____
Section 2.
Please answer each question as it applies to you: Self-reported physical fitness? 1= Very low ◯ 2 ◯ 3 ◯ 4 ◯ 5= Average ◯ 6 ◯ 7 ◯ 8 ◯ 9 ◯ 10= Above Average ◯ Self-reported exercise knowledge in the gym 1= Very low ◯ 2 ◯ 3 ◯ 4 ◯ 5= Average ◯ 6 ◯ 7 ◯ 8 ◯ 9 ◯ 10= Above Average ◯
We thank you for your time spent taking this survey. Your response has been recorded. Please proceed to the next survey link

Table T2

Participant Baseline Data Collection

To be completed by the student researcher:
Height (cm): _____ Weight (lbs):_____

Appendix U

Qualtrics Data Collection and Generation Measures

Table U1

Qualtrics Identification Code Collection

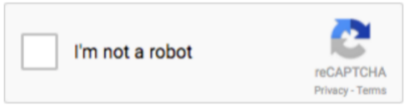
Question 1.
To remain anonymous in the data collection process, please create an identification code by following the outlined steps: 1. Enter your two-digit birth month 2. Enter the last two digits of your phone number 3. Enter the first and last letter of your last name Ex. Jane Doe was born in March, and her phone number is 807-123-4567. Her code is 03367JD. _____
Question 1.1.
Please verify that you are not a robot 

Table U2

Psychological Needs Satisfaction in Exercise Scale

Section 1. Please evaluate each statement based on how it applied to you over the past week
1. I feel that I am able to complete exercises that are personally challenging: ◯ True ◯ False

2. I feel confident I can do even the most challenging exercises: ◯ True ◯ False

3. I feel confident in my ability to perform exercises that personally challenge me: ◯ True ◯ False

4. I feel capable of completing exercises that are challenging to me: ◯ True ◯ False

5. I feel like I am capable of doing even the most challenging exercises: ◯ True ◯ False

6. I feel good about the way I am able to complete challenging exercises: ◯ True ◯ False

7. I feel free to exercise in my own way: ◯ True ◯ False

8. I feel free to make my own exercise program decisions: ◯ True ◯ False

9. I feel like I am in charge of my exercise program decisions: ◯ True ◯ False

10. I feel like I have a say in choosing the exercises that I do: ◯ True ◯ False

11. I feel free to choose which exercises I participate in: ◯ True ◯ False

12. I feel like I am the one who decides what exercises I do: ◯ True ◯ False

13. I feel attached to my exercise companions because they accept me for who I am: ◯ True ◯ False

14. I feel like I share a common bond with people who are important to me when we exercise together: ◯ True ◯ False

15. I feel a sense of camaraderie with my exercise companions because we exercise for the same reasons: ◯ True ◯ False

16. I feel close to my exercise companions who appreciate how difficult exercise can be: ◯ True ◯ False

17. I feel connected to the people who I interact with while we exercise together: ◯ True ◯ False

18. I feel like I get along well with other people who I interact with while we exercise together: ◯ True ◯ False

Table U3

Behavioural Regulation in Exercise Questionnaire-3

Section 3. Please evaluate each statement based on how it applied to you over the past week **0= not true for me, 2= sometimes true for me, 4= very true for me**
1. It's important to me to exercise regularly ◯ 0 ◯ 2 ◯ 4
2. I don't see why I should have to exercise ◯ 0 ◯ 2 ◯ 4
3. I exercise because it's fun ◯ 0 ◯ 2 ◯ 4
4. I feel guilty when I don't exercise ◯ 0 ◯ 2 ◯ 4
5. I exercise because it is consistent with my life goals ◯ 0 ◯ 2 ◯ 4
6. I exercise because other people say I should ◯ 0 ◯ 2 ◯ 4
7. I value the benefits of exercise ◯ 0 ◯ 2 ◯ 4
8. I can't see why I should bother exercising ◯ 0 ◯ 2 ◯ 4
9. I enjoy my exercise sessions ◯ 0 ◯ 2 ◯ 4
10. I feel ashamed when I miss an exercise session ◯ 0 ◯ 2 ◯ 4
11. I consider exercise part of my identity ◯ 0 ◯ 2 ◯ 4
12. I take part in exercise because my friends/family/partner say I should ◯ 0 ◯ 2 ◯ 4
13. I think it is important to make the effort to exercise regularly ◯ 0 ◯ 2 ◯ 4
14. I don't see the point in exercising ◯ 0 ◯ 2 ◯ 4

15. I find exercise a pleasurable activity ◯ 0 ◯ 2 ◯ 4
16. I feel like a failure when I haven't exercised in a while ◯ 0 ◯ 2 ◯ 4
17. I consider exercise a fundamental part of who I am ◯ 0 ◯ 2 ◯ 4
18. I exercise because others will not be pleased with me if I don't ◯ 0 ◯ 2 ◯ 4
19. I get restless if I don't exercise regularly ◯ 0 ◯ 2 ◯ 4
20. I think exercising is a waste of time ◯ 0 ◯ 2 ◯ 4
21. I get pleasure and satisfaction from participating in exercise ◯ 0 ◯ 2 ◯ 4
22. I would feel bad about myself if I was not making time to exercise ◯ 0 ◯ 2 ◯ 4
23. I consider exercise consistent with my values ◯ 0 ◯ 2 ◯ 4
24. I feel under pressure from my friends/family to exercise ◯ 0 ◯ 2 ◯ 4

Table U4

Depression Anxiety Stress Scales- Short Form

Section 4.

Please evaluate each statement based on how it applied to you over the past week
0= never, 1= sometimes, 2= often, 3= almost always

1. I found it hard to wind down ◯ 0 ◯ 1 ◯ 2 ◯ 3
2. I was aware of dryness of my mouth ◯ 0 ◯ 1 ◯ 2 ◯ 3
3. I couldn't seem to experience any positive feeling at all ◯ 0 ◯ 1 ◯ 2 ◯ 3
4. I experienced breathing difficulty (e.g., excessively rapid breathing, breathless in absence of physical exertion) ◯ 0 ◯ 1 ◯ 2 ◯ 3
5. I found it difficult to work up the initiative to do things ◯ 0 ◯ 1 ◯ 2 ◯ 3
6. I tend to over-react to situations ◯ 0 ◯ 1 ◯ 2 ◯ 3

7. I experienced trembling (e.g., in the hands) ◯ 0 ◯ 1 ◯ 2 ◯ 3
8. I felt that I was using a lot of nervous energy ◯ 0 ◯ 1 ◯ 2 ◯ 3
9. I was worried about situations in which I might panic and make a fool of myself ◯ 0 ◯ 1 ◯ 2 ◯ 3
10. I felt that I had nothing to look forward to ◯ 0 ◯ 1 ◯ 2 ◯ 3
11. I found myself getting agitated ◯ 0 ◯ 1 ◯ 2 ◯ 3
12. I found it difficult to relax ◯ 0 ◯ 1 ◯ 2 ◯ 3
13. I felt down-hearted and blue ◯ 0 ◯ 1 ◯ 2 ◯ 3
14. I was intolerant of anything that kept me from getting on with what I was doing ◯ 0 ◯ 1 ◯ 2 ◯ 3
15. I felt I was close to panic ◯ 0 ◯ 1 ◯ 2 ◯ 3
16. I felt unable to become enthusiastic about anything ◯ 0 ◯ 1 ◯ 2 ◯ 3
17. I felt I wasn't worth much as a person ◯ 0 ◯ 1 ◯ 2 ◯ 3
18. I felt I was rather touchy ◯ 0 ◯ 1 ◯ 2 ◯ 3
19. I was aware of the action of my heart in the absence of physical exertion (e.g., sense of heart rate increase, heart missing a beat) ◯ 0 ◯ 1 ◯ 2 ◯ 3
20. I felt scared without any good reason ◯ 0 ◯ 1 ◯ 2 ◯ 3
21. I felt life was meaningless ◯ 0 ◯ 1 ◯ 2 ◯ 3

Table U5

Exit-Questionnaire

Please answer each question as thoroughly as you can. There are no right or wrong answers. We are interested in your thoughts on each question.
1. Describe how your exercise routine has changed since starting this study, if at all. 2. How satisfied are you with your exercise routine now, compared to before the study? 3. How satisfied are you with your exercise routine now, compared to before the study? 4. What motivates you to exercise? 5. In what ways does having control over your exercise choices impact your overall engagement? 6. How would you rate your exercise knowledge in the gym environment on a scale of one to 10, with 10 being very high and 1 being very low? a. Why did you select this score? 7. What made it hard for you to exercise during this study? 8. What made it easy for you to exercise during this study? 9. What parts of the study did you enjoy? 10. What would have made this study a better experience for you? 11. How would you describe your sense of support from others in relation to your exercise engagement? a. How did you perceive the in-person support of your mentor throughout the study?* b. How did you perceive the virtual support of your mentor throughout the study?* 11. Aside from the resources provided in this study, did you access any additional resources (e.g., working out friends, online resources) to support your engagement? 12. What else would you like to share about your study experience

Note. Items marked with an asterisk (*) were included exclusively for participants in the intervention group.

Table U6

Qualtrics Conclusion Message

Thank you for completing this data collection period.

If you have any questions or concerns, please do not hesitate to let us know.

We can be contacted at.

Erin.pearson@lakeheadu.ca (Dr. Erin Pearson, Principal Investigator

mmfabian@lakeheadu.ca (Madeline Fabiano, Co-Investigator)

SHINEProgramLU@gmail.com (Research Team).

If you are feeling concerned or upset following this survey, here are some resources to help:

Student Health & Wellness (Lakehead University)

• Provides health services to students including medical and counselling services

• Call 807-343-8361

Thunder Bay Crisis Response

• Confidential 24/7 mental health hotline for Northwestern Ontario Region

• 807-346-8282

Immediate Help

• Emergency Response Personnel; Call 911

• Suicide and Crisis Lifeline: Call 1-800-273-8255