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Satisfaction of Basic Psychological Needs, Self-Determined Exercise Motivation, and Psychological Well-Being in Mothers Exercising in Group-Based Versus Individual-Based Contexts

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We compared mothers who exercised predominantly in group settings, those who exercised predominantly in individual settings, and those who exercised equally in group and individual contexts among the following: (a) satisfaction of basic psychological needs (autonomy, competence, and relatedness); (b) self-determined exercise motivation; and (c) psychological well-being. With clear implications for mothers' exercise interventions we found that exercising either predominantly in group contexts or in mixed group and individual settings was associated with mothers having significantly higher satisfaction of basic psychological needs and self-determined exercise motivation than those exercising predominantly alone.

Motherhood is a complex and often a challenging transition period for women including hormonal changes, social changes including increased social isolation, loss of identity, and actual and perceived negative changes in

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body image (e.g., Ashworth & Nobile, 2007; Kendall-Tackett, 2005; Marshall & Thompson, 2014). Research also suggests that motherhood is associated with role overload (Lovell & Butler, 2014), weight retention (Gore, Brown, & West, 2003), changes in sleep patterns (Bayer, Hiscock, Hampton, & Wake, 2007), fatigue (Dritsa, Da Costa, Dupuis, Lowensteyn, & Khalifé, 2008), and variation of daily routine (Mottola & Campbell, 2003). With these challenges and changing roles, depression during and after pregnancy is a major issue (Lewis & Kennedy, 2011; Lovell, Huntsman, & Hedley-Ward, 2014). While exercise is often lauded as an effective tool for enhancing psychological well-being (Davis & Dimidjian, 2012; Ekkekakis & Backhouse, 2009) and reducing the psychosocial impact of challenges faced by mothers (Daley, Jolly, & MacArthur, 2009; Dritsa et al., 2008), the mechanisms by which exercise helps and how it supports mothers' motivation to exercise is not well understood. Our research into how mothers' exercise contexts relate to their motivation to exercise, as well as psychological outcomes, was with the intention that our findings would help practitioners better design exercise programs to more successfully facilitate exercise adherence and ameliorate the challenges of motherhood.

Background

Exercise is considered a cost-effective treatment for poor mental health, with limited negative side-effects (Biddle & Mutrie, 2008). Although exercise appears to be a well-justified activity, motherhood represents a major barrier to being physically active (Bellows-Riecken & Rhodes, 2008). Research suggests that two thirds of women do not exercise to adequate levels and that women with children exercise even less than women without children (Brown, Mishra, Lee, & Bauman, 2000). Ansari and Lovell (2009) observed that almost one third of women's perceived barrier to exercise was accounted for by the number of children they had. Albright, Maddock, and Nigg (2005) further report that only 35% of women who were active before childbirth were active after childbirth. This is despite Currie and Develin (2002) finding that 69% of women in the postnatal period indicated that they would like to exercise more.

Understanding why mothers generally do not engage in sufficient exercise is clearly complex, with multiple personal, interpersonal, environmental, and policy determinants (King et al., 2000). Research that furthers our understanding of how such factors affect mothers' exercise behavior has clear potential to better inform exercise promotion interventions thus supporting positive public health outcomes both physiological and psychological. While our understanding of antecedents of exercise behavior for general populations has substantially developed over the last decade, however, our understanding for special populations such as mothers remains limited

(Ansari & Lovell, 2009; Daley, 2008). One exercise antecedent that requires further investigation to facilitate the efficacious design of strategies to promote mothers' exercise is exercise motivation and how this motivation may be differentially affected by different exercise contexts such as exercising alone or in groups. Furthermore, while exercise is associated with positive psychological well-being outcomes, our understanding of the mechanisms responsible are also limited (Daley, 2008). As with the hiatus in knowledge regarding mothers' exercise antecedents, our understanding of how exercise, incorporating different formats and contexts, relates to psychological well-being outcomes is also particularly lacking for the specific population of mothers (Kull, Ainsaar, Kiive, & Raudsepp, 2012).

In response to the limited understanding of how different exercise contexts are associated with exercise antecedents like motivation and exercise outcomes such as psychological well-being, we developed this current investigation. With specific reference to mothers, we contrasted mothers' levels of exercise motivation, satisfaction of basic psychological needs (considered a mediator of motivation and psychological well-being), and psychological well-being between the contexts of exercising alone or within groups.

Theoretical Framework

The theoretical framework of this investigation was Self-Determination Theory (SDT; Deci & Ryan 1985, 2000, 2002) and its subtheory Basic Needs Theory (BNT; Ryan & Deci, 2000), which contends that humans function and develop effectively as a consequence of the social environment and its potential to satisfy basic psychological needs. According to BNT, humans have three fundamental psychological needs: autonomy, competence, and relatedness (Deci & Ryan, 2000; Ryan & Deci, 2000). The inherent need for autonomy is fulfilled when people perceive that they are the origin of their choices and decisions and that they are acting in accordance with their integrated sense of self. Competence concerns an individual's need to feel a sense of mastery through effective interaction within their environment. The third need, relatedness, corresponds to feeling securely attached to and being respected by significant others. Satisfaction of these psychological needs is assumed to directly enhance motivation as well as psychological and physical well-being (Deci & Ryan, 2000). When basic psychological needs are thwarted, however, ill feeling is posited to ensue (Ryan & Deci, 2000). Thus, if exercise is constructed in such a way that it provides a sense of control in terms of choice to participate and what that modality of exercise may be (autonomy), a perception of competence through generation of feedback related to positive progress toward goals (competence), and a sense of belonging through exercising in a group or team (relatedness), motivation to exercise and psychological well-being should be enhanced.

Potentially, individual exercise settings may increase mothers' perceived autonomy compared with group situations because they may have greater control over deciding specifics of the exercise that would not be required to negotiate with coexercisers. Group contexts may be associated with increased perceived competency, however, through verbal feedback from and comparison with coexercisers. Furthermore, group exercise contexts may enhance mothers' perceived relatedness due to the increased potential for social interaction and connectedness compared with when exercising alone. According to the premises of SDT, therefore, exercising alone has the potential for greater satisfaction of autonomy needs compared with exercising in a group. Group exercise may promote the satisfaction of competence and relatedness, which are basic psychological needs. These group-based exercise benefits may outweigh the contribution that individual-based exercise makes to autonomy satisfaction, in turn enhancing self-determined motivation for exercise and psychological well-being. No prior studies have utilized SDT to directly examine group versus individual exercise contexts in mothers.

While only very limited research has compared group and individual exercise contexts in mothers (none using SDT as a theoretical framework), research has examined mothers' exercise interventions such as pram walking groups (Armstrong & Edwards, 2003, 2004) focusing upon social support aspects (Fjeldsoe, Miller, & Marshall, 2010; Miller, Trost, & Brown, 2002). Interestingly, one underlying characteristic of many of these interventions is the "group" aspect. Accordingly, Norman, Sherburn, Osborne, and Galea (2010) found that mothers suffering from postnatal depression experienced improvements in symptoms after completion of only one group exercise session per week compared with a control. Armstrong and Edwards (2003, 2004) found that mothers with postnatal depression were fitter and had fewer symptoms of depression after pram walking interventions compared with controls. Currie (2004) performed a qualitative assessment on a 12-week exercise class intervention and found the majority of mothers experienced a decrease in stress and an increase in psychological well-being. In comparison, home-based exercise interventions (typically performed alone) have demonstrated inconsistent results (e.g., Da Costa et al., 2009; Dritsa et al., 2008), while possibly due to several factors but including limited satisfaction of basic needs such as perceived relatedness compared with that developed by group-based programs. Such previous research did not directly examine the role that these exercise contexts played in satisfying basic psychological needs, however, thus limiting our ability to substantiate such suggestions.

Research Aims

In response to the limitations in previous research, using SDT as the theoretical framework, we addressed three research aims. These aims were to

compare mothers who exercised predominantly in group settings, those who exercised predominantly in individual settings, and those who exercised equally in group and individual contexts upon the following: (a) satisfaction of basic psychological needs (autonomy, competence, and relatedness); (b) self-determined exercise motivation; and (c) psychological well-being.

METHOD

Design

To conduct this research we utilized a cross-section survey design.

Participants and Recruitment

Following institutional ethical approval and informed consent, 231 mothers ($M_{age} = 29.1$, $SD = 9.5$) from the Sunshine Coast region (Queensland, Australia) completed a survey offered both online and in paper format (85% completion rate). Mothers were eligible for inclusion if they met the following criteria: (a) were exercising at least once a week and that exercise was intended to expend energy; (b) had been exercising for at least 4 weeks prior to filling out a survey; (c) were at least 18 years old; (d) their youngest child was 5 years old or younger; and (e) were currently free from any mental health diagnosis or intellectual disability.

Participants were recruited via three methods. The three methods were used to maximize the number of participants in the study to increase external validity. The first method was in person at a number of exercise facilities and gymnasiums on the Sunshine Coast (Queensland, Australia). Potential participants were approached by a researcher, informed of the research aims and what their involvement would entail, and then asked whether they would like to participate. If the participants agreed, they were handed a written link to the online survey (SurveyMonkey) as well as a hardcopy of the survey; participants could either complete it there and then, in their own time, or online. Participants were also recruited via posters on noticeboards at the different exercise facilities and public noticeboards. In this instance participants could also take a hardcopy of the survey, use a copy of the link that had been provided, or contact one of the researchers. An additional recruitment method was via the Internet with web-based announcements on various mother and child forums directing potential participants to the online survey via a posted link. Reflecting the challenges of recruiting mothers, usually associated with being time-poor and with multiple conflicting roles (see Lovell & Butler, 2014), the majority of the surveys were completed via hardcopy (68%) facilitated by face-to-face contact with the research team at the places of exercise. We believe that the final sample size is well justified

based upon the challenges of recruiting such a specific sample of mothers, for whom to a large extent this research was low on their long list of priorities.

Based on self-report, participants were classified into one of three exercising contexts: predominantly group exercise context ($n = 60$); mixed-exercise context ($n = 42$); or predominantly individual exercise context ($n = 129$). The group exercise context was defined as exercise that was completed simultaneously with others (e.g., an aerobics class), whereas individual-based exercise was defined as any exercise completed alone (e.g., running alone or going to gym by oneself). Participants were categorized into the group exercise context if they exercised in group exercise contexts more times per week than they exercised in individual exercise contexts. Participants in the mixed-exercise context exercised equal times in group and individual exercise settings per week. Participants in the individual exercise context exercised more times per week in an individual setting than in a group setting.

Materials

The survey completed by the participants consisted of demographic information (age, age of youngest child, working status, relationship status, how long they had been exercising prior to the investigation) as well as measures assessing satisfaction of the basic psychological needs, self-determined exercise motivation, and psychological well-being.

Satisfaction of basic psychological needs. Satisfaction of the basic psychological needs was measured by the Basic Psychological Needs in Exercise Scale (BPNES; Vlachopoulos, Ntoumanis, & Smith, 2010). The BPNES is an 11-item scale measuring the satisfaction of the three basic psychological needs in an exercise context: autonomy (e.g., "The way I exercise is in agreement with my choices and interests"); competence (e.g., "I feel I perform successfully the activities of my exercise program"); and relatedness (e.g., "My relationships with the people I exercise with are close"). Responses are made on a 5-point Likert scale, ranging from 1 (*I don't agree at all*) to 5 (*I completely agree*). The BPNES is reported to be valid and reliable with a Cronbach α of .75, .80, and .86 for autonomy, competence, and relatedness, respectively (Vlachopoulos et al., 2010).

Self-determined exercise motivation. To assess self-determined exercise motivation we used the Behavioral Regulation in Exercise Questionnaire (BREQ-2; Markland & Tobin, 2004). We used a 5-point Likert scale ranging from 0 (*not true for me*) to 4 (*very true for me*); the BREQ-2 is a 19-item scale that measures the degree to which an individual's motivational regulations in exercise are amotivational, external, introjected, identified, and intrinsic (respective Cronbach α of .83, .79, .80, .73, .86). Higher positive scores for the RAI indicate more autonomous motivation, whereas lower

negative scores indicate less autonomous motivation; the maximum possible score when applying this formula to the BREQ-2 is 20 and the minimum is -24. The Cronbach α of the BREQ-2 scales for the current sample ranged from .81 to .89. As per Markland (see Wilson, Sabiston, Mack, & Blanchard, 2012), weighted subscales of the BREQ-2 (amotivational = -3, external = -2, introjected = -1, identified = 2, intrinsic = 3) were summed to form a single measure of self-determined exercise motivation titled the relative autonomy index (RAI).

Psychological well-being. Psychological well-being, despite being a popularly used term, is a multifaceted concept that is difficult to operationalize; each approach has different limitations and merits (Keyes, Shmotkin, & Ryff, 2002). While our understanding of psychological well-being has developed greatly over the last decade, previous research has been variable in their definitions of exactly what has been measured. For the current investigation, we adopted the perspective of Keyes (2005) that psychological well-being consists of two related but separate dimensions: mental health and mental illness. That is, psychological well-being is not merely the absence of mental illness, but it also includes the presence of mental health. In the current investigation, to assess the negative aspect of psychological well-being (mental illness) we used the Depression, Anxiety, and Stress Scale-21 (DASS-21; Lovibond & Lovibond, 1995). We used the Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985) to assess the positive aspect of psychological well-being (mental health).

The DASS-21 is a 21-item scale measuring feelings of depression, anxiety, and stress in the past week scored on a 4-point severity scale, ranging from 0 (*did not apply to me*) to 3 (*applied to me very much or most of the time*) with adequate Cronbach's alpha internal consistencies of .88, .82, .90, and .93 respectively. Summing the entire 21 items of the scale and multiplying by 2 has been reported to be a valid and reliable measure of general psychological distress (GPD; Lovibond & Lovibond, 1995) and equivalent to the long-form DASS (Henry & Crawford, 2005). The SWLS is a 5-item scale that asks participants questions about their satisfaction with their life (e.g., "In most ways my life is close to ideal"). Responses are made on a 5-point Likert scale, ranging from 0 (*strongly disagree*) to 4 (*strongly agree*). The SWLS has been reported to be valid and reliable, with a Cronbach α of .80 (Diener et al., 1985).

Data Analysis

Dependent upon whether participants hand completed hardcopies or the online version of the survey, data were either downloaded from the online survey platform or entered manually by a member of the research team. To check for accuracy of data input from hardcopy surveys, 10% of the inputted

data were audited by a research team member who did not input the data. The mothers' classification of exercise context (individual, group, or mixed) was the independent variable. The mothers' exercise context groups were then contrasted upon the dependent measures regarding satisfaction of basic psychological needs (BPNES autonomy, competence, and relatedness), self-determined exercise motivation (RAI), and psychological well-being (GPD and SWLS).

Although there were unequal sample sizes across the three participant groups, for all statistical analyses we used IBM SPSS version 22 (SPSS, Chicago, IL), which in its calculation of MANOVA adjusts for such differences (Method 1, SSTYPE 3) and one-way ANOVA is considered robust against such challenges (Tabachnick & Fidell, 2013).

RESULTS

Age, age of youngest child, working status, relationship status, and how long they had been exercising prior to the investigation characteristics of the mothers across the three exercising contexts are presented in Table 1.

Table 2 presents means, standard deviations, and Cronbach alphas for each of the dependent variables. It is worthy of note that reflecting that the sample was currently exercising, the participants' mean RAI exercise motivation score was relatively high: 12.44 on a possible -24 to 20 scale. Furthermore, while it is expected because the sample were mothers, the participants' mean DASS-21 general psychological distress scores were higher than reported Australian female adult norms (Crawford, Cayley, Lovibond, Wilson, & Hartley, 2011), but, again, likely to be reflective of their exercising status, their scores were not significantly higher (one sample *t* test; *t* (230) = .939, *p* = .349)

TABLE 1 Participant Characteristics

Characteristic	Predominantly group	Mixed	Predominantly individual	Complete sample
<i>n</i>	60	42	129	231
Age (yrs)	26.8 (10.2)	28.3 (9.1)	30.4 (9.2)	29.1 (9.5)
Age of youngest child (yrs)	2.6 (1.6)	2.2 (1.5)	2.0 (1.4)	2.2 (1.5)
Work status				
Full time (%)	16.7	33.3	28.7	26.4
Part time (%)	53.3	33.3	32.6	38.1
Not working (%)	30.0	33.3	38.8	35.5
Relationship status				
Married/ <i>de facto</i> (%)	87.6	86.0	84.4	85.5
Single (%)	12.5	14.0	15.6	14.5

TABLE 2 Means, Standard Deviations, and Cronbach Alpha's for Basic Psychological Needs in Exercise Scale (BPNES), Relative Autonomy Index (RAI), General Psychological Distress (GPD), and Satisfaction With Life Scale (SWLS)

Characteristic	α	Predominantly group	Mixed	Predominantly individual	Complete sample
BPNES					
Autonomy**	0.85	4.09(0.75)	4.12(0.74)	3.62(0.91)	3.83(0.88)
Competence**	0.87	3.80(0.84)	3.76(0.84)	3.27(0.92)	3.49(0.92)
Relatedness*	0.88	4.00(0.86)	3.98(0.95)	3.63(1.02)	3.79(0.97)
RAI*	0.73	13.81(5.05)	14.21(3.34)	11.23(5.57)	12.44(5.25)
Psychological well-being					
GPD	0.91	19.77(16.40)	15.09(14.42)	17.32(15.18)	17.55(15.38)
SWLS	0.86	20.10(3.31)	19.86(3.17)	19.18(3.44)	19.54(3.37)

Note. ** $p < .001$, * $p < .05$ significant exercise context effect.

Results of one-way MANOVA testing for differences in satisfaction of basic psychological needs (autonomy, competence, and relatedness) demonstrated a significant exercise context main effect, Wilks' Lambda = .913 $F(6, 452) = 3.52$, $p < .01$, $\eta_p^2 = .045$. Subsequent univariate F tests revealed significant effects for autonomy $F(2, 228) = 9.41$, $p < .001$, $\eta_p^2 = .076$; competence $F(2, 228) = 9.59$, $p < .001$, $\eta_p^2 = .078$; and relatedness $F(2, 228) = 3.14$, $p < .05$, $\eta_p^2 = .030$. Post hoc least significant difference (LSD) tests for each dependent variable demonstrated similar trends, although they were strongest for autonomy and competence with medium effect sizes; the group exercise context and the mixed exercise context were almost identical, both having significantly higher scores than the individual context.

Results of one-way ANOVA testing for differences in self-determined exercise motivation (RAI) also demonstrated a significant exercise context effect with medium effect size $F(2, 228) = 8.32$, $p < .001$, $\eta_p^2 = .068$. Post hoc LSD tests showed the group exercise context and the mixed exercise contexts to have significantly greater self-determined motivation than the individual exercise context.

Results of the third one-way MANOVA testing for differences in psychological well-being (general psychological distress and satisfaction with life) showed no significant differences between the exercise context groups Wilks' Lambda = .970 $F(4, 454) = 1.75$, $p = .138$, $\eta_p^2 = .015$.

Although there were unequal sample sizes across the three participant groups, for all statistical analyses we used IBM SPSS version 20.0 (SPSS, Chicago, IL), which in its calculation of MANOVA adjusts for such differences (Method 1, SSTYPE 3) and one-way ANOVA is considered robust against such challenges (Tabachnick & Fidell, 2013).

DISCUSSION

Adopting SDT as the theoretical framework, in the current investigation we aimed to assess whether exercising in group contexts as opposed to individual exercise contexts was associated with differential effects upon satisfaction of basic psychological needs, self-determined exercise motivation, and psychological well-being. Our results demonstrated that exercising either predominantly in groups or equally in group and individual contexts were associated with significantly and meaningfully greater satisfaction of autonomy, competency, and relatedness basic psychological needs as compared with predominantly exercising alone.

While comparing our findings with previous research is difficult due to the absence of such investigations, our effects fit well with SDT and with previous findings from related areas of investigation; for example Burke, Carron, and Shapcott (2008) reported that women prefer to exercise in contexts where safety and procedural knowledge of the exercise is overseen by a professional and by other group members. According to SDT (Deci & Ryan, 1991), this structure allows for greater satisfaction of the need for competency. While our results are in accordance with SDT theoretical perspectives and compliment finding from previous related research, our findings are novel for the special population of mothers.

In regards to the satisfaction of the need for autonomy, according to the literature group environments can support this need satisfaction or thwart it. Burke and colleagues (2008) highlight the potential controlling nature of group exercise contexts and thus the potential for reduced perceived autonomy; however, it appears from the mothers sampled in this investigation that the group environments were autonomy supportive. An explanation of this effect is due to the mothers' roles within the family. Mothers consistently report feelings of obligation to support the needs of their children, husband, and family, subsequently frequently reporting not having time for themselves or their own pursuits (Miller & Brown, 2005). It may be that mothers have low levels of autonomy in general and by electing to engage in group exercise, which for the majority is at a certain time and location, they reestablish some independence and individuality (Currie, 2004), thus promoting satisfaction of autonomy needs. Individual exercise, although has been noted with fewer barriers, that is, travelling to exercise, may reduce autonomy as mothers adapt their individual exercise routines to suit children's and families' feeding and sleeping habits. Electing to partake in group exercise thus might be instrumental in satisfying mother's need for autonomy.

Our findings that satisfaction of competency and relatedness needs was higher for the mothers classified as predominantly exercising in groups or exercising equally in group setting as alone does concur with predictions from SDT. Intuitively, group exercise would be linked to higher relatedness due to the increased socialization. With regards to how the group context

promoted satisfaction of competence needs, we propose that the group environment facilitates the generation of feedback related to positive progress toward goals (competence), both via verbal feedback from coexercisers and instructor as well as via direct comparison. Further research, ideally qualitative in design, however, is needed to substantiate the validity of such a contention.

In terms of how self-determined exercise behavior varied across the exercise context classifications, this investigation clearly suggests that exercising predominantly in groups, or equally in groups and alone, is associated with greater levels of self-determination exercise motivation than when exercising predominantly alone. This very important finding regarding mothers' exercise motivation is again supported by tenants of SDT in that greater need satisfaction leads to greater levels of self-determined motivation. The group exercise contexts facilitated autonomy, competency, and relatedness support, which would be expected to enhance satisfaction of basic psychological needs and subsequently enhance self-determined motivation (Deci & Ryan, 2000; Ryan & Deci, 2000). Our finding that exercise motivation was higher for the mothers with higher incidences of group exercise is in agreement with previous research reporting greater adherence to exercise in people who exercise in group contexts (Cox, Burke, Gorely, Beilin, & Puddey, 2003; Hong, Hughes, & Prohaska, 2008).

Regarding exercise context and psychological well-being, there were no differences between the exercise context groups on negative affect or subjective well-being. The results support previous findings that there appear to be no differential benefits to psychological well-being associated with different exercise contexts (Blumenthal et al., 2007; Karapolat et al., 2007; Segal et al., 2001). An explanation of our finding of no difference in psychological well-being between the exercise contexts is that the majority of the participants in the sample were completing some form of exercise, and this was sufficient to develop equivalent levels of psychological well-being across the exercise settings. Supporting this explanation was the fact that the combined measure of the DASS-21 revealed a floor effect, suggesting that the majority of participants had good psychological health. This effect is noted as a potential consequence of analyzing nonclinical samples (Netz, Wu, Becker, & Tenenbaum, 2005).

Our investigation does have limitations, however, including that potential exercise type (e.g., aerobic versus resistance training) effects were not controlled. Our rationale for electing not to measure this variable was the decision to capture a broad sample of different activities while limiting the survey to an acceptable length to avoid questionnaire fatigue and increase participant recruitment. Additionally, we predominantly examined exercising mothers; while our findings do provide useful insight regarding exercising mothers, these results may not be generalizable to women in earlier stages of exercise behavior change or different life span development stages (e.g.,

not mothers of under 5-year-olds). Further research should consider these limitations as well as adopt qualitative methodologies to investigate how the mothers regard whether different exercise contexts affect their satiation of basic psychological needs.

In conclusion, with reference to our first two research questions we found that mothers who exercised predominantly in group settings and those who exercised equally in group and individual contexts experienced significantly and meaningfully (medium effect sizes) higher satisfaction of autonomy and competence of basic psychological needs and self-determined exercise motivation than those who exercised predominantly in individual settings. There was a small significant effect in terms of relatedness needs satisfaction with the mothers exercising in individual contexts demonstrating the lowest levels. With regard to research question 3, we found no significant differences in psychological well-being between the different mother exercise context groups. The clear implication of this research is the value of mothers' exercise interventions based on group exercise settings to increase their motivation to exercise. Additionally, these results help provide a theoretical (SDT) and evidence base for the efficacious design of exercise promotion interventions to facilitate associated psychological and physical well-being outcomes.

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