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ARTICLE

Utility of an Outdoor Group Exercise Program for Improving Postpartum Mental Health

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Abstract

Background: Rates of anxiety in postpartum women are higher than those in women from the general population. Physical activity is known to be an effective therapy for treating anxiety and depression and may be beneficial for new moms. **Purpose**: We determined the effect of an 8-week outdoor group exercise intervention on postpartum mental health, exercise self-efficacy, and exercise motivation. **Methods**: In this non-randomized study, 19 women less than 9 months postpartum participated in a bi-weekly outdoor group exercise program for 8 weeks. The group exercise intervention was a 45-minute group fitness class, Les Mills TONE™, created by Les Mills International. Pre and post intervention, participants completed an online questionnaire to evaluate depression, trait anxiety, perceived stress, psychological needs, behavioural regulation, and exercise self-efficacy. Women also reported state anxiety before and after each exercise class. **Results**: Our 8-week bi-weekly exercise program for new mothers significantly reduced state anxiety pre-post each exercise class, as well as pre-post 8-week intervention. There were also non-significant improvements in depression, perceived stress, and trait anxiety. In addition, we found a significant improvement in meeting basic psychological needs (competence), and a significant improvement in autonomous regulation (intrinsic motivation). There was no significant increase in exercise self-efficacy. **Conclusion:** A group exercise intervention was effective in improving postpartum mental health but did not change exercise self-efficacy. To maximize physical activity benefits in new mothers, we suggest the inclusion of behavioral change support to further enhance the likelihood of adherence and self-efficacy for independent physical activity engagement.
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Introduction

The birth of a child is one of the most momentous occasions in some women's lives, yet the postpartum period can be fraught with physical and mental health issues (Juříková & Havelka, 2019; Rowlands & Redshaw, 2012). Rates of anxiety in women during the postpartum period are higher than women from the general population (Wenzel, Haugen, Jackson, & Brendle, 2005). Since the onset of COVID-19, these mental health issues have been amplified, with 40% of postpartum women reporting depression (compared to 15% pre-pandemic) and 72% reporting moderate-to-high anxiety (compared to 29% pre-pandemic) (Davenport, Meyer, Meah, Strynadka, & Khutana, 2020). Pre-pandemic motherhood challenges (e.g., sleep deprivation, lack of self-care, medically complicated deliveries) are now exacerbated with the global pandemic for a variety of reasons, including reduced direct

maternal care, lack of a home support system due to visiting restrictions, and lack of in-person breastfeeding support (Rice & Williams, 2021).

It is recommended that new mothers gradually return to physical activity 4–6 weeks after delivery (ACOG committee opinion, 2020) with the goal of meeting the physical activity guidelines of the general population (150 minutes of moderate-to-vigorous physical activity per week) after this time point, although any increase in physical activity is beneficial. Postpartum women who reported meeting these guidelines during the pandemic reported lower depression and anxiety than women who did not meet the guidelines for physical activity (Davenport et al., 2020). Physical activity is known to be an effective therapy for treating anxiety and depression and may be beneficial for new moms. A systematic review published in 2019 showed that physical activity in the postpartum period reduces the risk of developing postpartum depression (Kolomanska-Bogucka & Mazur-Bialy, 2019), but the role of physical activity in managing anxiety is less explored. Cramp and Bray (2010) reported significant improvements in state anxiety levels in women without a history of mental illness following a single group exercise session of 45 minutes. Given the rates of anxiety reported by new mothers during the pandemic it is necessary to assess the potential beneficial role of physical activity.

Physical activity levels tend to be reduced during pregnancy and further into the postpartum period (Olson, Strawderman, Hinton, & Pearson, 2003). Exercise self-efficacy is lower in pregnancy (Gaston, Cramp, & Prapavessis, 2012) and this may continue into the postpartum period due to physiological changes, childcare challenges, and lack of an exercise partner or support (Saligheh, McNamara, & Rooney, 2016). Given the additional challenges and constraints that women experience in the postpartum period, it is essential to provide exercise programming specific to the population needs. Group-based physical activity has been shown to be a promising tool for increasing adherence to exercise due to enhanced social support as shown by high task cohesiveness (Burke et al., 2005).

To this end, we aimed to assess the utility of an outdoor group exercise program for postpartum women during the spring of 2021 when restrictions regarding indoor group exercise were still in place and there was a lack of opportunity for new mothers to engage in socially supportive programming. Our main research question was to determine the effects of a group exercise intervention on mental health (anxiety (state and trait), postpartum depression, perceived stress), and exercise self-efficacy. We hypothesized that new mothers who engaged in group-based exercise with other new mothers would experience an improvement in mental well-being, as evidenced by decreases in self-reported anxiety, depression, and stress, and increased self-reported exercise self-efficacy. A secondary research question was to explore motivation to exercise in new mothers, and their feelings of group cohesion in a group exercise intervention delivered in the context of COVID-19 restrictions.

Methods

Participants

Twenty-one women less than one year postpartum volunteered to participate in a bi-weekly outdoor group exercise program for 8 weeks. The sample size was based on previous work by Cramp and Bray (2010), who conducted a single-session exercise

intervention on 23 postpartum women. Based on Cramp and Bray's (2010) results (22% decrease in State-Trait Anxiety Inventory scores after a single exercise session), a power analysis indicated that 5 women in an exercise group would result in a statistical power of 80%. However, to account for attrition, as well as to ensure that the women would be exercising in an environment representative of a group fitness class, the goal was to recruit at least 20 participants. Recruitment was done via posters in local physicians' offices and community billboards, advertisements on social media, and word of mouth. All women were at least 6-weeks postpartum and had been given physician clearance to begin exercising again. Classes were offered twice per week at an outdoor location due to restrictions on indoor exercise during the study period which coincided with the COVID-19 pandemic. In the event of rain, classes were moved to an open-air facility with a roof. This study was approved by the Institutional Human Research Ethics Board, and participants gave their informed consent by filling out online informed consent forms prior to accessing the pre-intervention questionnaires. The study adhered to the guidelines established by the Declaration of Helsinki.

Intervention

The group exercise intervention was the 45-minute group fitness class Les Mills TONE™, created by Les Mills International (Auckland, New Zealand). Les Mills TONE™ aims to strengthen core musculature, improve aerobic fitness and balance, and increase muscular strength and endurance. In each 45-minute class, 8-10 minutes was spent warming up, 10-14 minutes was spent on aerobic training, 11-13 minutes was spent on resistance training, and 7-9 minutes was spent on core training. The classes were delivered by one instructor (GLH) who is certified (certification through Les Mills USA) in the program. Classes were offered twice per week at two different times to keep group size under ten, in line with pandemic public health restrictions in British Columbia, Canada at the time.

Participants were given the option to bring their baby to the group fitness class to help reduce potential barriers with exercise engagement. Previous research has demonstrated no significant difference in anxiety outcomes when 45-minute aerobic exercise sessions were completed with or without baby present (Cramp & Bray, 2010). In each class, the instructor provided options to either increase or decrease the intensity of each exercise. In addition, options for using the baby as weight if the mother had to be attending to the baby during exercise were provided.

Methodologies Employed

The Visual Analog Scale (VAS) was used to quantify the participants' state anxiety level pre and post exercise. The VAS consisted of a 10-cm straight line with "calm" on the left side, "anxious" on the right side, and a marker in the middle (Abend, Dan, Maoz, Raz, & Bar-Haim, 2014). Participants assessed their own anxiety pre and post exercise class by placing a corresponding mark on the anxiety line. In a study by Abend et al. (2014), test-retest reliability of the VAS was found to be significant, $r(172) = .56$, $p < .001$. Participants also reported their rating of perceived exertion (RPE) on a 6–20-point scale at the completion of each exercise class (Borg, 1992).

Before and after the 8-week exercise intervention, participants completed online questionnaires using Survey

Monkey (Momentive.ai, San Mateo, USA). Baseline questionnaires included demographic data (birthdate of mother and baby, height and mass of mother), delivery method (vaginal or caesarian section), and nursing method (formula, breast-feeding, combination). The other outcome measures (described below) were assessed before and after the intervention.

For mental health outcomes, in addition to state anxiety, we measured postpartum depression, trait anxiety, and perceived stress. Depression was assessed using the Edinburgh Postnatal Depression Scale, which is the most common and widely used screening instrument for assessing perinatal anxiety and depression (Gibson, McKenzie-McHarg, Shakespeare, Price, & Gray, 2009). In a study by Cox, Holden, & Sagovsky (1987), the scale was effective at detecting postnatal depression in nine out of ten women diagnosed by a psychiatrist. The scale assesses emotional experiences over the previous week using a ten-item Likert scale. The 20-item Trait Scale of the State-Trait Anxiety Inventory (STAI) was used to assess general anxiety. This scale has test-retest reliability, internal consistency, and construct validity (Spielberger, 1983). The STAI has previously been used to assess anxiety after exercise in a postpartum population (Cramp & Bray, 2010). A cut off score of 40 on the STAI has been used as a marker of early postpartum anxiety (Dennis, Coghlan, & Vigod, 2013). The Perceived Stress Scale (PSS) was used to assess perceived stress. The PSS is a 10-item questionnaire that is widely used as an instrument to measure the perception of stress (Lee, 2012). The PSS has shown strong internal reliability and test-retest reliability (Lee, 2012).

Exercise self-efficacy was assessed using the Self-Efficacy for Exercise Questionnaire (Resnick & Jenkins, 2000). There was high internal consistency, reliability and validity using the scale in a population of older adults (Resnick & Jenkins, 2000). To further explore motivation to exercise in new mothers, we used the Behavioral Regulations in Exercise Questionnaire (BREQ-3) (Markland & Tobin, 2004; Wilson, Rodgers, Loitz, & Scime, 2006; Wilson, Sabiston, Mack, & Blanchard, 2012) and the Basic Psychological Needs in Exercise Scale (BPNES) (Vlachopoulous, Ntoumanis, & Smith, 2010). For the BREQ-3 analysis we used the individual subscales, as well as the dichotomy of controlled (external and introjected) and autonomous (intrinsic, identified, and integrated) regulations, as commonly done in exercise-based research (Phillips & Johnson, 2018). Autonomously motivated individuals typically engage in exercise due to intrinsic goals, interest, and satisfaction, which results in more stable and consistent behaviour. In contrast, controlled motivation typifies individuals motivated by extrinsic purposes, such as rewards, social approval, or the avoidance of shame and guilt. The BPNES is an 11-item scale measuring the satisfaction of autonomy, competency, and relatedness using a 5-point Likert scale. The scale is reported to be valid and reliable for each of the basic psychological needs (Vlachopoulous et al., 2010), and has previously been used to assess the satisfaction of basic psychological needs in postpartum women (Lovell, Gordon, Mueller, Mulgrew, & Sharman, 2016).

At the completion of the program, participants additionally completed the Physical Activity Group Environment Questionnaire (PAGEQ) (Estabrooks & Carron, 2000) to assess the experience of engaging in group exercise with other new mothers, while adhering to COVID-19 restrictions. Group cohesion was measured

utilizing PAGEQ, which measures four separate constructs: individual members' attraction to the group task (ATG-T), individual members' perception of attraction, acceptance, and social interaction within the group (ATG-S), individual members' perceptions of bonding and closeness to the collective task (GI-T), as well as individual members' perceptions of integrating into the social atmosphere of the group (GI-S). Collectively, then, the PAGEQ measures task-cohesive groups (ATG-T and GI-T) as well as socially cohesive groups (ATG-S and GI-S). This scale has previously been validated in aerobic exercise classes and is suggested to be a measure of cohesion in exercise groups (Estabrooks & Carron, 2000).

Statistical Analysis

Paired t-tests were used to compare Edinburgh Postnatal Depression Scale, Trait Scale of the STAI, PSS, Self-Efficacy for Exercise Questionnaire, BREQ-3, and BPNES scores before and after the 8-week exercise intervention. In addition, a paired t-test was used to compare the group mean pre and post state anxiety scores assessed with the visual analog scale of all 16 exercise classes throughout the 8-week program. Effect sizes for all outcome measures were calculated using Cohen's d, with 0.2, 0.5, and 0.8 corresponding to small, medium, and large effect sizes, respectively. Statistical significance was set at $\alpha < 0.05$, and a Bonferroni correction was applied based on the number of comparisons (15 pre-post t-tests, therefore 0.05/15 = an adjusted alpha of 0.003 for significance). Paired t-tests were completed in SPSS Version 25.0 (IBM, Armonk, NY).

Results

While twenty-one women began the 8-week program, two women withdrew from the study within the first 3 weeks; one participant felt the program was too difficult (withdrew after first class), and the other was unable to find childcare for her oldest child during the exercise class times (withdrew after sixth class). The data presented in this paper is from the remaining 19 participants, who completed the pre- and post-intervention questionnaires. Participant attendance ranged from five participants who attended all sixteen classes (100% attendance), to one participant who attended 5 out of 16 classes (31% attendance). Overall, the average attendance rate of all participants was 85% (SD = 16%).

Participants ranged in age from 28 to 35 years old (M = 31 years, SD = 3), and in body mass index (BMI) from 18.21 to 32.84 kg/m^2 (M = 26.52 kg/m^2, SD = 4.15). At the start of the program in the spring of 2021, the age of the participants' children ranged from 2-11 months old (M = 6 months, SD = 3). Delivery method varied amongst participants between vaginal birth (N = 7) and caesarian section (N = 12). In addition, participants cited a range of nursing practices, including breast feeding (N = 13), formula feeding (N = 4), and a combined approach (N = 2). Three participants reported the use of antidepressant or antianxiety medications, and these medications did not change over the course of the intervention.

Participants reported state anxiety before and after each exercise class, and RPE after each exercise class. The average RPE across all participants and exercise classes was 13.90 (SD = 1.53), indicating a "somewhat hard" exercise intensity during the class. There was a significant decrease ($t(15) = 15.82$, $p < 0.001$, $d = 4.12$) in state

anxiety after each exercise session as illustrated in Figure 1. As well, results showed that participants reported lower state anxiety after the 8-week intervention (M = 1.93 cm, SD = 1.29) than before the intervention (M = 3.26 cm, SD = 1.76). A paired t-test found this difference to be significant ($t(18) = 3.76$, $p < 0.001$, $d = 0.86$). Collectively, this demonstrates significant decreases in state anxiety across the individual classes as well as pre and post 8-week intervention, with large effect sizes.

Figure 1: Pre and post exercise state anxiety, as denoted on a 10 cm visual analogue scale. Black diamonds represent pre-exercise state anxiety and grey squares represent post-exercise state anxiety. Paired t-tests showed a significant difference between pre- and post-exercise state anxiety for each exercise class ($p < 0.001$), and pre to post 8-week intervention ($p < 0.001$).

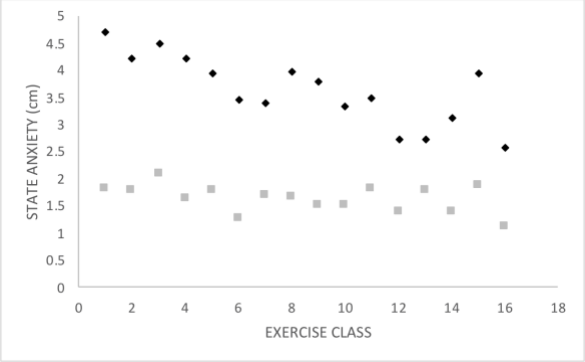

Table 1 reports the results of paired t-tests which explored changes in mental health, exercise self-efficacy, and exercise motivation outcomes pre and post intervention. There were improvements in depression, trait anxiety, and perceived stress, with small to medium effect sizes, but these decreases did not reach statistical significance with the adjusted alpha value. In terms of exercise motivation, there were significant improvements in autonomous regulation ($p = 0.002$, $d = 0.57$), driven by significant differences in integrated ($p = 0.003$, $d = 0.46$) and intrinsic ($p = 0.001$, 0.83) regulation. The composite basic psychological needs score significantly increased, ($p = 0.002$, $d = 0.93$) due to the significant increase in competence ($p < 0.001$, $d = 1.32$). Effect sizes for significant differences ranged from moderate to large.

Participants were highly attracted to their group's task (M = 8.07, SD = 1.31) and social (M = 7.33, SD = 1.37) components as shown by the group cohesion scale. In addition, participants had relatively strong perceptions of bonding around their group's task (M = 7.13, SD = 1.47), though demonstrated lower perception of group social cohesion (M = 6.11, SD = 1.76).

Discussion

To support new mothers in physical activity engagement during the COVID-19 pandemic we offered a group-based outdoor exercise program. Our aim was to determine the effects of a group-based intervention with other new mothers on postpartum mental health, exercise self-efficacy, and exercise motivation. Our 8-week bi-weekly exercise program for new mothers significantly improved state anxiety (i.e., anxiety in the present moment) pre-post each exercise class, and from pre to post the 8-week intervention. In addition, we found a significant improvement in meeting basic psychological needs (i.e., competence) and a significant improvement in autonomous regulation (i.e., an increase in internal motivation to engage in exercise). There were also non-significant improvements in depressive symptoms, perceived stress, and trait anxiety (i.e., general anxiety). New moms reported strong attraction to the group tasks (ATG-T and GI-T), though slightly weaker experience of overall group social cohesion (GI-S).

Table 1: Mental health, exercise self-efficacy, and exercise motivation outcomes pre and post eight-week exercise program. Data presented as mean (standard deviation).

Variable	Pre-Intervention	Post-Intervention	p-value	Cohen's d
Depression	10.95 (4.06)	8.74 (3.45)	0.045	0.57
Trait Anxiety	42.16 (9.01)	39.26 (7.42)	0.112	0.35
Perceived Stress	17.63 (5.51)	15.16 (6.87)	0.087	0.40
Controlled Regulation	1.62 (0.67)	1.56 (0.67)	0.708	0.09
External Regulation	0.70 (0.58)	0.67 (0.77)	0.840	0.04
Introjected Regulation	2.54 (1.19)	2.45 (0.85)	0.687	0.09
Autonomous Regulation	3.05 (0.77)	3.44 (0.58)	0.002*	0.57
Identified Regulation	3.45 (0.60)	3.58 (0.48)	0.154	0.24
Integrated Regulation	2.75 (1.19)	3.25 (0.96)	0.003*	0.46
Intrinsic Regulation	2.95 (0.73)	3.50 (0.58)	0.001*	0.83
Basic Psychological Needs (composite)	36.42 (6.18)	42.63 (7.14)	0.002*	0.93
Autonomy	13.42 (2.89)	15.89 (3.32)	0.011	0.79
Competence	12.16 (2.77)	15.63 (2.48)	<0.001*	1.32
Relatedness	10.84 (2.75)	11.11 (2.80)	0.674	0.10
Exercise Self-Efficacy (N=17)	45.65 (13.86)	46.06 (14.26)	0.868	0.03

Note: N = 19. Paired t-test among 19 participants who completed the intervention. Significant changes (adjusted significance level = 0.003) are represented by *. A decrease in depression, trait anxiety and perceived stress scores are indicative of an improvement in mental well-being. An increase in regulation, basic psychological needs and exercise self-efficacy is indicative of an improvement in exercise behavior.

Interestingly, we did not find significant improvements in perceived stress or trait anxiety at the end of the exercise program. This could be due to the reported baseline level of trait anxiety being quite low. A cut off score of 40 on the STAI has been used as a marker of early postpartum anxiety (Dennis et al., 2013), and our participants had a mean score of 42.16. It is possible that greater reductions in trait anxiety would be seen in participants with higher STAI baseline scores. It is also possible that our program, which equated to 90 minutes of physical activity per week (if adherent) was not adequate to achieve a significant reduction in trait anxiety or perceived stress, as this is lower than the recommended 150 minutes of moderate-to-vigorous physical activity per week which has been shown to benefit anxiety and depression (Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010). However, we did find a significant improvement in state anxiety (i.e., anxiety in the moment, rather than general (trait) anxiety) immediately after the exercise classes, as well as pre to post intervention. This suggests that the exercise program was a

positive distraction and benefitted women in the interim even if it did not affect general (i.e., trait) anxiety. This improvement in state anxiety is consistent with previous cross training interventions in young adults (Hale & Raglin, 2002) and aerobic exercise training in new mothers (Cramp & Bray, 2010). It adds to previous research by Cramp and Bray (2010), who examined state anxiety after a single exercise session. Like Cramp and Bray (2010), we found significant improvements in state anxiety after the first exercise session, in addition we found that improvements in state anxiety post-exercise persisted across the entire 8-week intervention. This indicates that consistent exercise continues to positively impact state anxiety.

Mothers who participated in our program improved their depression score, which had an average pre-intervention categorization of mild, but the decrease did not reach significance. It has been previously shown that mothers with greater depressive symptoms have a greater response to physical activity than those with lower depressive symptomology (Dritsa, Dupuis, Lowensteyn, & Da Costa, 2009), which means our results are likely a conservative estimate of the benefit of group-based physical activity in this group of women with mild postpartum depression. Additionally, the study was powered to detect significant changes in state anxiety. It is possible that the lack of significance in the depression scores are due to an inadequate sample size. The role of physical activity in improving depressive symptomology may be due to neurohormonal changes that trigger an improvement in mood although this is not well understood in the postpartum period (Da Costa et al., 2009).

Postpartum women who meet their basic psychological needs of autonomy, competence, and relatedness have been shown to positively adjust to life changes (Boyd, 2016). We found a significant improvement in meeting overall basic psychological needs, specifically competence, among mothers who completed the exercise program. According to the self-determination theory (Deci & Ryan, 2000; Ryan & Deci, 2017), when basic psychological needs are met, autonomous regulation increases. In our study, there were significant improvements in autonomous behavioral regulation among new mothers after the exercise program. These findings suggest that mothers' exercise behaviour became more self-determined and intrinsically motivated after the 8-week intervention. Significant improvements in integrated and intrinsic regulation correspond with changes in overall autonomous motivation. This indicates that mothers experienced greater interest and satisfaction in exercise, as well as considered exercise to become a more fundamental component of their personal identity.

As feelings of guilt have been shown to function as a barrier to engaging in physical activity amongst mothers (Mailey, Huberty, Dinkel, & McAuley, 2014), our study demonstrates that participation in a group exercise program can support mothers in integrating the value and desire to exercise, thus promoting future behavioural regulation and physical activity adherence. Enjoyment in participation as well as recognizing the importance of an activity are repeatedly shown to strongly predict physical activity behaviour (Miquelon & Castonguay, 2016; Wilson et al., 2012). In order for individuals to sustain behavioural change, individuals need to experience competency, and the behaviour

itself needs to be valued (Ryan & Deci, 2017). In fulfilling the basic psychological need of competency, the intervention was associated with improved internalization and self-determination, thereby supporting and enhancing mothers' exercise motivation.

Improvements in autonomous regulation (i.e., intrinsic motivation) may be due to mothers exercising in a group format as this has been associated with new mothers meeting their basic psychological needs and having higher motivation for exercise than those who exercised predominately alone (Lovell et al., 2016). The group dynamics expressed by mothers corroborates these findings; mothers indicated strong attraction to the group tasks though a slightly weaker experience of overall group social cohesion. Intuitively one would expect that relatedness would improve within a socially supportive exercise environment, however our findings demonstrate that mothers did not report strong group cohesion. Comparatively, the group context provided novel opportunity for expressions of independence and self-sufficiency. The lack of group cohesion could possibly be due to the COVID-19 public health orders in place during the group exercise sessions. Despite being outdoors, participants were still instructed to always maintain 2-metres of physical distancing and no social gatherings were permitted. This limited the ability for the new mothers to engage with each other outside of class time.

Surprisingly, we did not find an improvement in exercise self-efficacy in women after 8 weeks of bi-weekly group-based exercise programming. Exercise self-efficacy in the postpartum period has been associated with greater physical activity levels (Hinton & Olson, 2001). It is possible that to see a significant improvement in exercise self-efficacy in a postpartum population, exercise programming alone is not adequate. In studies by Miller and colleagues, women with young children that received behavioral strategies for physical activity engagement in new motherhood showed a significant improvement in exercise self-efficacy (Miller, Trost, & Brown, 2002; Miller & Brown, 2005).

We did not have a comparative control group in this intervention study, and therefore we are unable to determine whether state anxiety would have improved on its own. However, all but two women in this study were over 3 months postpartum at the beginning of the exercise classes, where anxiety is less likely to be changing as seen in the early postpartum period (Nakić Radoš, Tadinac, & Herman, 2018). Additionally, we did not have a control group who participated in an indoor group exercise intervention, thus improvements in mental health could have been influenced by time spent outdoors. Beyer, Szabo, and Nattinger (2016) previously reported a negative association between time spent outdoors and depressive symptoms. Public health restrictions related to COVID-19 prevented us from having an indoor group exercise control group and differentiating the effect of group exercise indoors versus outdoors in this population warrants future research. We did not recruit new mothers based on their anxiety level, nor did we measure pre-intervention physical activity levels, and likely experienced volunteer bias where mothers who were interested in the program had higher mental well-being and were more active to begin with than the average new mother. If this is the case, our findings are likely a conservative estimate of the beneficial effects of this

type of program. It is essential to assess whether these forms of programs can reach at-risk mothers who would potentially see the most substantive improvements from exercise therapy. In addition, future research should include strategies around behavioral change and habit formation in order to increase exercise self-efficacy and long-term adherence to physical activity. Finally, all exercise classes were provided by one instructor, thus it is possible that observed changes were due to interactions with the specific instructor, and not due to the exercise program itself. However, individual participant-instructor interactions were minimal.

Physical activity is particularly important during the postpartum period (Juříková & Havelka, 2019). This period may set the stage for the adoption of lifestyle habits that could either promote or impair long-term health and well-being in mothers as well as in their children (Hinkley, Crawford, Salmon, Okely, & Hesketh, 2008; Moore et al., 1991). Postnatal women have reported that they would engage in greater amounts of physical activity if there was accessible childcare, it was part of a group-based setting, they had formed a habit, and were motivated (Ellis, Pears, & Sutton, 2019). Additionally, the COVID-19 pandemic exacerbated challenges to physical activity engagement, with a reduction in physical activity among women (Nienhuis & Lesser, 2020) associated with increased childcare responsibilities (Zamarro & Prados, 2021). Our empirical findings suggest that outdoor, group-based programming, which allowed mothers to bring their babies to class, helped new mothers overcome a number of these barriers and engage in physical activity at a time when women were experiencing additional mental distress (Calarco, Meanwell, Anderson, & Knopf, 2021). This is reflected in our relatively high attendance levels for the program, despite the many obstacles women were likely facing during the pandemic with new babies.

Conclusions

In conclusion, an 8-week bi-weekly outdoor exercise program is beneficial for improving mental well-being in new mothers, specifically acute (i.e., state) anxiety, meeting the basic psychological need of competency, and autonomous regulation (i.e., internal motivation to exercise). To maximize physical activity benefits in new mothers we suggest the inclusion of behavioral change support to further enhance the likelihood of adherence and self-efficacy for independent physical activity engagement. Future qualitative research is necessary to explore the role of socially supportive environments in exercise engagement.

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Authors' Qualifications

The author qualifications are as follows: Gillian L. Hatfield BSc, BScPT, MSc, PhD; Iris A. Lesser BSc, MSc, PhD; Carl P. Nienhuis BA, MHK, PhD.

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