Proof-of-Concept Trial: Nature-based Intervention and Resistance Training for Men

by

Bradley A. Rudner

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Supervisory Committee

Dr. Nevin J. Harper, Co-Supervisor
School of Exercise Science, Physical, and Health Education

Dr. Ryan Rhodes, Co-Supervisor
School of Exercise Science, Physical, and Health Education

Abstract

Background: Men are struggling academically, with mental health, addiction, suicide, and all-cause mortality. These issues are especially prevalent in young males aged 18-34. **Purpose of Research:** Through the theoretical lens of self-determination theory (SDT), this proof-of-concept trial examines the potential for the consecutive dual interventions of an in-person nature-based intervention (NBI) group connection and a virtually supported resistance training (RT) program to provide a benefit for male mental health and well-being. **Methods:** A variety of recruitment strategies were utilized to enlist participants to fill two groups for the study. Intake documents provided a baseline understanding of participants' current physical and mental well-being. Each group met separately for two consecutive days in a nature setting to connect, discuss, and partake in activities designed to enhance the aspects of autonomy, competency, and relatedness within the SDT framework. The NBI segment concluded with assessment documents and an RT plan in place. The following six weeks included a guided RT program with weekly video conference call check-ins. Upon completion of the RT segment final assessments and exit interviews were completed with participants. **Results:** Participants reported satisfaction with both segments of the intervention, greater relatedness, competency, and autonomy for implementing and adhering to health habits in their own lives, including RT. In exit interviews, they highlighted the support formed through the group's in-person NBI and the subsequent weekly check-ins during the RT program as a significant lever in their progress toward positive changes. The NBI offered an opportunity for relatedness to be established within a less distracting context. The RT program built competency and autonomy with the scaffolding of their interpersonal connection. **Conclusion:** Findings suggest that, for this sample, the NBI-RT intervention has potential to benefit males' health and well-being through improved motivation

for implementation and adherence to healthy behaviors. The satisfaction with both the NBI and RT segments of the study, the positive shifts in motivation, and the improvements in anxiety and depression metrics suggest that moving to a feasibility trial is recommended.

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Dedication

I dedicate this work to the wood and the iron - nature and the weights. Both have brought me health and well-being, calmed my nervous system when I needed it the most, and inspired me to share their healing benefits. In this vein, I also dedicate this research to those who came before me in their exploration of these things, those who appreciate and utilize them currently, and those who will benefit from them in the future.

Do not think that what is hard for you to master is humanly impossible; and if it is humanly possible, consider it to be within your reach.

Marcus Aurelius

The goal of life is to make your heartbeat match the beat of the universe, to match your nature with Nature.

Joseph Campbell

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Introduction

The statistics on males 18 to 34 years of age show that many are struggling in a variety of ways; with academics (Belkin, n.d.; Smith, 2021), mental health, addiction, suicide (CDC, 2022; Chatmon, 2020; "Deaths of Despair," 2021), and all-cause mortality (Wang et al., 2016).

In academics, recent studies have shown a reversal between males and females in academic performance. At various levels of the educational ladder, females are outperforming males in almost all disciplines (Grant & Behrman, 2010; Morita et al., 2016; Perez-Felkner et al., 2012; Workman & Heyder, 2020). While after a long history of female disadvantages and marginalization in education, there have been significant improvements; however, the data on male performance are increasingly concerning. These trends forecast further underperformance in post-secondary education:

> UCAS's latest End of Cycle report shows the entry rate for men increased by much less than for women… widening the gap between the sexes to a record 9.2 percentage points at age 18, meaning young women are now 35 per cent more likely to go to university than men. If this differential growth carries on unchecked, then girls born this year will be 75 per cent more likely to go to university than their male peers. (Hillman, 2016, p.1)

For a variety of reasons – some seemingly more apparent and others more nebulous – males are disciplined at higher rates, diagnosed with learning disabilities more often, they achieve lower grades and test scores, and are less likely to graduate (Owens, 2016; Voyer & Voyer, 2014; Reeves et al., 2021).

According to the World Health Organization (WHO), men are 1.8 times more likely to commit suicide than women (Chang et al., 2019; World Health Organization, 2017). This disparity

is often associated with men being less likely to ask for support and their more negative attitude towards mental health services (Gonzalez et al., 2011; Sagar-Ouriaghli et al., 2019). The connection between suicide and depression seems obvious and yet more women are diagnosed with depression despite the exceedingly higher suicide rates of men (Robertson et al., 2018). One explanation for this is that there are gender differences in mental health presentation with women tending to internalize distress whereas men externalize it through mechanisms such as alcohol/substance abuse, violence, and suicide (Patrick & Robertson, 2016). The 'Big Build' model (Brownhill et al., 2005) terms male depression as 'depressive equivalents,' arising as maladaptive 'acting in' or 'acting out,' 'avoiding it' or 'numbing it.' Brownhill et al. express:

> 'Escaping it' is a maladaptive behaviour spanning 'acting in' and 'acting out' that is seen as a more drastic avoidance through more extreme risk-taking behaviours as a way to manage hurt, pain, loneliness or distress. Where this strategy fails, maladaptive behaviours increase in intensity to 'acting out' behaviours of 'hurting me, hurting you' (through exhibiting violence and aggression), to 'stepping over the line' (deliberate self-harm and suicidal behaviours). This model suggests that suppressed emotions in men build up over time and are ultimately released as anger, violence or aggression. (Brownhill et al., 2005, p. 926)

The data are compelling that men are receiving or accepting health support less effectively than women. This suggests that health services not specifically focused on males could be misaligned for many men (Sharp et al., 2022; Struik et al., 2019; World Health Organization, Regional Committee for Europe, 2018). Conversely, healthcare models incorporating "specific needs, concerns, preferences, and capacities of men can yield benefits in uptake and engagement" (P. M. Galdas et al., 2023, p.2).

Utilizing understandings of masculinity in healthcare services and promotion can address the gendered contexts that affect health and aid in recognizing the differing constraints and needs of men and women (Fleming et al., 2014; Gupta, 2000). Numerous studies have supported the need and shown the value of intentionally implementing sensitivity to gender-specific programs – these include male-oriented community-based health programs (Bergin & Richardson, 2021), mental health services (Seidler et al., 2016; Seidler et al., 2018), physical activity (Seaton et al., 2021), weight loss programs (Hunt et al., 2020a), and chronic illness self-management support (Galdas et al., 2014). While the issues that affect men's health challenges are multifactorial and necessitate diverse mitigation tactics (Sagar-Ouriaghli et al., 2019), the inclusion of physical activity (PA) has been shown to support improvements (Sharp et al., 2020a) in each of the aforementioned issues - academics, mental health, addiction, suicide, and all-cause mortality. The meta-analysis conducted by Sharp et al. concluded that - even when men have alternative primary focuses – "gender-tailored interventions, which include a core focus on physical activity, may help attract, engage and retain men to health behaviour interventions" (Sharp et al., 2020b, p.1216). Aside from the value of PA in improving men's health, tactics that are congruent with key aspects of their masculine identity (Galdas et al., 2014) - such as those that uphold the ideals of independence, stoicism, and control – impact men's willingness to participate in such programs. An improved sense of autonomy and competency seem to mirror these masculine ideals in significant ways. Fostering them in the context of likeminded males and building relatedness suggest the utilization of the theoretical framework of self-determination theory as logical and valuable. The literature indicates both the importance of recognizing masculine ideals and mitigating negative health practices traditionally associated with masculinity. The 5C framework (Galdas et al., 2023) – co-production, cost, context, content, and communication – is

such an approach that aims to design men's health programs utilizing masculinity in positive ways to improve accessibility and engagement. The importance of achieving a balance in reaching men through notions of masculinity without simultaneously reinforcing negative health behaviors is reiterated through numerous studies and reviews as well as tacit knowledge (Robertson et al., 2018). The challenge in uptake and adherence for men's health initiatives might be addressed with "thoughtful development to avoid the pitfalls of reinforcing negative (and outdated) gender stereotypes, with the overall goal of program design that tilts toward mechanisms which directly re-address the norms of masculinity that harm health and promote positive health changes" (Galdas et al., 2023, p.8). While there are an assortment of obstacles and approaches to engaging men better to improve their health trajectories, a program with the inclusion of PA both connects with notions of masculinity and has direct positive effects on health and wellbeing. Still, even this approach will not have universal efficacy as there are limitations created by the diverse variables impacting each individual's context and particular circumstances.

Considering there are clearly existing issues with men's health that are directly related to behavior, utilizing findings in social science and behavioral modification strategies seem to have promise in improving outcomes for health and wellness. Unfortunately, in contrast to the biomedical field - where early research has a defined pathway for new drug and device development, efficacy measures, and market implementation – behavioral-based treatments have been largely riddled by a lack of process from inception to standardized utilization. The insights gained in "fundamental human processes such as motivation, emotion, cognition, self-regulation, decision-making, stress, and social networks are not being optimally applied to pressing behavioral health problems" (Czajkowski et al., 2015, p. 973). Instead of a progressive ramp of

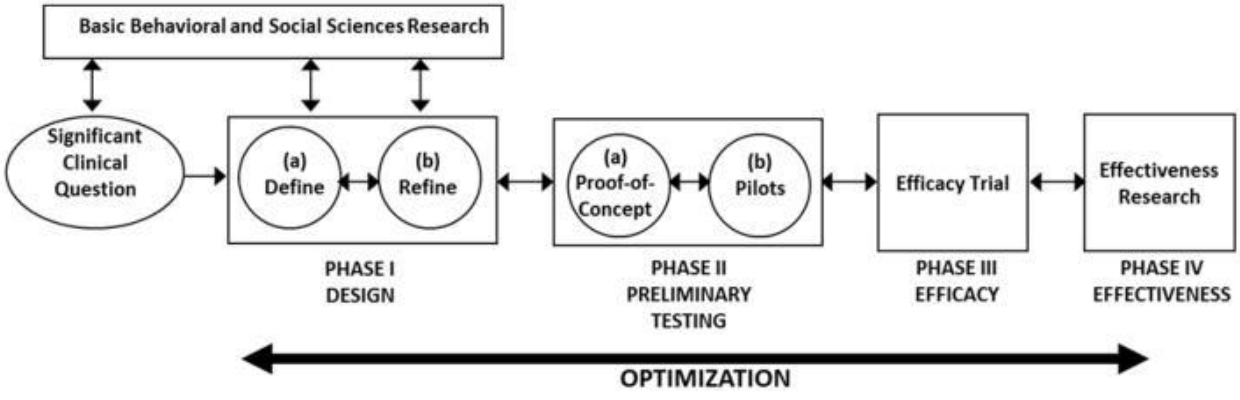
trials leading new realizations in early research to clinical operations, behavioral science has been stifled.

> Promising behavioral treatments "in the pipeline" are often abandoned, rather than refined, if they fail early tests. In some cases, treatments that achieve success in early studies are not pushed toward rigorous testing in Phase III efficacy trials, while others are tested in Phase III trials prematurely, without undergoing adequate development and refinement in early-phase studies. (Czajkowski et al., 2015, p. 975)

Improved development of formative research to enhance the implementation of behavioral science advances with a rigorous and graduated approach has the potential to alleviate missed opportunities and missteps in this arena. The ORBIT model is such an approach as it "provides a progressive, clinically-relevant approach to increasing the number of evidence-based behavioral treatments available to prevent and treat chronic diseases" (Czajkowski et al., 2015, p. 972). In this model, prior to measuring efficacy in an RCT, one would examine proof-of-concept and feasibility (see Figure 1). This paper is an examination of the proof-of-concept trial conducted and its merit to moving forward along the ORBIT model to a feasibility study.

Figure 1

The ORBIT Model for Behavioral Treatment Development



This study explored the proof-of-concept of a nature-based intervention (NBI) (Harper et al., 2019; Norwood et al., 2019; White et al., 2019) to interrupt cognitive and behavioral patterns, connect with a group, and generally improve mental health and well-being. The NBI provided opportunities to impart psycho-educational knowledge and to learn about integrating a fitness routine - specifically, resistance training (RT) (Ma et al., 2022; Rhodes & Lithopoulos, 2022; Rhodes et al., 2017) – in everyday life to build greater health and resilience.

The research objective was to evaluate the proof-of-concept (recruitment, retention, and satisfaction) of a nature-based intervention and a 6-week RT program's efficacy at mitigating health challenges in men aged 18 to 34. Secondary objectives were to explore the preliminary efficacy of this intervention at promoting PA motivation and behavior as well as improving the participants' self-reported state of mental health[1]. Improvements in motivation were assessed by adherence to the RT program and the check-ins, through both the satisfaction questionnaires on the NBI and RT program, and with the exit interview. The plausibility markers for success were defined as being equal to or greater than 30% and equal to or greater than 80% for recruitment and retention rates, respectively. The plausibility markers for success in satisfaction were defined as being equal to or greater than a mean score of 3 points and equal to or greater than a mean score of 3.5 points for the NBI and RT program, respectively. The primary question of this research was: *What effect can a 2-day nature-based intervention followed by a 6-week resistance training program have on a group of men, ages 18 to 34, reporting health challenges?*

Secondary questions:

[1] The secondary outcomes are extraneous to this proof-of-concept study; however, collecting this data before, during, and after the intervention seemed valuable. This allows further opportunities to analyze this study for the design of future papers, studies, and interventions.

1. *What advantages and/or disadvantages does a gender-specific intervention offer men to increase adherence in supporting their health?*
2. *What aspect does community and group work play in supporting men's adherence to intervention programs and improvements in well-being?*
3. *What aspect does a nature-based intervention play in supporting men's adherence to a RT program and its further implementation in their lives, enhancing motivation for RT, and improving the SDT needs of autonomy, competency, and relatedness?*
4. *What aspect does a guided resistance training program play in supporting men's adherence to furthering RT implementation in their lives, enhancing motivation for RT, and improving the SDT needs of autonomy, competency, and relatedness?*

Theoretical Framework

The theoretical framework informs the methods in which the research is conducted. The theoretical framework of Self-Determination Theory (SDT) (Deci & Ryan, 2000; Deci & Ryan, 1985) was utilized for its resonance with these objectives and its track record of success in improving adoption and adherence to health behavior changes (Teixeira et al., 2020). The efficacy of SDT in improving both PA and well-being is well established (Ntoumanis et al., 2021; Ryan et al., 2009). SDT is a broad theory of psychological growth and wellbeing that frames human motivation and the forces behind personality development. SDT highlights people’s basic psychological needs for autonomy, competence, and relatedness. Through this lens, SDT examines how social contexts that support these primary needs lead to greater resolution, vitality, and improved functioning.

Literature Review

Nature-based Interventions on Physiological and Psychological Health

For most of the human species' existence, life has revolved around cues from the natural world. In our current state, we are neurobiological identical to Homo Sapiens of 200,000 years ago (Ashraf & Sarfraz, 2016; Cosmides & Tooby, 1997). Compared to our ancestors, even those of a couple hundred years ago, we are more cutoff from the signals of nature by structures of modernity. The rapidity in which these changes have come and continue to come are significant in humanity's ability to adapt without negative consequences. This is clearly seen in the field of circadian biology. The Nobel Prize in Physiology or Medicine was recently won on decades of research into the integral relationship between natural light and human health (Nobel Prize, 2018). Simply stated, the greater the mismatch between natural light (i.e., sunlight) and human activity, the more probable there will be a deterioration in health and a rise in disease (Deota & Panda, 2021; Hatori et al., 2017; Lunn et al., 2017; Manoogian & Panda, 2017; Sulli et al., 2018; Tosini et al., 2016). Spending time outside during diurnal activity patterns and time in darkness for nocturnal sleep has significant benefits for well-being.

Beyond our intricate relationship with light, nature has been shown to improve physical, cognitive, emotional, and psychosocial well-being in a variety of ways. Green exercise, (i.e., exercise in nature), has positives effect on mental health through improving self-esteem and mood as well as those struggling with depressive and anxiety symptoms (Barton & Pretty, 2010; Zhang et al., 2021). While the exercise aspect itself is a factor in the positive results attributed to green exercise, even more passive time in nature has benefits on mental health (Li et al., 2018; Norwood et al., 2019), stress, and healing (Robbins, 2020; White et al., 2023). The potential for improved well-being through exposure to nature is significant enough that the field of

ecopsychology has continued to grow and nature-based counselling has embraced the notion of nature being a co-facilitator (Harper et al., 2019).

Whether it be the benefits of shinrin-yoku (Japanese forest bathing) showing a measured reduction in salivary cortisol (Hansen et al., 2017; Hunter et al., 2019), Western physicians prescribing 'green time' (Fleischer, 2018), hospitals utilizing nature for healing (*Apolitical*, 2019), brief walks in green space eliciting better cognitive function (Berman et al., 2008; Norwood et al., 2019), or the mere view of nature eliciting better moods (Jennings & Bamkole, 2019), exposure to the natural environment is a significant tactic for improving wellness. A mere 120-minutes per week in nature (White et al., 2019) will offer many of these benefits even if that nature is found in an urban setting. These published NBIs have utilized some rigorous measures of the effects on human physiological and psychological health. Shinrin-yoku (SY) has been utilized and studied by the Japanese and Chinese with its usage in preventative healthcare and healing being adopted in their medical community in the 1980s (Hansen et al., 2017). Hansen's 2017 review encompassed therapeutic effects on:

> (1) the immune system function (increase in natural killer cells/cancer prevention); (2) cardiovascular system (hypertension/coronary artery disease); (3) the respiratory system (allergies and respiratory disease); (4) depression and anxiety (mood disorders and stress); (5) mental relaxation (Attention Deficit/Hyperactivity Disorder) and; (6) human feelings of "awe" (increase in gratitude and selflessness). Moreover, various contemporary hypotheses, such as: Kaplan's Attention Restorative Hypothesis (Kaplan & Kaplan, 1989); Ulrich's Stress Reduction Hypothesis (Ulrich et al., 1991); and Kellert and Wilson's Biophilia Hypothesis (Kellert, 1993) provide support and a lens for the practice of SY and other forms of nature engagement. (Hansen et al., 2017, p. 2)

In the review, the changes to physiological and psychological health were established by monitoring central nervous system (CNS) activity biomarkers, heart-rate variability (HRV), salivary cortisol levels, immunoglobulin A and sense-specific metrics. Beneficial changes were seen with cardiovascular improvement in decreased pulse rate and blood pressure, and an 80% increase in the parasympathetic indicators of HRV while experiencing the forest setting (Kobayashi et al., 2015). Psychological benefits for those suffering from acute and chronic stress were observed with those suffering from chronic stress reporting the greatest reduction in subjective feelings of hostility, depression and anxiety as a direct result of time spent in the forested environs (Morita et al., 2007). Furthermore, the review included 12 studies examining the benefits on stress related psychological disorders and diseases and the pertinent comorbid conditions. These included stress related heart disease, emotional distress and chronic depression, alcoholism, sleep disorders, and pain. Regarding all these indications, the intervention groups fared better than the control.

Social Connection and Physical Activity

The value of connection for improving health extends beyond nature into social relationships that comprise a foundational aspect of human well-being. “The need to belong is a powerful, fundamental, and extremely pervasive motivation” (Baumeister & Leary, 1995, p.497) with a sense of belonging having significant effects on emotional patterns and cognitive processes. Belonging transcends mere social interaction and is recognized as lasting, positive, and significant interpersonal relationship. These relationships create more satisfaction when they are pleasant, frequent and with several of the same individuals regularly. The absence of

attachments has been shown to be deleterious to health, adjustment, and well-being (Baumeister & Leary, 1995).

Building on the basic need for interpersonal connection and belonging, the impact of social influence on exercise behaviors (adherence and compliance), cognitions (intentions and efficacy), and affect (satisfaction and attitude) has been shown to have a significant effect (Carron et al., 1996). In situations where a group of individuals enhance their cohesiveness through team building activities, both the individuals and the group can show improvement. As cited in the study by Carron, "group performance became better, task, social interactions and communications were enhanced, the group was more stable, and role acceptance and conformity to group norms increase" (Carron et al., 1996, p.8). Individual members had less anxiety and heightened self-esteem, more trust, sense of security, and openness to change. Individuals also were more willing to share responsibilities for group outcomes. These improvements seem to echo the value of belonging and social influence. Identity is significantly formed in relation to social groups. As the individual connects and associates with various social groups, their cognitive processes, emotions, and behaviors are influenced. Through sensing similarities to other group members, the group becomes more cohesive and attracts greater adherence to the group's salient traits and behaviors (Burke et al., 2008). This notion is fundamental in self-categorization theory which can be utilized as a strategy to improve efficacy in interventions such as those that promote PA (Beauchamp, 2019; Scarapicchia et al., 2017; Stevens et al., 2017).

Considering these findings, the value of social connection to interventional success with the aim of promoting healthy behaviors and their sustained practice seems to be a worthwhile aspect of such an endeavor. As greater numbers of people find themselves isolated and lonely

(Killeen, 1998) - due in part to excessive time partaking in individual digital screen device activities (Erzen & Çikrikci, 2018; Weissbourd et al., 2021) - the benefits of significant social connection has become more needed. By structuring health education and program implementation around a group that has an established rapport, similar goals, and regular interaction, the potential for adherence would likely be improved.

Resistance Training on Men's Health

While PA has been well-established as an amplifier of physical (Archibald et al., 2015; Hunt et al., 2013; Hunt et al., 2020) and mental health (Cormie et al., 2016; Gough, 2013), resistance training (RT) has often been overshadowed by the value of aerobic exercise and generally underutilized (Bennie et al., 2016; CDC, 2011; Chevan, 2008; Loustalot et al., 2013). There is now substantial evidence that RT has significant benefits for improving physical (Bennie et al., 2016; Galuska et al., 2002; Hunt et al., 2020), cognitive (Marston et al., 2017), emotional (Gough, 2013; O'Sullivan et al., 2023), and social wellbeing (Cormie et al., 2016). Considering men generally neglect seeking support and care more so than women (Sharp et al., 2020a) and are often under-represented in studies (Conn et al., 2011), there is a need for greater research in this field. There is some indication that interventions which focus on masculinity and limit participation to males could elicit better enrolment, retention, and post intervention adherence (George et al., 2012; Gough, 2013; Viester et al., 2018). Although these findings are not conclusive and are countered by some opposing data, there would be value in further exploration of male-only structures in health interventions (Archibald et al., 2015; Cormie et al., 2016; Gough, 2013; Hunt et al., 2013; Hunt et al., 2020; Sharp et al., 2020).

While RT can benefit most people, its pursuit is not equally represented. Certain factors lead to greater participation in RT. In a systematic review sourcing data from nine countries, RT participation was associated with the factors of education, perceived health status, quality of life, affective judgements, self-efficacy, intention, self-regulation behaviors, subjective norm and program leadership (Rhodes et al., 2017b). Lower education levels and poorer health correlated with a diminished participation in RT. Factors that may be important for promoting RT habits include affective judgements, self-efficacy, and self-regulation behaviors (Rhodes et al., 2017b). Although RT has clear benefits it is underutilized by the majority of the population with only 31% engaged in this behavior (Ma et al., 2022). A lower adoption rate of RT compared to aerobic or general PA intervention may be a result of barriers like specialized knowledge, equipment, and perceived complexity. Behavior change techniques have been extensively studied in interventions addressing smoking, diet, and PA but remain largely underexplored in RT (Kompf & Rhodes, 2023a; Kompf & Rhodes, 2023b). The complexity and multitude of variables to consider present a challenge to designing RT interventions. Factors such as the mode of delivery, providers, intervention dose, setting, and the exercise prescription may affect efficacy of the intervention (Ma et al., 2022).

Considering men generally neglect seeking support and care more so than women (Sharp et al., 2020a) and are often under-represented in studies (Conn et al., 2011), there is a need for greater research in this field. There is some indication that interventions which focus on masculinity and limit participation to males could elicit better enrolment, retention, and post intervention adherence (George et al., 2012; Gough, 2013 ; Viester et al., 2018). Although these findings are not conclusive and the efficacy of PA interventions for men remains unclear, there would be value in further exploration of male-only structures in health interventions (Archibald

et al., 2015; Cormie et al., 2016; Gough, 2013; Hunt et al., 2013; Hunt et al., 2020; Sharp et al., 2020). One reason to delve deeper in to male-focused interventions with the utilization of RT would be that it has been "noted as a preferred modality of PA among men due to its perceived 'masculine' nature associated with strength but most importantly because it targets disease-related risk factors for men" (Sharp et al., 2020a). Regardless of gender specific values, RT improves bone density, immune function, weight management, and disease mitigation and prevention amongst other benefits. It would entail that the value to a group of men experiencing a nature-based intervention followed by a structured RT program would be an increase in their health and well-being through a variety of processes.

Resistance Training and Mental Health

PA shows significant effects in mitigating mental health concerns, such as depression and anxiety. A recent systematic review concluded that "physical activity is highly beneficial for improving symptoms of depression, anxiety and distress across a wide range of adult populations, including the general population, people with diagnosed mental health disorders and people with chronic disease" (Singh et al., 2023) which corroborates previous studies (Caponnetto et al., 2021; Mahindru et al., n.d.; Smith & Merwin, 2021; Teychenne et al., 2018; Warburton & Bredin, 2017). Considering these reviews explicitly state that "physical activity should be a mainstay approach in the management of depression, anxiety and psychological distress" it seems reasonable to further examine a variety of different types of PA, including RT. This is more relevant since RT has been understudied in this regard until more recently (Strickland & Smith, 2014). Contemporary findings support the use of RT in the clinical management of anxiety as "anxiolytic effects have been observed across a diverse range of

populations and dependent measures" (Strickland & Smith, 2014) as well as it value for reducing depressive symptoms regardless of health status, training volume, or strength gains (Gordon et al., 2018; Noetel et al., 2024). Further, in a randomized controlled trial utilizing an eight-week training program the participants experienced a significant anti-depressant effect as well as a mitigation of anxiety showing the potential for reduction in depressive and anxiety symptoms following RT to augment each other (O'Sullivan et al., 2023). Unfortunately, RT is still underutilized as a form of PA as well as for its potential to improve mental health (Bennie et al., 2020; Bennie et al., 2020).

Self-Determination Theory and Physical Activity

Sedentary lifestyles are more pervasive than perhaps at any time in the past and the people who struggle to meet the medical recommendation of 150 minutes of PA weekly are often those who might benefit the most (Hoare et al., 2016; Ross et al., 2020; Tremblay et al., 2010). Motivation to exercise is instrumental in implementing and adhering to this healthy habit. Through the theoretical lens of SDT, creating circumstances that fulfill the three psychological needs of autonomy, competency, and relatedness can lead to greater success integrating PA into one's lifestyle (Gillison et al., 2019). SDT suggests that intrinsic motivation is vital with overcoming resistance in embarking on new healthy habits and maintaining these positive behaviors. Negative reinforcement and being directed to participate in PA are rarely sufficient to sustain changes (Chatzisarantis et al., 2012). Conversely, it has been demonstrated that "autonomous motivation predicted success in increasing PA even after controlling for the effect of other important life-context factors" (Koponen et al., 2018, p.104). In a systematic review and meta-analysis on SDT applied to physical education, "autonomy, competence, and relatedness

satisfactions were strongly correlated with autonomous student motivation" (Vasconcellos et al., 2020, p.1444). Increased need satisfaction has been shown to improve the quality of motivation, which leads to better PA intentions and attitudes (Sabiston et al., 2009). It appears that need satisfaction is fundamental to increasing the potential of sustaining PA behaviors for longer term (Kinnafick et al., 2014). Considering many of the benefits of PA are realized through making this behavior an ongoing lifestyle for as long as possible, it follows that utilizing the satisfaction of the psychological needs of autonomy, competency, and relatedness would be a valuable strategy for improving lifelong health.

The previous sections expressed a variety of the benefits realized through RT and PA that support the importance of successfully promoting exercise and engaging in it for a lifetime. The human body is designed to move and in so doing, it becomes stronger, healthier, and more resilient. Men are generally struggling more than women with their health and one reason is their levels of inactivity. Engaging men to be more motivated in PA could address their gender specific needs as well as improve their health (Garfield et al., 2008; Sagar-Ouriaghli et al., 2019; Seidler et al., 2018; Sharp et al., 2020; Sharp et al., 2022; Struik et al., 2019). Virtually everyone can benefit from becoming more physically active (Warburton & Bredin, 2017). The benefits of PA are not limited to our physical wellbeing but include psychological, cognitive (Faught et al., 2019), and social health (Mahindru et al., 2023).

Methods

Design

This research was structured as a single group proof-of-concept trial that began through the recruitment process and followed retention through the two-day nature-based intervention

(NBI) and the six-week resistance training program. As outlined in the ORBIT model, the decision to design this study as a proof-of-concept trial was selected because the existing literature and the researcher's field experience suggested it would be "plausible that the treatment will have a clinically significant benefit on the behavioral risk factor" (Czajkowski et al., 2015). Moving forward with a *Phase II* proof-of-concept trial is an efficient and cost effective way to determine whether a fixed treatment protocol will have a clinically significant change on a behavioral risk factor within a small sample size of accessible subjects prior to investing in a randomized design. Recruitment involved two cohorts of participants, both being included with the same demographics and criteria. Once the NBI aspect of the proof-of-concept trial began, the duration of the study was 44 days. The study received ethical approval from the University of Victoria Human Research Ethics Board (number: 22-0513) and applied CONSORT guidelines for pilot and feasibility trials (Eldridge et al., 2016).

Inclusion Criteria

Eligible participants were males between the ages of 18 and 34 who self-reported not currently meeting physical activity (PA) guidelines (i.e., 150 minutes of moderate to vigorous physical activity (MVPA) per week; Ross et al., 2020). Also, participants' eligibility required them to not be utilizing RT as a form of PA. The research aimed to recruit up to 30 men and divide them into two groups of 15 for the benefit of running the 2-day NBI as well as the weekly video check-in calls.

Recruitment Strategy

Participants were recruited through social media and posters at local community/recreational centers, educational institutions, job sites and community boards. Recruitment began upon receipt of ethics approval in January 2023 and stopped after four months of sustained effort and resulted in achieving the minimum acceptable sample size for the proof-of-concept trial.

The recruitment process utilized the researcher's network and then was expanded as the following outlines. The secondary recruitment process utilized steps 1 to 3 below. The subsequent steps applied for both the primary recruitment efforts and the secondary efforts, and went as follows:

1. Ads were placed on social media and in local community centres with information to apply.
2. The prospects were provided with a recruitment letter to introduce the study and the expectations.
3. Each applicant was sent an inclusion questionnaire which included a Physical Activity Readiness Questionnaire (PAR-Q) questionnaire.
4. The participants completed the questionnaire and emailed it back.
5. Those meeting the inclusion criteria through the questionnaire were emailed to schedule a 15-minute interview time to review the questionnaire, explain the research, answer questions, and assess fit.
6. Once sufficient applicants had been determined to meet the criteria and complete the 15-minute verification interview, recruitment was closed, and the groups established.

Intervention

The intervention took place in an outdoor setting where the researcher-facilitator provided psychoeducational presentations, engaged the group in fostering connections, led nature-based activities, discussed the value of RT and how to implement it in regular daily life, and created a forum for participants to share and ask questions. By the end of the intervention, each participant had a RT plan that detailed a warmup, exercise selection with set and repetition ranges, and a cool down/stretch routine. They were shown how to record their workouts and gain an understanding of expected progress.

The aims of the intervention were:

A. Foster connection and build the potential for a supportive community,
B. Experience the multifaceted benefits of time in nature, and,
C. Learn about and integrate RT into daily lives.

During the intervention the participants had a group session to discuss concepts around men's health issues, and how these could be supported and leveraged to optimize the ensuing 6-week RT program. The intervention aimed to build social cohesion and create comradery amongst the participants and to have them support each other through the process and beyond. The 2-day NBI aimed to setup the participants for success in the ensuing six weeks through potential bonding with the other participants, an increased sense of accountability, and a willingness to embrace challenge. The theoretical framework of SDT was both discussed and practically incorporated into the programming (see Tables 1 and 2).

The study utilized the NBI to introduce and foster the aspects of SDT to increase the likelihood of adoption and adherence to the ensuing RT program. Group discussions, psychoeducational presentations and reflection were utilized with the intent to increase the aspect

of autonomy as related to intrinsic motivation. Striving to reinforce autonomy in the participants anticipates the psychological need to experience self-direction and personal endorsement in the initiation and regulation of one's behavior. The hallmarks of autonomy need satisfaction are volitional action and wholehearted self-endorsement (i.e., personal ownership) of that action (Teixeira et al., 2020). The SDT aspect of competence was more pertinently utilized through educating the participants on RT technique, progress, and their specific program details. This occurred at the end of the two-day NBI and was reinforced weekly through the group video conference check-ins. The third basic psychological need in SDT, relatedness, was leveraged in the activities fostering connection amongst the participants during the NBI experience and again further reinforced with the weekly check-ins. As the facilitator, I strived to frame certain discussions, presentations, and education (see Table 1) to highlight the commonalities in the group (i.e., males, 18-34, interest in nature connection and RT).

Table 1

2-Day Nature-based Intervention Agenda

Time	Activity	Notes
Day 1		
9 - 10:15am	Introductions & Ice Breakers	Gain familiarity with each other & us
break		
10:45 - 12pm	Men's Issues Group Discussion	Allow guided free flowing sharing
lunch		
1 - 2:15pm	Physical Activity	Hike, team challenge
break		
2:45 - 4pm	Nature Connection/Debrief/Close	Silent nature walk, sit spot reflection, nature sculpture

Time	Activity	Notes
Day 2		
9 - 10:15am	Ice Breaker/Reflection	Energize the group, review Day 1

break		
10:45 - 12pm	Psycho-Ed	Present and discuss on healthy behaviors, behavior change, SDT
lunch		
1 - 2:15pm	Team Building	Build comradery
break		
2:45 - 4pm	Men & RT discussion/Q&A/Close	Craft the plan for going forward

The programming and interactions for the proof-of-concept trial were designed to utilize the efficacy of motivational behavior change techniques (MCBT) and framing with the theoretical lens of SDT. The NBI agenda (Table 1) - as well as the follow up interactions in the six weekly video conferencing group check-ins and the final one-on-one exit interview – were mapped to elucidate this design in the planning (see Table 3). The men were encouraged to maintain connection with at least one other participant throughout this period and, if possible, participate in RT together for this time.

The RT program was designed to utilize compound lifts, (e.g., bench press, overhead press, rows, pulldowns, lunges, and squats), and organized into a full body split that could be repeated without the concern that missed workouts would result in neglected major muscle groups. All the exercises were demonstrated at the end of the NBI, and modifications were shown that could translate each exercise to a bodyweight version. This provided the participants the freedom to continue with the program if they could not or did not want to go to a gym. The participants were encouraged to stick to the exercises or the bodyweight version for the six weeks but were not discouraged if they wanted to do more exercise or needed to modify any particular exercise. The prescription for RT was 90-minutes a week, which could be divided into two 45-minute sessions or three 30-minute sessions. Each participant received tracking sheets to

track their workouts which included the specific exercise, sets and repetitions, and weight used (see Appendix A for Week 1 sample).

Check-ins

Regular group weekly check-ins occurred via video conferencing where participants were encouraged to voice their level of satisfaction and any concerns about the intervention. The calls were pre-scheduled for a time that was as convenient as possible for as many participants as possible. The duration of the check-in call was approximately 1.5 hours. Participants were strongly encouraged to attend and participate but were not removed from the study for being absent.

Measures

The primary assessment schedule included collecting data on interested prospects followed by enrollment, then initial attendance and completion. The secondary outcomes were focused on self-reported health, satisfaction, and a qualitative gauge of motivation. The full assessment schedule is detailed in Table 2.

Table 2

Full Assessment Schedule

Data Collection Item	Schedule	Primary	Secondary
1. Prospect Tally	Prior to start date	X	

2. PAR-Q • Consent form	Prior to start date	X		
3. Recruitment Rate	Start date – day 1	X		
4. Background questionnaire a. Sociodemographics b. RT history c. PA history d. Health-related questions	Start date – day 1			
5. PHQ-9 GAD-7 (mental health) questionnaire pre-intervention	Start date – day 1			X
6. NBI satisfaction questionnaire (including SDT material)	End of NBI – day 2	X		
7. Workout log x6	Weekly after NBI	X		
8. Group Video Conference Call Check-In Questions	Weekly	X		X
9. SDT motivation for RT a. Adapted BREQ-3 b. Psychological Needs Satisfaction Q c. RT Satisfaction Questionnaire	End of RT program Day 44	X		X

10. PHQ-9 GAD-7 (mental health) questionnaire post-intervention	End of RT program Day 44		X
11. Exit Interview (including SDT material)	End of RT program ~ Day 44		X
12. Retention	End of RT program ~ Day 44	X	

Demographics

Basic demographics were collected from the participants: age, ethnicity, education, marital status, employment, household income, household responsibilities.

Primary Proof-of-Concept Measures

Recruitment & retention

Recruitment rate was calculated by dividing the number of participants scheduled for a baseline meeting (12) by the number of participants who expressed interest in the study (26) (= 0.461, or 46%). Retention was calculated by dividing the number of participants who completed the follow-up questionnaire (8) after the 6-week study by the number of participants who completed the baseline questionnaire (8) (1.0, or 100%).

Each participant was also asked to maintain a RT log of workouts which they shared weekly. This was utilized as another metric of retention and to support them in maintaining motivation as well as in recognizing progress.

Satisfaction & usability

Satisfaction was assessed through two questionnaires. The first questionnaire focused on participant satisfaction from the two-day nature-based intervention. The second questionnaire focused on the 6-week follow up with RT (see Figure 2). The first questionnaire was seven items, scored using a 4-point Likert scale (Lewis, 2018). The second questionnaire was nine items, scored using a 5-point Likert scale (Lewis, 2018).[2]

The questionnaires were utilized to determine:

- What was the most impactful aspect of the program and why?
- How enjoyable was it?
- Was it accessible?

The first questionnaire, NBI Satisfaction Questionnaire, utilized the seven questions to determine the participants levels of satisfaction – briefly gauging SDT's psychological needs of autonomy, competency, and relatedness – as they completed the NBI and were preparing for the outset of the RT program. The second questionnaire, RT Satisfaction Questionnaire, positioned the nine questions as a means to assess the fulfilment of SDT's needs through the RT program and looking forward post-trial. While these questions provided a basic litmus test on motivation through the SDT framework - paired with the weekly check-ins and exit interviews – a substantial grasp of how the participants' motivation had been affected was attained.

[2] The scores of the items on the System Usability Scale are manipulated according to whether they are an odd (subtract 1 from the score) or even (subtract the score from 5) item and then their collective sum is multiplied by 2.5 to obtain a standard score that ranges from 1 to 100 (Hollman et al., 2022; Lewis, 2018).

Secondary Measures

All participants completed a PHQ-9 (Patient Health Questionnaire) and GAD-7 (General Anxiety Disorder) prior to commencing the study. These two questionnaires are short, self-reporting tools for assessing depression and anxiety severity amongst medical and community samples. They have adequate formal psychometric properties as severity measures for individuals with anxiety and mood disorders (Stanyte et al., 2023).

Procedures

A specific agenda was designed for the 2-day NBI which included elements to build group cohesion and relatedness, increase awareness of pertinent issues with men's mental and physical health and wellness, improve motivation for healthy habit adoption, and provide education and strategies to be integrated in the participants' lives going forward – including nature connection approaches and RT competency (see Table 3). Each selected aspect of the NBI corresponds to one or more of the MBCTs (see Appendix B for a reference list) determined as most effective in the framework of SDT through an iterative expert-consensus method (Teixeira et al., 2020).

Table 3

Proof-of-Concept Trial Participant Interactions Mapped with MBCT and SDT

Activity	Title	Content	MBCT	SDT
1	NBI Intro	• Intro to study • Ice Breakers	MBCT1 MBCT3/ MBCT16	Autonomy Relatedness Competence

2	Group health discussion	• Convey some stats • Convey SDT approach • Convey PA, RT, NBI benefits	MBCT2 MBCT3 MBCT4 MBCT5 MBCT8 MBCT9	MBCT10 MBCT11 MBCT12 MBCT13/ MBCT15 MBCT16	Autonomy Relatedness Competence
3	PA – Nature walk	• Walking/PA • Sensory awareness with NBI	MBCT10		Autonomy Relatedness
4	NBI - reflection	• Quiet solo sit • Nature item collection and share	MBCT1 MBCT3/ MBCT8 MBCT9	MBCT10 MBCT11 MBCT12 MBCT13	Autonomy Relatedness
5	Day 1 Debrief	• Share circle • Q&A	MBCT1 MBCT3 MBCT4 MBCT5/ MBCT8 MBCT9 MBCT10	MBCT11 MBCT12 MBCT13 MBCT14/ MBCT15 MBCT16 MBCT18	Autonomy Relatedness Competence
6	Day 2 Intro	• Summarize Day 1 • Preview Day 2 • Ice Breaker/Energizer	MBCT3/ MBCT8 MBCT9 MBCT10	MBCT11 MBCT12/ MBCT15 MBCT16	Autonomy Relatedness Competence
7	Psycho-Ed	• Motivation (SDT): autonomy (scale), competence, relatedness • Handling setbacks • Habit formation	MBCT1 MBCT3 MBCT4 MBCT5/ MBCT8 MBCT9 MBCT10	MBCT11 MBCT12 MBCT13 MBCT14/ MBCT15 MBCT16 MBCT17	Autonomy Relatedness Competence

		• Polyvagal theory			
8	RT Intro	• RT plan • Workout structure • Q&A • Debrief/Close	MBCT3 MBCT4 MBCT5 MBCT6 (MBCT7)/ MBCT8 MBCT9 MBCT10 MBCT11	MBCT12 MBCT13 MBCT14/ MBCT15 MBCT16 MBCT17 MBCT18 MBCT19 MBCT20 MBCT21	Autonomy Relatedness Competence
9	Video Conference Calls	• Encouragement • Connection • Support	MBCT1 MBCT3 MBCT4 MBCT5/ MBCT8 MBCT9 MBCT10 MBCT11/ MBCT12 MBCT13	MBCT14/ MBCT15 MBCT16 MBCT17 MBCT18 MBCT19 MBCT20 MBCT21	Autonomy Relatedness Competence
10	Exit Interview	• Reflection • Encourage adherence	MBCT1 MBCT3 MBCT4 MBCT5 (MBCT6) MBCT7/ MBCT8	MBCT9 MBCT10 MBCT11 MBCT12 MBCT13 MBCT14/ MBCT15 MBCT16	Autonomy Relatedness Competence

Note: PA = physical activity, NBI = nature-based intervention, RT = resistance training, SDT = self-determination theory, MBCT = motivational behavior technique *Numbers correspond to the MBCT Classification as defined by Teixeira et al., (2020)

As a proof-of-concept trial, the data began being collected through the recruitment stage. Tallies of total prospects were taken. All prospects were contacted multiple times and encouraged to move to enroll. Retention was monitored from onset to completion. Once the group was finalized, the 2-day NBI was their first meeting. All participants completed their initial paperwork prior to the first activity (see Table 2). They completed the post-NBI paperwork at the end of the first two days and then the post-intervention paperwork six weeks later at the end of the RT program. The agenda was followed with room for open discussion and questions. The NBI finished off with RT orientation, Q&A, and plans for the weekly group check-in. The 6-week RT program began immediately after the two days in nature. The first check-in was later that week and was proceeded by five subsequent check-ins once a week. At the conclusion of this six week and two day duration, exit interviews were scheduled and completed.

Analysis Plan

Participants have been assigned pseudonyms for the purposes of anonymity in this report. Recruitment rate was compared to the 30% general estimate recruitment rate of other PA and health trials recruiting men (Borg et al., 2024; Ryan et al., 2019; Whatnall et al., 2021). Considering this, recruitment rates of ≥ 30% would be gauged as successful.

A 80–100 % retention rate was identified as a strong trial (Jackson & Waters, 2005). -matching this rate would be considered a success.

To analyze satisfaction, means and standard deviations were calculated for the individual questions in the questionnaire. The data for the NBI satisfaction questionnaire and the RT program satisfaction questionnaire can be seen in Tables 3 and 4 respectively. Any scores of 3 or higher and 3.5 or higher would indicate satisfaction had met the success criteria for the NBI and RT experience, respectively.

Secondary outcomes were analyzed through the questionnaires and the exit interviews. The mean score of each question in the PHQ-9 and GAD-7 questionnaire was calculated and an analysis of the pre-post changes scores was done through a mean differential and Cohens d score. The greater the negative mean differential score the more it reflected substantial improvement in depression and anxiety metrics. The exit interviews were transcribed and organized in a thematic code. The most salient responses were separated into three central themes – Participant Satisfaction with Time in Nature; Participant Satisfaction with Resistance Training Program; Feedback on Intervention Format and Motivational Changes **-** with subthemes branching off these.

Results

Characteristics of the Sample

The inclusion criteria significantly shaped certain characteristics of the participants, most notably their gender and age. Beyond that, the men ranged in the upper half of the inclusionary age. The youngest being 28 and oldest 33. Three of the participants had completed a college, university, or graduate degree. There was only one parent in the sample, but three men were in long-term committed relationships, the rest being single. Income ranged but was mostly polarized between the two ends of the spectrum provided in the demographics survey. A single participant identified as a visible minority.

Table 4

Demographic Table for Participants

Category	Sub-Category	Frequency (N)	Percentage (%)
Gender	Male	8	100
	Female	0	0
	Other	0	0
Age	18-21	0	0
	22-25	0	0
	26-29	3	37.5
	30-34	5	62.5
Education	8^{th} Grade or Less	0	0
	Some High School	1	12.5
	High School Diploma	0	0
	Vocational School or Some College	3	37.5
	College Degree	3	37.5
	Professional or Graduate Degree	1	12.5
Marital Status	Single	5	62.5
	Married	1	12.5
	Widowed	0	0
	Divorced/Separated	0	0
	Common Law	2	25
Employment	Homemaker	0	0
	Parental leave	0	0
	Paid full-time employment	2	25
	Paid part-time employment	4	50
	Temporarily unemployed	1	12.5
	Other	1	12.5
Annual Family Income	Less than $20,000	3	37.5
	$20,001 to $40,000	2	25
	$40,001 to $75,000	1	12.5
	$75,000-$100,000	0	0
	$100,000 or above	2	25
	Prefer not to answer	0	0
Family Role	Parent	1	12.5
	Caretaker	0	0
	Dependent	0	0
	Independent	7	87.5
Visible Minority	Yes	1	12.5
	No	7	87.5

Primary Outcomes Measures

The primary outcome measures consisted of recruitment rate, retention, satisfaction with the NBI, and satisfaction with the RT program.

RT adherence was tracked through attendance at the weekly check-ins (see Tasble 5) and with verbal confirmation of the participants workout schedules. The participants who missed a weekly check-in were contacted separately to validate their RT progress.

Table 5

Participation rate in weekly check-ins

Participant	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Totals
Ned	present	present	present	present	present	present	P6:A0
Erik	present	absent	absent	absent	present	absent	P2:A4
Ryan	present	present	present	present	absent	present	P5:A1
Joe	present	present	present	present	present	present	P6:A0
Sal	present	present	present	present	present	present	P6:A0
Rick	present	present	present	present	present	present	P6:A0
Tal	present	present	present	present	present	present	P6:A0
Dan	present	present	present	present	present	present	P6:A0

A significant impetus in working with this demographic was the data showing that men seek help significantly less than women, often too late and tend not to follow through (Sharp et al., 2020a). The recruitment process seemed to anecdotally support the existing literature. As I will detail more fully below, recruiting took a significant amount of time, and the process encountered a variety of setbacks.

This study had a recruitment rate of 46% and thus showed above average recruitment success and the plausibility markers (see Table 6). Anecdotally, the recruitment process showed

a greater rate of success after establishing first contact through advertising and word of mouth referrals than it did in respect to the extended time and volume of exposure to initial interest.

This study had a 100% retention rate and thus can be identified as a strong trial according to the predetermined criteria. There was one participant who met the retention criteria but only attended a single video conference call check-in. This participant voiced that personality differences between himself and another participant was the main reason he wished not to take part in the group calls.

Table 6

Participant intervention feasibility and acceptability success criteria

Outcome	Success Criteria	
	NBI	**RT program**
Recruitment Rate	≥ 30%	
Retention Rate	≥ 80%	
Satisfaction	Mean score ≥ 3 points	Mean score ≥ 3.5 points

The participants' satisfaction with NBI segment of the proof-of-concept trial was collected through a questionnaire provided at the conclusion of the two days. The results are displayed (see Table 7 and 8) by participant and by question, both per item and as an average. Further details are provided in the discussion of this paper. Overall, the group reported satisfaction scoring higher than the success criteria threshold of 3 or greater.

Table 7

NBI Satisfaction

P	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Total Avg.
Sal	3	2	2	1	4	4	4	2.85
Rick	4	3	4	4	4	4	4	3.85
Tal	4	4	3	3	4	4	4	3.71
Joe	4	4	4	3	4	3	4	3.71
Ned	4	4	4	2	3	4	4	3.57
Erik	3	2	3	1	4	3	1	2.42
Ryan	4	4	3	3	4	3	3	3.42
Dan	3	4	4	3	4	3	3	3.42
mean	3.6	3.3	3.3	2.5	3.8	3.5	3.3	3.37
SD	0.5	0.9	0.7	1.0	0.35	0.53	1.0	0.73*

*mean SD

Table 8

Participant (N=8) satisfaction with the nature-based intervention

Item	**M ± SD**
Participant satisfaction	
NBI components	
1. I was satisfied with the two days of nature time	3.6 ± 0.5
2. I would do this again if I had the opportunity	3.3 ± 0.9
3. Having only males in the group was a benefit	3.3 ± 0.7
4. It was challenging connecting to others in the group	2.5 ± 1.0
5. Being in nature was an important factor in the experience	3.8 ± 0.4
6. I am likely to integrate this experience in my life	3.5 ± 0.5
7. I feel prepared for the RT program ahead	3.3 ± 1.0

The participants' satisfaction with RT segment of the proof-of-concept trial was collected through a questionnaire provided at the conclusion of the six weeks post-NBI. The results are displayed (see Table 9 and 10) by participant and by question, both per item and as an average. Further details are provided in the discussion of this paper. Overall, the group reported satisfaction scoring higher than the success criteria threshold of 3.5 or greater.

Table 9

Resistance Training Program Satisfaction

P	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Total Avg.
Sal	4	5	5	4	3	5	4	5	5	4.4
Rick	5	5	5	4	5	5	1	5	5	4.4
Tal	5	5	5	5	4	5	2	5	4	4.4
Joe	5	5	5	4	5	4	2	5	4	4.3
Ned	5	5	5	5	2	2	2	4	4	3.8
Erik	3	3	3	5	2	3	4	2	3	3.1
Ryan	5	5	5	4	4	5	2	4	5	4.3
Dan	4	5	5	5	4	5	5	5	4	4.7
mean	4.5	4.75	4.75	4.5	3.625	4.25	2.75	4.375	4.25	4.2
SD	0.75	0.70	0.70	0.53	1.18	1.16	1.38	1.35	0.70	0.94*

*mean SD

Table 10

Participant (N=8) Satisfaction with Resistance Training Program

Item	M ± SD
Participant satisfaction	
RT program	
1. I am satisfied with the RT program I just completed	4.5 ± 0.8
2. RT made a positive impact on your life over the last six weeks	4.8 ± 0.7
3. I am likely to continue an RT practice after this	4.8 ± 0.7
4. Having a group of men to check in with increased my motivation	4.5 ± 0.5
5. I am likely to maintain motivation without other people involved in the same program	3.6 ± 1.2
6. My mental health was positively affected by the inclusion of RT in my week	4.3 ± 1.2
7. Having RT in my schedule made my life more challenging	2.8 ± 1.4
8. I often considered quitting the program	4.4 ± 1.4
9. RT is now a higher priority in my life	4.3 ± 0.7

Secondary Outcome Measures

Without factoring in external interference, seven out of eight participants showed significant positive improvement in their PHQ-9 with the average reduction of negative health experiences being 42.25%. One participant reported negative health experiences reducing by

78.57%. Only one participant reported a deteriorated state of health with a 20% increase in concerns. The group's mean differential for the PHQ-9 showed a decline in depressive mood scores of 0.65 (see Table 11). In the pre-intervention scores, the aggregate for the group was 12.33, translating to a moderately severe depression (11-15 moderately severe anxiety). The post-intervention group aggregate score of 6.48 translates to the bottom of the moderate scores for depression severity (6-10 moderate). A score of 5 or lower is considered to represent mild depression severity (Stanyte et al., 2023).

Table 11

Preliminary PHQ-9 (Pre-Post) participant outcomes of the NBI-RT (N=8)

Outcome	**Pre-intervention** (M ± SD)	**Post-intervention** (M ± SD)	**M_{diff}**	**Cohens *d***
PHQ-9				
Aggregate	12.33	6.48	- 5.85	
Total Mean	1.37 ± 0.45	0.72 ± 0.34	- 0.65	- 1.44
1. Little interest or pleasure in doing things.	2.00 ± 0.86	0.75 ± 0.43	- 1.25	- 1.45
2. Feeling down, depressed, or hopeless.	1.38 ± 0.99	1.13 ± 0.78	- 0.25	- 0.25
3. Trouble falling or staying asleep or sleeping too much.	1.50 ± 1.11	1.00 ± 0.86	- 0.50	- 0.45
4. Feeling tired or having little energy.	1.63 ± 0.99	1.13 ± 0.59	- 0.50	- 0.50
5. Poor appetite or overeating.	1.50 ± 0.87	0.50 ± 0.50	- 1.00	- 1.15
6. Feeling bad about yourself - or that you are a failure or have let yourself or your family down.	1.75 ± 0.97	0.88 ± 0.33	- 0.87	- 0.9
7. Trouble concentrating on things, such as reading the newspaper or watching television.	1.38 ± 0.48	0.75 ± 0.66	- 0.63	- 1.3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite - being so	0.75 ± 0.66	0.13 ± 0.33	- 0.62	- 0.94

fidgety or restless that you have been moving around a lot more than usual.				
9. Thoughts that you would be better off dead, or of hurting yourself in some way.	0.50 ± 0.71	0.25 ± 0.43	- 0.25	- 0.35

The post study reports on the GAD-7 showed a universal improvement in general anxiety from both groups. The average reduction in reported anxiety was 50.71 %. One participant reported an 84.61% reduction in anxiety related concerns. The participant who had the smallest improvement in their GAD-7 score, with a 20% decline in concerns, was the participant who chose to miss the majority of weekly check-ins. The group's mean differential for the GAD-7 showed a decline in anxiety scores of 0.82 (see Table 12). In the pre-intervention scores, the aggregate for the group was 11.41, translating to a moderately severe anxiety. The post-intervention group score of 5.67 translates to mild anxiety severity (Spitzer et al., 2006).

Table 12

Preliminary GAD-7 (Pre-Post) participant outcomes of the NBI-RT (N=8)

Outcome	**Pre-intervention** (M ± SD)	**Post-intervention** (M ± SD)	**M_{diff}**	**Cohens *d***
GAD-7				
Aggregate	11.41	5.67	- 5.74	
Total Mean	1.63 ± 0.33	0.81 ± 0.32	- 0.82	- 2.48
1. Feeling nervous, anxious, or on edge.	2.00 ± 0.87	1.13 ± 0.93	- 0.87	- 1.01
2. Not being able to stop or control worrying	1.75 ± 1.09	0.63 ± 0.99	- 1.12	- 1.03
3. Worrying too much about different things.	1.88 ± 0.59	1.25 ± 0.97	- 0.63	- 1.05
4. Trouble relaxing.	1.88 ± 0.93	0.88 ± 0.93	- 1.00	- 1.07
5. Being so restless that it's hard to sit still.	1.00 ± 1.00	0.38 ± 0.70	- 0.62	- 0.62
6. Becoming easily annoyed or irritable.	1.50 ± 0.86	1.00 ± 0.71	- 0.50	- 0.58

7. Feeling afraid as if something awful might happen.	1.38 ± 0.69	0.38 ± 0.48	- 1.00	- 1.44

The exit interviews provided testimonials and an opportunity for feedback for how the participants were impacted by the intervention, its enjoyability, accessibility, effects on RT motivation and motivational catalysts, perceptions of changes in competency around RT, and changes in relatedness to individuals practicing RT (see Appendix C for exit interview questions). Thematic coding for the transcripts of the interviews was utilized to extract commentary that exemplified the themes and subthemes (see Table 13). The first theme, *Participant Satisfaction with Time in Nature*, captured interview statements that fell in the subthemes of either: *1a. Enjoyment and benefits of the intervention*, or *1b. Challenges to participation*. The most pertinent quotes were included. The first subtheme captured the positive aspects of guidance through facilitation, the educational value of the NBI's curriculum, accountability within a social context, nature and nature connection as a beneficial in engaging the group and with the content. The second subtheme reflected the challenges to participation, which were time and location. Both challenges were described as reasonably surmountable. The second theme, *Participant Satisfaction with Resistance Training Program*, divided the responses into the same subthemes as theme 1. *The Enjoyment and benefits of the intervention* were most notably in an increased sense of motivation and competency regarding RT. Comments also captured mental health benefits of reduced stress and mood. The challenges were mainly around time and motivational shifts. These were noticed but did not become prohibitive for making progress. The third theme, *Feedback on Intervention Format and Motivational Change*s, included three subthemes: *3a. NBI value to RT*; *3b. Weekly Check-ins and Support*; *3c.*

Applications Going Forward. The 3a. subtheme highlighted the impact of the time in nature for buy in to the program and group, wanting more of it, the value of having trust in the facilitator, and relatedness to the group. Subtheme 3b. captured the importance of weekly check-ins for motivation and accountability, group connection, and facilitator guidance. The third subtheme looked at applying the content of the intervention going forward and mainly collected statements that reflected a heightened appreciation, competency, autonomous motivation regarding RT.

Table 13

Qualitative themes from participant exit interviews

Themes & Subthemes	Illustrative Quotes
1. Participant Satisfaction with Time in Nature	
1a. Enjoyment and benefits of the intervention	"The leader, the person responsible for facilitating the experience, gave me some insightful thoughts that changed my perspective on some things." - Erik "After the first weekend it was like, okay, now, now, I have like a commitment with more people, and I have to do it. And not only because of the group, but because it's like the research you shared." – Tal "And there's just so many layers the accountability of meeting in person, and I think nature is 100% the right place for that." - Ryan "That initial launching platform with nature and nature connection with the other guys, yourself and myself actually having a real relationship." - Ryan
1b. Challenges to participation	"Making the time to take two days was challenging at first but once I committed, it was not a problem and worth the effort." – Ned "The biggest obstacle was getting there but you did pick a place that was pretty accessible by public transit." - Dan

2. Participant Satisfaction with Resistance Training Program	
2a. Enjoyment and Benefits of the intervention	"I can feel my muscles, my body. My mood is more stable." – Rick "I've noticed better muscle firmness. And when I'm lifting, I'm not thinking about too much else. I've felt a natural desire to do it and it alleviates stress." – Joe "You just gave me new information which I can utilize, and I've shared it with a lot of people" - Erik "During this program, it was actually just having your experiential advice for which exercises to do that have like an overall whole-body benefit. That really helped me kind of focus and not get overwhelmed by thinking about which exercises should I do." – Joe "I didn't used to enjoy lifting because I felt for me it was kind of boring, but now, I realized that it was because I was not pushing myself hard enough. I was like kind of afraid of hurting myself. So, I didn't really put a lot of weight on or anything. Also, because I didn't do a lot of effort, I didn't see a lot of changes. So that was kind of discouraging, too. And now, yeah, I always like trying to push myself a little further." – Tal "I don't feel lost when I go to the gym. And then it's just you keep going, and the confidence just keeps going." – Ned "I was able to go from contempt for weightlifting in the gym to showing up every week and learning and experimenting with that." – Ryan "I think it's led to 180 degrees shift - I went from not caring to, if anything, I'm going to keep up the same routine." - Ryan

2b. Challenges to participation	"The time it takes, and my other responsibilities are a challenge right now." – Tal "My original motivation is not there – longevity – I noticed this when I miss one workout because I was away, but I did exercise. I felt a bit like I failed but as soon as I got back, I went instantly." – Sal "Forming a new habit is almost like kicking an addiction" – Erik "Kind of more in-person contact and checkups around that stuff." – Joe "I think that's the hardest part is getting so you feel comfortable to keep going and keep learning." – Dan
3. Feedback on Intervention Format and Motivational Changes	
3a. NBI value to RT	"The time in the forest was the most impactful by far." - Erik "Maybe a second day of nature time in the middle or something. I think I would have gotten more enjoyment out of that, because I really love being out in nature and physically being around other people doing things like this together." – Joe "There were a bunch of things that made that it possible. I think a big part of that… would be the confidence I had that I wasn't just picking up bull$h!t on the Internet. I'm being given some structure and a plan by someone who knows something and is giving me a good base starting off point and paired with the accountability. And there's just so many layers the accountability of meeting in person, and I think nature is 100% the right place for that. And then the check-ins." - Ryan
3b. Weekly Check-ins and Support	"I can't let these guys down." – Rick

	"Pressure of meeting helped me not to procrastinate." – Sal
	"It was a really good time talking with all of you. I felt like we had a really unique good, strong bond, and that's what has led me to work out so much in the past week, too." – Erik
	"Having a meeting once a week helps with motivation." – Joe
	"Just having someone with a lot of expertise, but not the kind that lays any hammers down and just being very accepting and accommodating of each person where they're at. So that's been very motivating." – Dan
	"The formation of a habit - being accountable with someone else - kind of forced me to because I've been trying to go back to the gym for a while now, and I was like, it doesn't matter if I don't go, it's okay. But having in the back of my mind that I cannot go to the meeting and say like, oh, I didn't go even once." – Tal
	"Every week the accomplishment of like reaching the goal, or when it was possible to go beyond the goal." - Ned
3c. Applications Going Forward	"It motivates me to be better in other ways." – Joe
	"Motivated me to improve sleep and nutrition as well." – Sal
	"I feel, way more competent that I felt 6 weeks ago. I feel that I still have a lot of things to learn. I would never even think about saying that I have the same knowledge or expertise than people who have been doing this for years, but at least I don't go feeling that I don't know what I'm doing." – Tal
	"And now I kind of identify people in my existing social group that are interested in working out. And there's these different weight training classes that I can get involved. And there's a bunch of

different stuff that's out there, and that I wouldn't have ventured into. It wasn't for this." – Ryan

"I'm like, okay, there's this huge like, I come across this huge toolbox, and you gave me 6 different tools to play with over the course of the last 6 weeks. and I've gotten kind of familiar with those, and I've been able to look at other things out there." - Ned

"I've known that resistance training is an important part of my health for a while and being able to recruit a program to help me with that and make that accessible to me was massive." - Dan

Discussion

The purpose of this study was to assess proof-of-concept - through the theoretical lens of SDT - of the potential for the consecutive dual interventions of an in-person NBI group connection and a virtually supported RT program to provide benefit for male mental health and well-being. The rationale for this study comes from a recognition that men are disproportionately struggling academically (Morita et al., 2016; Workman & Heyder, 2020), with mental health , addiction, suicide (Chatmon, 2020), and all-cause mortality (Wang et al., 2016b). These issues are especially prevalent in young males aged 18-34. Through this proof-of-concept trial, the participants showed overall satisfaction with both the NBI and RT segments, improvements in their mental health – specifically depression and anxiety – as reported with pre-post evaluations, and an increased motivation to adhere to an RT practice in their lives going forward.

Primary Outcomes

Recruitment and Retention Rate

The recruitment process highlighted the underlying impetus for this proof-of-concept trial – men are slow to seek help, often do not follow through, and deprioritize their health compared to women (Gough, 2013; Sharp et al., 2020; Wang et al., 2016). The men who showed up on day one of the intervention came with an awareness of their need to improve their physical and mental health. These men had all tried to improve their health in various ways before. Their willingness to put effort into health-related behaviors distinguished them from many of the men who neglect this area of their lives. The success criteria for recruitment were set upfront at a rate of 42% or greater (see Table 5). After some attrition of interested prospects and several no-shows at the outset of both NBIs, the study had a total of eight participants, with four in each group. The recruitment rate was 46%. In recruiting for this study, a lead list was gathered from social media postings, Facebook group posting, a $35 paid boosting of the social media post, and physical posters placed in the community. Each prospect that ended up on the list was contacted multiple times – at least four tries - through email correspondence to encourage them to enroll.

While recruitment surpassed the success criteria, this could be potentially improved further in several ways. Greater lead time and exposure would benefit recruitment in future studies of this sort. Dissemination of the recruitment poster through various departments at multiple post-secondary institutions might elicit greater response. The demographic of 18 to 34 presents with several challenges. Many of the potential participants exposed to the recruitment promotions were either already utilizing RT or had not recognized it as valuable for them and thus had little interest. Younger and older prospects could be enroll in greater numbers. High school aged males are more likely to be uninitiated in RT and, therefore, would be more likely to

gravitate towards this type of supportive introduction than those already with a self-perception of some competence in RT. All the participants were over the age of 26 and 62.5% were over 30 years of age. Both the capacity to seek support and the recognition of the value of health interventions generally increases as one ages. If the inclusionary criteria expanded the age bracket to 40 and/or included high school age males, then recruitment would be less challenging. A recommendation to consider is increasing the budget and efforts through social media. This source seemed to offer a good return on investment with trackable results.

The retention rate was 100%, as every participant who started the intervention completed it. This rate cleared the success criteria of 80% or greater (see Table 5). The NBI aspect required two consecutive days of commitment, of which all eight participants achieved. The second phase was the six-week RT program with weekly group video check-ins, some completion paperwork, and a final exit interview. All participants completed the paperwork and did an exit interview with the researcher-facilitator. One participant only attended one group video check-in. This participant remained in contact with the researcher-facilitator but expressed a resistance to meeting with the group. The stated reasons for this and my analysis are expanded below.

While retention was 100%, further modifications for future iterations of this type of study might enhance this outcome in terms of ease of effort and investment of time. The value of having a group with high levels of relatedness was elucidated in the successful support and comradery that aided in motivation and adherence to the RT program. This was expressed repeatedly in the check-ins and exit interviews, for example, Rick stated, “I can’t let these guys down.” Sal echoed this sentiment with the “pressure of meeting helped me not to procrastinate.” The connections that occurred through the initial in-person NBI lay the foundation for enhanced interpersonal bonding during the weekly video conference calls. These check-ins encouraged

accountability and bolstered social influence. Ideally, motivation resides intrinsically and is autonomously generated; however, this might be an unrealistic expectation in the earlier stages of developing a RT practice. Through the duration of the intervention greater autonomy was observed – which could be attributed to an increased sense of competency with the RT program and relatedness around common goals – as reflected in Erik's statement,

"It was a really good time talking with all of you. It feels like we had a really unique, good, strong bond, and I know that's what has led me to work out so much in the past week, too".

The importance of relatedness was not just apparent in the successful aspects of retention and adherence but also through the one individual who expressed his lack of it in regard to another specific individual. This lack of relatedness caused the participant to avoid the weekly check-ins when the other participant was going to be there. Although this was not what the design of the study was aiming for, it has provided greater clarity on the value of, as much as possible, having a significant level of relatedness amongst all participants. A more thorough screening of participants in creating the groups to potentially eliminate counterproductive interpersonal dynamics might be worthwhile. In this case, it was related to differing perceptions of masculinity. This topic can be a challenge to navigate depending on participants backgrounds, conscious and unconscious beliefs, and other confounding variables. Being intentional and meticulous about the participants constituting each group could be beneficial in mitigating antagonistic situations. Nonetheless, the participant struggling with relatedness remained active with the group check-ins when his antagonist participant was not present and maintained regular contact with the researcher-facilitator throughout the study. He was still able to complete all the requirements for retention. The fact that this participant remained with the study and reported positive changes from pre-intervention to post-intervention along with the rest of the group all

meeting or exceeding the success criteria leads me to recommend at least moving forward to the next stage in the ORBIT model with phase IIb, pilot testing, if not phase III, an efficacy trial (Czajkowski et al., 2015).

NBI satisfaction

The plausibility for satisfaction was measured by scores exceeding 3 out of 4 through the NBI Satisfaction Questionnaire (see Table 5). Overall, participants reported a high level of satisfaction with an average score of 3.365 (see Table 6 and 7).

The group scored the highest on the questions 1 (3.6) and 5 (3.8) which relate to the outdoor nature aspect of the experience. A participant, Ryan, stated, “And there's just so many layers [to] the accountability of meeting in person, and I think nature is 100% the right place for that.” The other two questions with overall high scores were 3 (3.3) and 6 (3.5) which asked about the value of having only males in the group and the likelihood of integrating the experience, respectively. The lowest levels of satisfaction were in connecting with the other participants (question 4; 2.5).

Satisfaction with the NBI was highest in relation to being in nature for the experience. There is likely a degree of self-selection that is reflected in higher satisfaction with nature-based activities. The participants were aware that the study design included two days of nature time, and their enrolment is an acknowledgement that this was an acceptable if not a desirable aspect of their participation. Beyond this, being in nature was an opportunity to improve well-being through social connection (Norwood et al., 2019), stress reduction (Bratman et al., 2015); Hunter et al., 2019b), and an improved sense of well-being (Shukla, 2019). Being in nature was an integral aspect to favorable satisfaction reports but the inclusion of nature connection activities,

psychoeducation and interactions that gave the participants opportunities to share their perspectives, gain further understanding of their challenges, and experience supportive strategies added to the positive valuation of the NBI.

Facilitating a small group in nature for multiple hours provided an environment of reduced distraction that is more conducive to connection and potentially less inhibiting in terms of self-expression. While this setting seemed to provide a space conducive for the exploration of a variety of issues, the commitment of two consecutive seven hour days could be prohibitive for some. Considerations of condensing the NBI experience to a shorter time duration while maintaining the fundamental aspects of it would likely be a valuable modification in a future study.

RT satisfaction

The plausibility for satisfaction was measured by scores exceeding 3.5 out of 5 through the RT Satisfaction Questionnaire (see Table 5). Overall, the group reported a high level of satisfaction with an average score of 4.2 for the 6 week RT program (see Table 8 and 9).

The high scores were on questions 2 (4.8) and 3 (4.8) which relate to RT making a positive impact and the likelihood of continuing it. Question 9 was another high scorer also with an average of 5. This question asked if RT was now a higher priority. A participant, Ned, stated, “I don't feel lost when I go to the gym. And then it's just you keep going, and the confidence just keeps going.” While another participant, Ryan, expressed, “I was able to go from contempt for weightlifting in the gym to showing up every week and learning and experimenting with that.” Question 4 had a high score too (4.75), which related to the value of a check-in with a group of

men adding to motivation. This sentiment is captured with Joe's statement, "Having a meeting once a week helps with motivation."

The lowest levels of RT satisfaction were reported in the question which anticipated maintaining motivation without the support of a group of men (question 5; 2.5). This seems to speak to the value of a men supporting men in the mutual pursuit of better health. Question 7 – relating to the difficulty of adding RT to one's schedule - had some lower scores but could be interpreted in contradictory ways in how it represents the RT program satisfaction.

The group data suggests that the RT program satisfaction was favorable and contributed to continued motivation to implement RT into daily life. Participant Dan said, "I've known that resistance training is an important part of my health for a while and being able to recruit a program to help me with that and make that accessible to me was massive". The structure of the RT program – which arguably was significantly supported by the prior NBI – led to increased interest in RT, a deeper recognition of RT benefits to both mental and physical wellbeing, and higher prioritization of RT in the participants lives.

Secondary Outcomes: RT Adherence and Mental Health

This proof-of-concept trial utilized SDT as a theoretical framework for the design of the NBI and the RT program as well as to analyze participants' processes. The psycho-educational presentations and ensuing discussions intentionally disseminated the concepts of SDT to the participants and incorporated MBCT (Teixeira et al., 2020) that relate to the underlying psychological needs of autonomy, competence, and relatedness. Since SDT has demonstrated promise in health-related behavior change by addressing these psychological needs that influence

motivation (Deci & Ryan, 2000; Gillison et al., 2019), the facilitation of the activities and the weekly group video check-ins included these concepts.

With this being a proof-of-concept trial, the primary goal was not efficacy. Assessing if men could be recruited, would complete the study, and report satisfaction in their experience was paramount. Nonetheless, the men who signed up all had some level of psychological stress disrupting their wellbeing. None of the participants had an issue with filling out a questionnaire that divulged their mental health challenges. While the attraction to connect in nature and with nature as well as improve their physical health through resistance training was a significant motivator, it seems that their mental health challenges at least played a part in their eagerness for improved connection and strength.

Undoubtedly, each participant had other variables in their lives as they traversed the 44-day program. Changes in work situations, relationships, living arrangements and more were reported to me. These factors cannot be controlled in this kind of study. They obviously affect the mental health and fortitude of the participants. Variables beyond the scope of the study could have significantly interfered with the time and capacity it takes to engage in RT two or three times a week for 90 minutes. This does not necessarily imply that the motivation to adhere to the scheduled RT sessions was less in those who worked out less. The difference in external factors can make comparison of participants difficult.

Overall, the data reflects favorably on the NBI as a satisfactory mechanism in the design of this proof-of-concept trial. The participants' reports suggest that the NBI was effective in advancing willingness to embark on new healthy habits, motivate to utilize nature for improved wellbeing, and foster opportunities to build connection with other men interested in health.

Autonomy

All the participants who enrolled and began the NBI had a degree of autonomous motivation for the stated goals of improved health and wellbeing through increased connection to nature, other men, and implementing RT into their lives. While they began with the study with sufficient motivation to make the time for two consecutive days of NBI and a commitment to six weeks of 90-minutes of RT (divided into two or three sessions), the ensuing NBI and the ongoing support throughout the RT program aimed to increase that motivation. By elucidating the role that RT plays in not just aesthetic physique improvements and strength gains – which were motivating factors for several participants – but also in improved cognition (Caponnetto et al., 2021; Marston et al., 2017), mood improvement (Biddle, 2016), anxiety and depressive symptom reduction (O'Sullivan et al., 2023), and increased self-esteem (Carron et al., 1996), enhanced autonomous motivation was evident and reported. All the participants had shared some mental health concerns in their pre-study PHQ-9 and GAD-7 questionnaires, making improvements in mental health a universally desirable goal for them. One participant had expressed a negative bias towards 'gym culture'; however, through the NBI interactions and activities, he gained an appreciation of the benefits of RT for improving the quality of his life. He was a committed rock climber and did not want to 'waste time' in the gym but realized that RT could significantly enhance his climbing skills. Notably, he would not have joined the study if there was not an NBI component first. Through the NBI, his perceptions about RT were altered. In the NBI discussions about RT, the participants shared that they "wanted to feel confident walking into a room," "gain a sense of pride from the discipline and consistent hard work" that was required for RT, "improve [their] ability to persevere through challenges" as well as other goals that reflected an autonomous motivation. These indicators of intrinsic motivation are associated with behavioral

persistence and healthier psychological outcomes across numerous health contexts and through a compelling body of research (Chatzisarantis et al., 2012).

Competence

The participants in both groups had some experience with being in nature. This could have to do with the relative ease of access that people living in Victoria have to many urban green spaces, regional parks, and other nature settings. Still, even those with more nature experience had limited knowledge and skills in nature connection. They were provided with several nature connection activities that are easy to do and implement by yourself. The silent nature walk and sit spot are two examples that were included in the NBI agenda (see Table 3). Through these activities and the discussions that followed, the participants gained a greater competency in connecting with nature. This provides an opportunity for continued utilization of the NBI for benefits such as improved cognitive function (Berman et al., 2008), stress reduction (Hunter et al., 2019a), enhanced social wellbeing (Norwood et al., 2019), greater resilience and recovery (White et al., 2023), and further positive mental health shifts (Barton & Pretty, 2010; Richardson et al., 2019; Robbins, 2020; Tillmann et al., 2017). In the context of SDT, "the need for competence refers to the experience of being effective in one's environment, mastering mentally or physically challenging tasks, and perceiving sufficient capacity to perform actions" (Teixeira et al., 2020). Arguably, being effective at connecting to nature while being present in that environment is a significant measure of mental and physical self-regulation. It reflects an ability to be at ease in a nature, which contrasts with the modern realities of so many people being disconnected from the natural world (Little & Derr, 2018; Preub et al., 2019).

In relation to RT, competence was enhanced during the two-day NBI in several ways. All the participants except for one had negligible experience with RT. The one who did have more experience had not practiced RT for years. The design of the NBI provided information about specific exercises, their benefits, recovery and nutrition advice, tips for scheduling training, monitoring progress tactics, guidance on correct technique and safety, adaptations for at-home workouts, and other pertinent details to increase knowledge, comfort, and competence. All the participants reported feeling ready for the RT program at the end of the NBI. The one exception was the participant who had previous experience with RT. Why he did not feel prepared was not made clear. It is reasonable to assume that he was prepared with the knowledge that was provided prior to the NBI information on RT and thus did not feel any more prepared. It is also possible that he did not have the motivation due to his aversion with a member of the group, which potentially detracted from his state of readiness. This interpersonal dynamic continued to interrupt his willingness to join the group for check-in calls. The significance on motivation of a lack of connection to one or more members of the group reflects the psychological need of relatedness which is discussed further below.

The weekly check-ins were integral for promoting competence. These group video calls provided an opportunity to give support for both technical issues surrounding RT as well as psychological challenges in adhering to the program. All the participants expressed an appreciation of the check-ins and valued having support from a facilitator with more experience and knowledge than them in this field. This ongoing facilitation provided opportunities to address questions and quell doubts through the discussions that arose from the weekly questions that were asked (see Figure 3). The check-ins utilized the MBCT that were summarized in Table 3 which were an “organized description of the essential techniques implemented within

interventions based on self-determination theory in health contexts using an expert consensus approach" (Teixeira et al., 2020). Each week, the participants met for an hour and a half to share their experiences, describe their successes, and get support for their concerns. Often, there was significant peer support on the calls. The value of the check-ins was multifactorial as the participants expressed that friendly competition, accountability, connection to others going through a similar experience, and encouragement were key factors in moving forward through the six weeks. The calls reinforced the men's existing knowledge of RT as well as improved it. This supported the psychological need of competence in relation to continuing motivation for their RT and other associated health habits. The calls were also essential for fostering the SDT aspect of relatedness.

Relatedness

Both the initial NBI and the subsequent RT program utilized SDT's basic psychological need of relatedness to increase motivation. In the NBI, the participants met and had two days to connect and bond. This was fostered through meaningful discussions, opportunities to share goals, concerns, challenges, and other personal insights. Each participant was encouraged to open up and clarify their motivations for getting involved in the study. While recruiting requirements bracketed age eligibility between 18-34, all the participants were comprised of males between the ages of 27-33. Relatedness was applicable in a multitude of ways from the outset of study – age, sex, location, desire to improve personal health, an interest in NBI and RT. The activities that filled the NBI were also designed to further this relatedness, from the basic notion of spending two days undistracted in nature with a small group to engaging in substantial dialogue spanning relevant subject matter. Being in nature while exchanging ideas about health,

issues surrounding manhood, and purpose allowed the men to feel calmer (Norwood et al., 2019) and promoted focus on being present (Shukla, 2019). This likely helped with the bonding.

In the second group, there was an unfavorable dynamic between two participants. Although this friction was not overt and serious, it shifted one of the participant's desire to engage during the second day. The other participant in this interaction was more talkative than the rest of the group and could go on tangents at times. He also expressed a different perspective on masculinity than most of the group and certainly than the participant who was antagonized by this. While this inharmonious interpersonal scenario did not aid with the antagonized participant's progress in the study, it highlighted the importance of relatedness in motivational behavior change. The rest of the group was unaffected and the first group – which clearly had good interpersonal connections – explicitly reported the value of being part of a group they could relate to.

During the RT program the most significant opportunity for relatedness was during the weekly group video conference call check-ins. The men were eager to share, committed to showing up, and generous in offering encouragement and support. The participants usually displayed mood improvement and increased enthusiasm over the course of the hour and a half video meeting. The regularity of the meetings created a palpable point of connection to anticipate each week. This seemed to motivate the men to complete their minimum of 90 minutes of RT before the next check-in. On the odd time someone was unable to get two or three workouts in between check-ins, they were encouraged by the group and myself which seemed to reignite their motivation. Having consistent, standardized check-ins kept the group in the mind of each individual and aided in a sense of relatedness throughout the six weeks. By maintaining the initial bonds of the NBI and building upon them through mutual encouragement during the RT

program, the men knew they had a supportive group while they strove to implement new health habits in their lives. Beyond the value of autonomous motivation to initiate their journey with RT, relatedness seemed to be the most significant motivator in adherence. The need of relatedness reflects the need to feel accepted and respected, and to gain a sense of connectedness and mutual concern with important others (Deci & Ryan, 2000), which was tangible in observing the group's interactions.

Overall, mental health, RT adherence, and SDT motivation all showed progress and improvement. This was expressed repeatedly and explicitly in the exit interviews (see Table 12). Nonetheless, these are preliminary outcomes which suggest the need for further research and studies to corroborate these findings. It seems that the value of an NBI-RT intervention is promising for RT adherence, improvements in anxiety and depression, and SDT motivation – especially for men.

Other Findings

Through this study a variety of insights have arisen and might be of value in future iterations of this type of study and/or program: group selection, additional in-person events, and accessibility in terms of in-person time commitment. The importance of group selection became even more apparent through the challenges that arose between a couple of the participants. Although it might be complicated to screen all participants adequately and gain sufficient insight into their personalities and perspectives prior to the outset of a study like this, it would be worthwhile to be more cognizant of the importance of relatedness' reliance on positive regard between group members for increasing the likelihood of success in program adherence and retention. While structuring a group carefully with individuals that are more likely to connect and

want to support each other might be ideal, it might not be realistic. Another approach would be to further the efforts, activities, and discussions in the initial NBI to aid in transcending interpersonal challenges. This was done in this study, but it could be reexamined and enhanced.

A significant portion of the participants vocalized wanting more in-person connection opportunities. The suggestions indicated a mid-point and/or endpoint reconnection. The value of being physically present with the group you are involved in is not a surprise. Human connection is a psychological need and while the video group check-ins offer it to some extent, evolutionarily, humans are hardwired to bond in person. While adding another in-person meeting would address this desire and likely be advantageous for motivation, practically adding more demands on time and travel could result in less accessibility for some participants. The balance between optimizing motivational supports and respecting the challenges arising when coordinating the schedules of multiple individuals needs to be navigated with intentionality and practicality.

In consideration of accessibility, including a two-day, weekend, in-person component certainly challenges the availability of a significant number of potential participants. The NBI was invaluable in building group relatedness, enhancing autonomous motivation, and advancing competency. It is difficult to estimate to what extent it contributed to the retention and adherence of the participant in the subsequent RT program. The NBI offered important cohesion for the group, buy-in to the program, and trust in the facilitator. However, it is plausible that with the elimination of a two-day in-person event, there would have been more participants enrolled. It is possible to reduce the time of the in-person NBI instead of eliminating it. The options could be a single day, a few evenings, a half-day, or even online guided NBI program. It would be important

to not reduce this aspect too much for the purpose of higher enrollment so that its benefits would be diluted to negligible.

Limitations and Future Directions

While as a proof-of-concept trial, limitations might not be as concerning as an efficacy study, they are still valuable to consider. The sample size of the group is small and thus, might not be reflective of the demographic. Self-selection may have played a part in the type of individuals who were attracted to enrolling. This might have led to more favorable outcomes than the population in general. The duration of the study likely increased the propensity for confounders to affect the participants wellbeing, motivation, and availability more than a shorter study or one that did not expect the same continuous level of commitment.

Considering these limitations, future iterations of this type of study might benefit from maintaining more detailed and rigorous accounting for other influences. Daily or weekly participant journal entries might elucidate the extraneous variables affecting changes in motivation, SDT factors, mental and physical health shifts, and other influences. It is unlikely that these can be fully controlled for but documenting them could provide further insights. Increasing sample size and utilizing randomization would offer greater accuracy on the efficacy of the prescribed intervention. It might be worthwhile splitting the group into cohorts that have no NBI versus one that has the same two day NBI and one that has a more basic and shorter NBI, for example, a three hour evening session, or a virtual version. The commitment to two consecutive days could stifle moving this intervention into a general clinical practice; however, if it is vital to achieving the benefits observed in this proof-of-concept trial, it would be inadvisable to alter it too drastically.

Summary

This study provided significant evidence of the proof-of-concept for a NBI followed by an RT program to positively impact men's health and wellbeing. The recruitment process showed higher success (46%) than comparable feasibility studies in the health context (30%). These data suggest that men are motivated to improve their health through NBI and RT mechanisms. The 100% retention rate reflects a study design that was sufficiently compelling to avoid attrition. This could be attributed to the satisfaction with the NBI as an intervention to increase self-efficacy and connection to others, improved SDT motivation, and the satisfaction with RT as a practice that improves mental and physical health. The self-reported questionnaires, weekly check-ins, and exit interviews support these claims. While a two-day NBI might be prohibitive in terms of availability for a portion of potential participants, the experience of connecting with nature and with likeminded men was pivotal in supporting relatedness and advancing autonomy and competence for the subsequent RT program. NBI can seem disconnected from RT but both pursuits connect with aspects of masculinity that might engage men to prioritize their health more than they otherwise would. Regardless of how aligned NBI and RT seem, the opportunity to utilize nature to connect with a group prior embarking on a health-related behavior change program makes sense. In nature, without the distractions and presence of everyday stressors, bonds can be formed, self-efficacy can be strengthened, and one can prepare more effectively for the challenges ahead. Men are 1.6 times less likely to receive conventional mental health support than women (Sagar-Ouriaghli et al., 2019) and interventions that implement an action-orientated or solution-focused framework may be promising as men are less inclined to engage in

traditional talking therapies (Patrick & Robertson, 2016). The value of providing NBI and RT structured interventions for this demographic is promising and needed.

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Appendix A

RT Workout Log (Week 1 Sample)

	Week 1		Week 1	
	Session 1		Session 2	
	Sets/reps	Weight	Sets/reps	Weight
(Example)	Set 1:10 reps Set 2:10 reps Set 3: 8 reps	30kg (65lbs) 30kg (65lbs) 30kg (65lbs)	Set 1:10 reps Set 2:8 reps Set 3: 10 reps	65lbs 75lbs 65lbs
Chest press				
Squat				
Row				
Lunge				
Shoulder press				
Pulldown				

Appendix B

Classification of Motivation and Behavior Change Techniques

Label	Definition	Function description
	Autonomy-Support Techniques	
MBCT1. Elicit perspectives on condition or behavior	Encourage exploration and sharing of perspectives on current behavior (e.g., causes, perpetuating factors etc.).	Allows exploration of behavior in more depth (self-knowledge), which can inform the program and personal choices.
MBCT2. Prompt identification of sources of pressure for behavior change	Prompt identification of possible sources of external (or partially internalized) pressures and expectations, and explore how they may relate to client's desired goals and outcomes.	Explores locus of causality and potential sources of external/introjected regulation and its consequences.
MBCT 3. Use non-controlling, informational language	Use informational, non-judgmental language that conveys freedom of choice, collaboration, and possibility when communicating (avoiding constraining, pressuring, or guilt-inducing language). For example, use "might" or "could" instead of "should" and "must".	Avoids being a source of pressure or creating internal pressure, countering external locus of causality for actions.
MBCT 4. Explore life aspirations and values	Prompt identification and listing of important life aspirations, values, and/or long-term interests and explore how changes in behavior (or maintaining the status quo) could be linked to them.	Explores integrity and internal coherence between aspirations, values, and goals/behaviors, which can sustain autonomous regulation.
MBCT 5. Provide a meaningful rationale	Prompt client to identify rationale for behavior change and its maintenance that is tailored, explanatory, and personally meaningful or valuable.	Highlights and reinforces motives/reasons that could form the basis of autonomous motivation.
MBCT 6. Provide choice	Provide opportunities to make choices from a collaboratively-devised menu of behavioral options and autonomous goals. It includes the decision not to change, delay change, select focus/intensity of change, personally endorsed intrinsic goals and standards for success, including the timing or pace for certain outcomes.	Promotes personal input and ownership over behavior change and responsibility through choice.
MBCT 7. Encourage the person to experiment and self-initiate the behavior	Prompt the person to experiment and self-initiate (new) target behavior that could be fun and enjoyable, is experienced as positive challenge, opportunity for learning or personal expression, and/or are associated with skill development, all of which provide experiential / immediate positive reinforcement".	Supports autonomous action via intrinsic motivation.
	Relatedness-support techniques	
MBCT 8. Acknowledge and respect perspectives and feelings	Provide statements of empathy and acknowledgment of the person's perspective, conflicts/ambivalence, distress and negative affect (fear, confusion, etc.) and also expression of positive feelings when communicating with client (concerning the target behavior, treatment, or other related matters).	Indicates attention and respect for the person's attitudes, thoughts perceptions, and feelings, which creates an accepting and warm social environment.
MBCT 9. Encourage asking of questions	Prompt the client to pose questions regarding their goals/behavioral progress.	Creates an open and collaborative relation that promotes trust.
MBCT 10. Show unconditional regard	Express positive support regardless of success or failure.	Demonstrates unconditional respect, care and support and promotes warm social environment.
MBCT 11. Demonstrate/show interest in the person	Provide statements of interest and curiosity about the person's thoughts and perceptions, personal history and background, social context, life events, etc. when communicating.	Displays involvement; indicates to the person that their experiences and input are valued.
MBCT 12. Use empathic listening	Demonstrate attentiveness to the client's responses (e.g., stay silent to allow the person to complete sentences), and provide reflective and summary statements when appropriate (directed at affect or content) when communicating. Prompt permission to provide new information, guidance or advice.	Creates open, collaborative relation; promotes trust; displays respect for the person.

Label	Definition	Function description
MBCT 13. Providing opportunities for ongoing support	Offer the person an appropriate venue and means to contact you in the event of difficulties or questions during the behavior change process.	Shows care and personal involvement.
MBCT 14. Prompt identification and seek available social support	Prompt identification of sources of support for behavior change (if relevant), acknowledge challenges in recruiting adequate support (autonomous vs controlled), and promote effective ways of seeking positive support.	Includes strategies that will help in feeling confident to overcome potential challenges and meet behavioral goal (e.g., information about available programs, active involvement of others such as family members).
	Competence-support techniques	
MBCT 15. Address obstacles for change	Prompt identification of likely barriers to behavior change, based on previous attempts, and explore how to overcome them (e.g., what may have worked in the past).	Increases confidence and reinforces existing skills.
MBCT 16. Clarify expectations	Prompt statements of client's own expectations in terms of behavior change (e.g., identify a clear goal or learning objective), both its experiential elements (process) as well as outcomes.	Provides structure and minimizes future failure (and perceived incompetence).
MBCT 17. Assist in setting optimal challenge	Assist in identification of goals that are realistic, meaningful challenging, and achievable.	Provides structure and minimizes future failure (and perceived incompetence)
MBCT 18. Offer constructive, clear, and relevant feedback	Provide relevant, tailored, non-evaluative feedback on goal/behavioral progress. This can include specific, process-focused feedback.	Provides encouragement and information to guide future behavior.
MBCT 19. Help develop a clear and concrete plan of action	Develop and provide summary of action plan to work toward a behavioral goal.	Provides structure, increases confidence, and minimizes future failure (and perceived incompetence).
MBCT 20. Promote self-monitoring	Prompt monitoring of progress, skill level, or performance such as suggesting options for monitoring tools/means and metrics for success, including steps in the direction of behavior change.	Provides structuring information that reinforces success and self-awareness.
MBCT 21. Explore ways of dealing with pressure	Provide information to manage and limit effects of pressuring contingencies that would undermine competence, such as extrinsic rewards, criticism, negative feedback.	Increases confidence to deal with sources of controlling pressure from others and themselves.

Note. Reference to "the person" in technique descriptions refers to the individual or group whose behavior is to be changed (e.g., a client, patient or participant). MBCT = Motivation and behavior change technique.

(Teixeira et al., 2020)

Appendix C

Exit Interview Questions

1. What was the most impactful aspect of the program and why?
2. How enjoyable was it?
3. Was it accessible?
4. How has the intervention affected your level of motivation to participate in regular RT?
5. How competent do you feel in engaging in RT on your own going forward?
6. How has your ability to relate to other people who engage in RT changed through this intervention?