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A Pilot Study of Women's Affective Responses to Common and Uncommon Forms of Aerobic Exercise

Courtney J. Stevens^{1,*}, Jane Ellen Smith², and Angela D. Bryan¹

¹Department of Psychology and Neuroscience, University of Colorado Boulder, Boulder, CO, USA

²Department of Psychology, University of New Mexico, MSC03 2220, Albuquerque, NM, USA

Abstract

Objective—To test the extent to which participants exposed to an uncommon versus common exercise stimulus would result in more favourable affect at post task.

Design—Experimental design. Participants, ($N = 120$) American women aged 18–45 years, were randomly assigned to complete 30-minutes of either the uncommon (HOOP; $n = 58$) or common (WALK; $n = 62$) exercise stimulus.

Main Outcome Measures—Self-reported affect and intentions for future exercise were measured before and after the 30-minute exercise bout.

Results—Analyses of covariance (ANCOVA) were run to compare post-task affect across the HOOP and WALK conditions. At post-task, participants assigned to HOOP reported more positively valenced affect, higher ratings of positive activated affect, lower ratings of negative deactivated affect, and stronger intentions for future aerobic exercise compared to participants assigned to WALK.

Conclusions—Participants who completed an uncommon bout of aerobic exercise (HOOP) reported more favourable affect post-exercise, as well as stronger intentions for future exercise, compared to participants who completed a common bout of aerobic exercise (WALK). Future work using a longitudinal design is needed to understand the relationships between familiarity with an exercise stimulus, affective responses to exercise, motivation for future exercise behaviour, and exercise maintenance over time.

Keywords

affective response; exercise; physical activity; uncommon exercise; hula-hoop; women's health

Introduction

Despite overwhelming evidence that physical inactivity increases risk for disease and significantly reduces life expectancy (Lee et al., 2012; Schoenborn & Stommel, 2011), 34%

*Corresponding author at: University of Colorado Boulder, Department of Psychology and Neuroscience, 345 UCB, Boulder, CO 80309-0345, USA, Tel: + 1 603-398-0125, Fax: + 1 303-492-2967, Courtney.Stevens@Colorado.edu.

of women worldwide are less physically active than is recommended for good health (Hallal et al., 2012; World Health Organization [WHO], 2010). Women are less physically active than men across all age groups, and rates of inactivity among women increase significantly in older age (Carlson, Fulton, Schoenborn, & Loustalot, 2010; Hallal et al., 2012; National Center for Health Statistics [NCHS], 2014). Risks for many of the leading causes of death and functional impairment among women (e.g., heart disease, stroke, breast cancer, major depression; Centers for Disease Control [CDC], 2010) are known to be attenuated with regular aerobic exercise engagement (Lee et al., 2012; Schoenborn & Stommel, 2011; Trivedi et al., 2011), and thus, the implications for identifying strategies to increase rates of aerobic exercise among women are profound and far-reaching.

Over the past two decades, evidence has been mounting for an association between affective responses to aerobic exercise and subsequent exercise behaviour (Kwan & Bryan, 2010b; Rhodes & Kates, 2015; Schneider, Dunn, & Cooper, 2009; Williams et al., 2008; Williams, Dunsiger, Jennings, & Marcus, 2012). More favourable affective responses to acute bouts of aerobic exercise have been shown to predict both stronger intentions for future exercise (Kwan & Bryan, 2010a), and higher rates of exercise participation up to a year later (Williams et al., 2012). Additionally, there is evidence that more favourable affective attitudes (e.g., 'exercise is pleasurable'), and anticipated affective reactions to exercise are predictive of subsequent exercise behaviour over and above the influence of other theory driven constructs (Conner, McEachan, Taylor, O'Hara, & Lawton, 2014; Conner, Rhodes, Morris, McEachan, & Lawton, 2011; Dunton & Vaughan, 2008). And though there is great variation in how individuals respond affectively to exercise, post-exercise affect is nearly unanimously improved (i.e., the 'affective rebound' effect; Ekkekakis, Parfitt, & Petruzzello, 2011; Ekkekakis, 2003). In response to these findings, researchers have suggested that efforts to encourage exercise participation could be bolstered with a better understanding of how to 'manipulate the determinants of affective response [to exercise]' (Ekkekakis, Hargreaves, & Parfitt, 2013, p.754) and perhaps increase the saliency of post-exercise affect improvement (Stevens & Bryan, 2012).

To date, several studies have observed changes in affective response to exercise by manipulating various contextual or environmental variables such as the presence of motivational music (Karageorghis et al., 2009), the leadership style of the fitness class instructor (Loughead, Patterson, & Carron, 2008; Raedeke, Focht, & Scales, 2007), the presence of mirrors (Martin Ginis, Burke, & Gauvin, 2007; Raedeke et al., 2007) and/or the presence of co-exercisers (Martin Ginis et al., 2007). Other studies have similarly attempted to influence affective responses to exercise by manipulating cognitive factors such as self-efficacy (McAuley, Talbot, & Martinez, 1999), imagery (Stanley & Cumming, 2010) and/or information about exercise bout duration (Baden, McLean, Tucker, Noakes, & St Clair Gibson, 2005; Eston, Stansfield, Westoby, & Parfitt, 2012; Welch, Hulley, & Beauchamp, 2010). We are not aware, however, of any studies that have attempted to influence affective responses to exercise by manipulating participants' familiarity with the exercise stimulus.

Effects of Novelty and Variety on Enjoyment and Motivation

The notion that novel stimuli increase motivation to seek out and attend to rewards is popular anecdotally – e.g., ‘*the lure of the unknown*’ (Knutson & Cooper, 2006), but is also supported empirically. From a micro level perspective, prior work has demonstrated that reward-coding dopaminergic neurons in the substantia nigra/ventral tegmental area (SN/VTA) of the midbrain, the deepest structures within the mesolimbic dopaminergic system, respond preferentially to absolute (versus relative) stimulus novelty (Bunzeck & Düzal, 2006). Applied examples of this process include the increases in risk taking behaviour observed among humans under the influence of dopaminergic agonist drugs (Norbury, Manohar, Rogers, & Husain, 2013) and the paucity of dopamine inhibiting receptors in the brains of high ‘novelty seekers’ (Zald et al., 2008).

From a more macro level perspective, the notion that unfamiliar stimuli provoke interest and influence enjoyment and/or pleasure is perhaps intuitive given the numerous examples of this phenomenon in the broader context. For instance, the ‘novelty effect’ is documented by researchers studying advertising effectiveness (e.g., novel stimuli increase brand recall; Macinnis, Moorman, & Jaworski, 1999), intimate relationships (e.g., couples who engage in novel and arousing activities score more highly on measures of relationship quality; Aron, Norman, Aron, McKenna, & Heyman, 2000), consumer spending patterns (e.g., brief increases in game attendance for newly constructed sports stadiums; Love, Kavazis, Morse, & Mayer, 2013) and leisure (e.g., individuals who place great importance on pleasure aspects of their vacation are more likely to seek out novel vacation experiences, and high novelty seekers are less likely to return to the same vacation destination; Assaker, Vinzi, & O’Connor, 2011; Bello & Etzel, 1985).

Within the exercise literature, past work has shown that greater variety (and perceived variety) in an exercise session is associated with more interest in, and enjoyment of, the bout as well as higher levels of exercise related well-being and vitality (Dimmock, Jackson, Podlog, & Magaraggia, 2013; Juvancic-Heltzel, Glickman, & Barkley, 2013; Sylvester et al., 2014). As a case in point, a study by Glaros and Janelle (2001) assigned low active participants to one of three 8-week long exercise-training conditions: variable, static, or preferred. Participants in the variable exercise condition were instructed to perform the same exercise modality for 2 weeks before switching to a different exercise modality; thus participants in this condition changed exercise routines a total of 4 times over the course of 8 weeks. Participants in the static condition were instructed to choose a single exercise modality and remain with it for the duration of the training period; and participants in the preferred exercise condition were allowed to choose whatever exercise modality they wanted to complete on a given day for the duration of the training period. The researchers found that adherence was best for the variable exercise condition, and that the participants in the variable exercise condition reported the most enjoyment of their exercise sessions.

In summation, across a broad range of human subjects research, associations have been found among novel, unfamiliar, and/or variable stimuli or contexts and resultant motivation, pleasure, preference, and/or enjoyment. While findings from the exercise literature specifically suggest that exposing participants to variable exercise stimuli increases self-

reported enjoyment of exercise, exercise related well-being, and vitality, we note that these constructs are not isomorphic with affect, that the aforementioned studies did not examine affect directly, and thus, that they do not tell us how an individual may respond affectively to a bout of exercise (see Ekkekakis, 2003, 2013). Additionally, variety in an exercise context may not necessarily involve exposure to activities that are uncommon to the participant. For these reasons, additional work is needed in order to understand how lack of familiarity with an exercise stimulus may influence affective response to exercise (rather than preference or enjoyment), and how this response may influence intentions to engage in subsequent exercise behaviour.

Common and Uncommon Forms of Aerobic Exercise

Walking is the most commonly reported mode of exercise participation worldwide. As a case in point, Baumen and colleagues (2009) compared exercise participation across 20 countries and found that at least 20% of total expended MET (metabolic equivalent) minutes per week were accumulated through walking. Among women living in the United States, the prevalence of walking for exercise is 2 to 3 times higher than the next most commonly reported exercise activities (Simpson et al., 2003). Thus, the classification of brisk walking as a highly common form of exercise engagement is justified. Conversely, an activity such as *hula-hooping* may represent a highly uncommon form of exercise.

While hula-hooping may be more typically thought of as a form of play than as an option for exercise, preliminary research on hula-hooping in an exercise context has demonstrated that hula-hooping sufficiently raises heart rate (HR) and burns calories at a rate similar to what would be expected from other moderate intensity exercise activities (Holthusen, Porcari, Foster, Doberstein, & Anders, 2010). Notably, modern fitness hula-hoops are larger (37–45 inches in diameter) and heavier (1–4 pounds) than the traditional hula-hoops sold in toy stores (Holthusen et al., 2010). The increased size and weight of these hoops allow for slower rotation speeds, making it easier to sustain continued hula hooping movements for the length of a traditional exercise bout.

Study Aims

We present a pilot investigation exploring the effect of common versus uncommon exercise stimuli on affective responses to exercise and intentions for future exercise. Women were randomly assigned to complete either a 30-minute bout of common aerobic exercise (brisk treadmill walking; WALK) or a 30-minute bout of uncommon aerobic exercise (hula-hooping; HOOP).

Our specific hypotheses for this investigation were threefold. First, consistent with prior work, we anticipated affect change from pre- to post-task across conditions such that participants would report decreases in negative affect and increases in positive affect, affective valence, and affective arousal (Ekkekakis et al., 2011; Ekkekakis, 2003). Second, based on prior work suggesting that greater exercise variety leads to more enjoyment of exercise (Dimmock et al., 2013; Glaros & Janelle, 2001), we expected that participants assigned to the HOOP condition would report more favourable post-task affective responses to exercise (more positive and less negative affect) than the participants assigned to the

WALK condition. Lastly, consistent with past work finding improved intentions for future exercise when exercise is experienced as more pleasurable (Kwan & Bryan, 2010a), we expected that participants assigned to the HOOP condition would report stronger intentions for future exercise at post-task than would the participants assigned to the WALK condition.

Method

Participants

The sample was comprised of 120 adult women from a large USA metropolitan area, aged 18–45 years. Eligible participants were “insufficiently active,” defined as not achieving exercise guidelines published by the American College of Sports Medicine (ACSM; Garber et al., 2011) at any time in the past 3 months, but not completely sedentary, and had no contraindications for aerobic exercise as assessed by a study physician.

On average, participants were 26.88 ($SD = 7.06$) years of age and were racially/ethnically diverse. Participants most commonly self-identified as Hispanic ($n = 44$; 28%) or White ($n = 33$; 27.5%). This was followed by multi-racial/other ($n = 22$; 18.3%), American Indian/Alaskan Native ($n = 9$; 7.5%), Black ($n = 7$; 5.8%), and Asian ($n = 5$; 4.2%). The sample was moderately well educated; 90 participants (75%) reported completing at least ‘some college’ or more. Household income was low for the majority of participants, with 89 participants (74.2%) reporting a yearly household income of \$30,000 or less. Participant BMI (measured as weight in kg/height in m^2) averaged 27.52 kg/m^2 ($SD = 7.46$) and ranged from 17.5 – 52.40 kg/m^2 . Fifty participants (41.7%) were normal weight (BMI between 18.5 and 24.9), whereas 23 participants (19.2%) were overweight (BMI between 25 and 29.9), 21 participants (17.5%) were Grade I obese (BMI between 30 and 34.9), 11 participants (9.17%) were Grade II obese (BMI between 35 and 39.9), 9 participants (7.5%) were Grade III obese (BMI 40 or greater), while 6 participants (5%) were underweight (BMI less than 18.5; NCHS, 2014).

Measures

Current exercise behaviour—The Voluntary Aerobic Exercise Questionnaire (VAEQ; Bryan & Rocheleau, 2002) was used to assess participants’ current aerobic exercise behaviour. Participants first read a definition of aerobic exercise: ‘Any activity that uses large muscle groups, is done for at least 20 minutes, and is performed at a level that causes your breathing rate to be heavy and your heart to beat faster.’ They then completed three items concerning their recent exercise behaviour: (1) ‘In the past month only, how often did you engage in aerobic exercise?’ scored 1 = *never*, to 7 = *often*; (2) “In the past month only, what is the average number of days per week that you engaged in aerobic exercise?” scored 0 – 7 days; and (3) ‘In the past week only, how many days did you engage in aerobic exercise,’ scored 0 – 7 days. Responses to these items were summed to yield current exercise behaviour scores ranging from 1 – 21. The VEQ was administered at pre-task only ($\alpha = .77$).

Intentions for exercise—Participants responded to three items regarding their intentions for future exercise participation at both pre- and post-task: (1) ‘I intend to engage in aerobic

exercise as much as I can in the next month,’ scored 1 = *strongly disagree*, to 7 = *strongly agree*; (2) ‘How likely is it that you will regularly engage in aerobic exercise in the next month?’ scored 1 = *not at all likely*, to 7 = *very likely*; and (3) ‘How likely is it that you will engage in aerobic exercise at least 5-times per week in the next month?’ scored 1 = *not at all likely*, to 7 = *very likely* (Bryan & Rocheleau, 2002). Responses were averaged across the three items to create composite scores ranging from 1–7 for the pre-task ($\alpha = .81$) and post-task ($\alpha = .86$) time points.

Affect—Affect was measured before and after the experimental exercise bout using three self-report scales: the Feeling Scale (FS; Hardy & Rejeski, 1989), the Felt Arousal Scale (FAS; Svebak & Murgatroyd, 1985), and the Physical Activity Affect Scale (PAAS; Lox, Jackson, Stephen, Wasley, & Treasure, 2013). Although space limitations do not allow for a detailed discussion (c.f. Ekkekakis, 2003, 2013), we note that the FS and FAS measures constitute the valence and arousal dimensions (respectively) of the circumplex model of core affect (Russell & Feldman Barrett, 1999) while the PAAS measures map on to a rotated circumplex model of core affect (Watson & Tellegen, 1985), capturing the four quadrants of the valence and arousal dimensions.

The FS is a single item, 11-point measure of affective valence. Scores on the FS range from -5 to $+5$, with verbal anchors at odd integers and the zero point (i.e., $+5 = \text{very good}$, $3 = \text{good}$, $1 = \text{fairly good}$, $0 = \text{neutral}$, $-1 = \text{fairly bad}$, $-3 = \text{bad}$, $-5 = \text{very bad}$). The FAS is a single item, 6-point measure of affective arousal. Participants reported how ‘worked up’ they felt before and after completing the exercise bout on a scale from 1 = *low arousal*, to 6 = *high arousal*.

Finally, the PAAS is a 12-item measure comprised of four 3-item subscales representing four quadrants of core affect: Positive activated affect (i.e., positive valence, high activation – e.g., ‘energetic;’ pre-task, $\alpha = .76$; post-task, $\alpha = .89$), positive deactivated affect (i.e., positive valence, low activation – e.g., ‘relaxed;’ pre-task, $\alpha = .80$; post-task, $\alpha = .76$), negative activated affect (i.e., negative valence, high activation – e.g., ‘miserable;’ pre-task, $\alpha = .85$; post-task, $\alpha = .74$), and negative deactivated affect (i.e., negative valence, low activation – e.g., ‘fatigued;’ pre-task, $\alpha = .86$; post-task, $\alpha = .83$). Participants were asked to indicate how strongly each item reflected their subjective experience immediately before and after completing the experimental exercise bout on a scale from 0 = *definitely do not feel*, to 4 = *definitely feel*. Responses were averaged and then summed to create four PAAS subscale scores for pre- and post-task. Thus, possible scores on these four subscales ranged from 0–4 at each time point.

In-task measures—Timex® digital heart rate monitors (30-Lap Model) were used to track in-task HR (measured as beats per minute; bpm). The ACSM guidelines define moderate intensity aerobic exercise as activity that raises HR to 64–76% of HR max (see Garber et al., 2011). We used an established formula to calculate age-predicted HR max: $206 - (.88 \times \text{age})$; Gulati et al., 2010), and then multiplied that value by .64 and .76 in order to calculate the appropriate in-task HR range for each participant. Percent HR max (%HRmax) was computed as average in-task HR/age-predicted HR max; %HRmax served as an objective measure of exercise-bout intensity.

Perceived exertion during the exercise bout was assessed using the Rating of Perceived Exertion scale (RPE; Borg, 1998). The RPE measures subjective physical exertion on a 15-point scale ranging from 6 = *no exertion at all* to 20 = *maximal exertion*. The RPE scale served as a secondary (subjective) measure of exercise bout-intensity. A research assistant collected ratings of HR and RPE after a 5-minute warm-up, and then every 5 minutes during the 30-minute exercise bout.

Procedure

Data collection was completed at a local centre for wellness, fitness, and cardiac rehabilitation. Participants were recruited through flyers, e-mails distributed via university list-serves, newspaper advertisements, and Craigslist.

Upon arrival at the wellness centre, informed consent was obtained from all participants. Immediately thereafter, participants were examined by a study physician; if no contraindications for exercise were found, participants were fitted for a HR monitor and a baseline measure of resting HR was collected after 5-minutes of seated rest (Pickering et al., 2005). Next, participants were randomly assigned to either the HOOP or WALK exercise condition and brought to a private room to complete the pre-task survey. Notably, participants were not made aware of the exercise they would be asked to perform until after they had completed the pre-task survey.

Following completion of the pre-task survey, participants were given a brief demonstration of the exercise activity to which they had been assigned. For the HOOP condition, experimenters demonstrated how to start the hula-hoop rotating by indicating proper foot stance and posture, and explaining the direction and speed with which the participant should initially push the hoop to start its motion. Participants were instructed to squat down, pick up the hoop, and restart its motion as quickly as possible if it dropped in order to ensure the maintenance of exercise intensity. The fitness hula-hoops used for this condition ranged from 35–55 inches in diameter and weighed between 2–5 pounds. Experimenters helped participants choose a hoop that was best matched to their body size and ability level. For the WALK condition, experimenters demonstrated how to safely step onto, start, and stop the treadmill. Immediately following the demonstration for each condition, five minutes of warm-up activity ensued. HOOP participants were instructed to warm-up by walking at a brisk pace around the perimeter of the room. WALK participants were asked to walk on the treadmill at a pace of 2.5 miles per hour with the incline set to zero per cent grade (Ekkekakis & Lind, 2006).

To begin the 30-minute exercise session, participants were asked to either begin hula-hooping or to increase the pace of the treadmill belt to achieve a moderate level of exertion. Researchers continuously monitored participant HR to ensure that the proper intensity level was achieved and maintained. If HR fell below the bottom end of the prescribed range for a participant, the research assistant instructed that participant to increase her walking pace or speed of hooping motion until HR was sufficiently increased. At the conclusion of the exercise session, participants engaged in a 5-minute cool down before being brought to a private room to complete the post-task survey.

Overview of Planned Analyses

Before conducting analyses relevant to our study hypotheses, we performed several between groups tests to ensure that participants had been successfully randomized to condition (see Table 1). Specifically, independent samples *t* tests were performed to test for between groups differences on demographic variables (i.e., age, ethnicity, education, income, and BMI), current exercise behaviour (i.e., the VAEQ), pre-task differences on affect measures, and pre-task intentions for future aerobic exercise. Additionally, in order to ensure that the respective exercise bouts were successfully standardized in terms of level of exercise intensity, we conducted two additional independent samples *t* tests to assess for between groups differences on average in-task %HRmax and average in-task RPE scores.

To test our first hypothesis that affect would change from pre- to post-task across conditions (i.e., decreases in negative affect and increases in positive affect, affective valence, and affective arousal), we conducted a series of paired samples *t* tests to compare average pre-task affect against average post-task affect across the two exercise conditions. Next, in order to test our second hypothesis that participants assigned to the HOOP condition would report more favourable post-task affective responses (more positive and less negative affect) compared to participants assigned to the WALK condition, we conducted a series of univariate analyses of covariance (ANCOVA) tests. In each of these ANCOVA tests, post-task affect served as the dependent variable, condition served as the independent variable, and pre-task affect, %HRmax during exercise, current exercise behaviour (i.e., the VAEQ), and BMI were included as covariates. Our rationale for including these covariates was based on prior work establishing exercise-bout intensity, current exercise behaviour, and BMI as important moderators of the affective response to exercise (Ekkekakis & Lind, 2006; Magnan, Kwan, & Bryan, 2013). Lastly, we conducted a final ANCOVA to test our third hypothesis that participants assigned to the HOOP condition would report stronger intentions for future exercise at post-task compared to participants assigned to the WALK condition. In this analysis, post-task intentions to engage in aerobic exercise in the next month served as the dependent variable, condition served as the independent variable, and pre-task intentions to engage in aerobic exercise in the next month was included as a covariate.

Results

Tests for Pre-Task and In-Task Between Groups Differences

No between groups differences were observed for age, ethnicity, education, income, or BMI. Tests of between groups differences on pre-task and in-task measures are displayed in Table 1.

No between groups differences on current exercise behaviour or pre-task exercise intentions were observed. Across the full sample, participants reported an average of 1.37 (*SD* = 1.35) days per week of aerobic exercise in the past month, and .78 (*SD* = .91) days of aerobic exercise in the past week. Thus, although no participants in the sample were completely sedentary, most participants performed voluntary aerobic exercise approximately 1 day per week. During the experimental exercise bout, %HRmax ranged from 60–96% for the overall

sample. HOOP participants maintained a higher average %HRmax compared to WALK participants, but average %HRmax was within the moderate intensity range for both conditions (Garber et al., 2011). Average in-task RPE did not differ between groups. These findings suggest that the intensity of the respective exercise bouts was successfully standardized.

Results revealed a single statistically significant between groups difference at pre-task such that participants in the WALK condition scored higher on pre-task negative activated affect than participants in the HOOP condition. Between groups differences on all other pre-task affect measures were non-significant.

Tests for Pre- to Post-Task Affect Change Across Groups

Results revealed significant pre- to post-task differences for affective valence, ($M_{t1} = 1.81$, $M_{t2} = 3.26$), $t(119) = 7.25$, $p < .001$, affective arousal, ($M_{t1} = 2.95$, $M_{t2} = 4.19$), $t(119) = 10.29$, $p < .001$, positive activated affect, ($M_{t1} = 1.93$, $M_{t2} = 2.51$), $t(119) = 7.31$, $p < .001$, negative activated affect, ($M_{t1} = .544$, $M_{t2} = .156$), $t(119) = -5.59$, $p < .001$, and negative deactivated affect, ($M_{t1} = 1.21$, $M_{t2} = .761$), $t(119) = -4.69$, $p < .001$. The pattern of means suggests that as expected, affective valence, affective arousal, and positive activated affect increased from pre- to post-task across conditions, whereas negative activated and negative deactivated affect decreased from pre- to post-task across conditions. Across conditions, positive deactivated affect at post-task was not significantly different from pre-task ($M_{t1} = 2.21$, $M_{t2} = 2.13$).

Tests for Post-Task Between Groups Differences on Affect and Exercise Intentions

HOOP participants reported more positively valenced affect, higher ratings of positive activated affect, and lower ratings of negative deactivated affect at post-task compared to WALK participants (see Table 2). No significant between groups differences were observed for affective arousal, negative activated affect, or positive deactivated affect at post-task. Across all models tested, no main effects of BMI or %HRmax were observed. Main effects for current exercise behaviour were observed for the positive activated affect and negative activated affect models only; greater current exercise behaviour was associated with more positive activated affect and less negative activated affect.

Lastly, a significant main effect of condition was found such that after completing the experimental exercise bout, participants in the HOOP condition reported significantly higher intentions for aerobic exercise in the next month compared to participants in the WALK condition (see Table 2).

Discussion

The unique perspective of this pilot investigation entailed an exploration of the effect of an exercise familiarity manipulation on affective responses to exercise and intentions to engage in subsequent exercise. Providing broad recommendations regarding the utility of hula-hooping as a form of aerobic exercise was not a goal of this paper. Hula-hooping was chosen as the uncommon aerobic exercise stimulus for this study because its use in exercise settings

is infrequent, and it could be matched to brisk treadmill walking in terms of exercise setting and intensity (Holthusen et al., 2010).

In support of our first hypothesis, the findings are largely consistent with previous work showing improved affective states following moderate intensity exercise (Ekkekakis et al., 2011; Kwan & Bryan, 2010b; Schneider et al., 2009). In terms of the circumplex model of core affect, increases in affective valence (FS scores) and arousal (FAS scores) were observed across conditions at post-task. Similarly, in terms of the rotated circumplex model of core affect (i.e., the PAAS), our findings showed that on average, positive activated affect increased from pre- to post-task, and both negative activated and negative deactivated affect decreased from pre- to post task. It is not clear why no changes were observed for positive deactivated affect across conditions, as prior work has shown increases on this measure pre- to post-engagement in a bout of moderate intensity exercise (Kwan & Bryan, 2010b).

In support of our second hypothesis, we found main effects of condition on post-task affect for affective valence, positive activated affect, and negative deactivated affect. Specifically, at post-task, HOOP participants reported more positively valenced affect, higher ratings of positive activated affect, and lower ratings of negative deactivated affect compared to WALK participants. The magnitudes of these between groups effects were small (Cohen, 1988); this is not surprising, however, given that affect improved from pre- to post-task in both conditions (as expected), and thus, these results represent the magnitudes of the between group differences in post-task affect due to type of exercise activity performed.

Because we are unaware of any studies that have compared change in affect across common and uncommon exercise activities, it is difficult to couch these findings in light of past research; however, the changes in affect observed *across* conditions are highly consistent with past research.

Lastly, in support of our third hypothesis, we observed a main effect of condition on post-task intentions for future aerobic exercise such that participants in the HOOP condition reported stronger intentions to exercise in the next month than did participants in the WALK condition. Past work has demonstrated an association between more favourable affective responses to exercise and intentions for future exercise (Kwan & Bryan, 2010a; Rhodes & Kates, 2015). Thus, one possibility is that stronger intentions for future exercise observed for the HOOP participants at post-task was related to the more favourable affective responses observed for the HOOP participants at post-task. However, this is merely speculation, as it was not an aim of this paper to explicitly test for a mediational relationship between condition, affective response, and intentions. Furthermore, the broad implications of finding stronger intentions for future exercise among HOOP participants should be interpreted with caution as the magnitude of the between groups difference was small (Cohen, 1988), and prior work has found considerable discrepancies between participants' reported intentions for future exercise and their subsequent exercise behaviour (Rhodes & Yao, 2015; Rhodes, 2014; Sheeran, 2002).

When considering these results, it is important to note that the common and uncommon forms of exercise were matched on intensity, suggesting that affect improvement was not

simply due to hula-hooping being easier and/or less strenuous than brisk treadmill walking. In fact, women in the HOOP condition maintained a slightly, but significantly, higher %HRmax during the exercise bout compared to participants in the WALK condition. Despite this difference, HOOP participants did not differ from WALK participants on RPE (their subjective perception of exercise intensity).

Future Directions

Questions left unaddressed by this study include whether our findings are specific to hula-hooping or can be generalized to other uncommon exercise activities. Although we acknowledge that novelty, familiarity, and variety are not one and the same, prior work exploring subjective responses to increased variety in an exercise context would suggest that findings could indeed be generalized to other uncommon activities (Dimmock et al., 2013; Juvancic-Heltzel et al., 2013; Sylvester et al., 2014). Still, this is an empirical question to be tested. Important questions also remain about the dose-response relationship between exposure to an uncommon exercise stimulus and its influence on affective responses (i.e., how much exposure to an uncommon exercise stimulus is needed and how long do affect improvements last). There is some evidence to suggest that rotating among various types of exercise stimuli may have benefits for maximizing interest in and enjoyment of exercise (Glaros & Janelle, 2001). However, we can only speculate based on prior work how frequently new exercise activities would need to be introduced (e.g., every 2 weeks), and it is still not clear what effect this variation would have on affective responses to the exercise sessions over time.

Finally, the demonstration of a more positive affective response to an uncommon exercise modality is important, but from a public health perspective it is necessary to conduct this work using a fully powered design allowing tests for mediational effects and including a longitudinal follow-up. Such a design could determine whether participation in an uncommon exercise activity fosters motivation for future exercise behaviour and ultimately exercise maintenance, directly or indirectly, through affect improvement. A longitudinal research design would also serve to address the questions raised above about how unfamiliar or uncommon exercise activities could be incorporated into intervention research.

Study Limitations

Several limitations of this work should be considered. First, affect measurements were not collected during the exercise bouts, and thus, conclusions are limited to affective response to the *completion* of an uncommon versus common aerobic exercise bout. Past work has shown that it is important to assess affective response *during* aerobic exercise when the goal is the prediction of future moderate intensity exercise (Ekkekakis et al., 2011; Rhodes & Kates, 2015; Schneider et al., 2009; Williams et al., 2012). Thus, future work interested in predicting subsequent exercise behaviour from affective responses to an uncommon exercise stimulus should collect assessments of in-task affective responses. However, it was not a goal of this pilot investigation to demonstrate associations between affective response and future exercise *behaviour*; rather, we wanted to see if exposure to uncommon (versus common) exercise stimulus would result in more favourable affect at post task, *over and above* the change in post-task affect *expected* to occur following the completion of an

exercise bout (vis-à-vis the ‘affective rebound effect,’ Ekkekakis et al., 2011; Ekkekakis, 2003).

A second limitation concerns our lack of individual difference variable assessment, and how individual differences may have influenced affective responses to the uncommon exercise activity. While the affective rebound effect suggests that most individuals experience a similarly positive affective state post-exercise (Ekkekakis et al., 2011), it may not be the case that most individuals would necessarily enjoy participation in an uncommon exercise bout, and it is not clear how the experience of performing the uncommon exercise bout would influence affect post exercise. Apart from wide variation in personality factors (e.g., novelty seeking, risk taking, extroversion), individuals suffering from social physique anxiety or social phobia may find such an experience to be highly emotionally aversive; other individuals may experience frustration or confusion when attempting to perform an exercise activity that is unfamiliar to them. We controlled for the influence of current exercise behaviour and BMI in our analyses because past research has found marked differences in response to exercise, both psychologically (affect, self-efficacy, perceived exertion and pain) and physiologically (blood lactate, HR, body temperature), across levels of these constructs (Bryan, Hutchison, Seals, & Allen, 2007; Ekkekakis & Lind, 2006; Magnan et al., 2013; Vazou-Ekkekakis & Ekkekakis, 2009). While exploration of the influence of these factors on affective response to the common and uncommon exercise bout was beyond the scope of this pilot investigation, we acknowledge that future work in this area would benefit from the additional study of the individual differences that may moderate response to uncommon exercise activities. For example, the transdisciplinary model of exercise behaviour proposed by Bryan and colleagues (2011, 2013) may serve as a useful framework for understanding the role that individual differences across physiological, motivational, and genetic factors have on subjective responses to uncommon exercise activities.

It is also possible that the completion of the uncommon exercise activity induced increases in mastery (not measured) that resulted in the observed changes in affect. While possible, the participants in the present study were not exercising frequently or regularly (if at all); specifically, across the sample, participants reported engaging in aerobic exercise activities on less than 2 days per week on average in the last month, and less than 1 day on average in the past week. Consequently, it is likely that engaging in *any* form of aerobic exercise may have evoked a sense of mastery upon completion for the participants in this study.

The lack of explicit assessment of participants’ past exposure to the two exercise conditions is another limitation of this research. For example, walking on a treadmill may have been a truly novel exercise experience for some participants. To explore this possibility, we examined the results of a free response question from our measure of current exercise behaviour, the VAEQ. Specifically, participants were asked, “*In the past month only, what types of aerobic exercise activities have you engaged in?*” We found that while many participants reported engaging in ambulatory types of aerobic activities in the past month (i.e., 31 participants reported “running or jogging” in the past month, 26 reported “brisk walking” in the past month, and 8 reported “hiking” in the past month), very few participants reported engaging in activities that might be considered similar (in movement

pattern) to hula-hooping (i.e., 5 participants reported “dancing” in the past month, $n = 3$ assigned to HOOP, 2 reported “Zumba” in the past month, $n = 1$ assigned to HOOP, and 2 reported “Yoga” in the past month, $n = 0$ assigned to HOOP). Notably, there were no participants that reported “hula-hooping” for aerobic physical activity in the past month. These points notwithstanding, future work would benefit from explicitly testing the relationships between novelty, familiarity with an exercise stimulus, and affect so that the mechanisms through which novel or unfamiliar stimuli may influence affective responses to exercise can be better understood.

Lastly, due to limited resources, we were not able to conduct VO_2max assessments, considered by the ACSM to be the gold standard procedure for establishing HR max values (Garber et al., 2011). Instead, we used a widely accepted formula for calculating HR max (Gulati et al., 2010), and used those values to standardized the intensity of the exercise across conditions.

Conclusions

In a sample of insufficiently active, racially/ethnically diverse women who varied widely on BMI, participants assigned to the uncommon exercise condition (HOOP) reported more positive and less negative affective responses to a 30-minute bout of aerobic exercise than did participants assigned to the common exercise condition (WALK). Further, participants assigned to the uncommon exercise condition reported significantly stronger intentions for future aerobic exercise after completing the experimental bout than did participants assigned to the common exercise condition. Our findings dovetail nicely with work in the exercise literature showing a relationship between exercise variety and enjoyment of the exercise experience. Future work using a longitudinal design is needed to understand the relationships between familiarity with an exercise stimulus, affective responses to exercise, motivation for future exercise behaviour, and exercise maintenance over time.

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Table 1

Tests for Pre-Task and In-Task Between Groups Differences

Construct	M		95% CI		t statistic	p	d
	HOOP	WALK	LL	UL			
Pre-task measures							
Affective Valence ^a	1.97 (SD = 1.86)	1.66 (SD = 2.02)	-.399	1.01	.857	.393	.160
Affective Arousal ^b	2.98 (SD = 1.15)	2.92 (SD = 1.27)	-.375	.502	.286	.775	.050
PAAS							
Positive Activated Affect ^c	2.03 (SD = .745)	1.84 (SD = .765)	-.083	.463	1.38	.171	.252
Negative Activated Affect ^c	.397 (SD = .653)	.683 (SD = .850)	-.562	-.011	-2.06	.042	.377
Positive Deactivated Affect ^c	2.32 (SD = .825)	2.10 (SD = .753)	-.071	.499	1.49	.140	.279
Negative Deactivated Affect ^c	1.23 (SD = .954)	1.19 (SD = .906)	-.300	.373	.214	.831	.043
Intentions for Aerobic Exercise ^d	3.57 (SD = 1.46)	3.53 (SD = 1.56)	-.500	.596	.173	.863	.027
Current Aerobic Exercise Behaviour ^e	4.53 (SD = 2.84)	4.79 (SD = 3.26)	-1.37	.853	-.457	.649	.085
In-task measures							
%HR max ^f	74.39 (SD = 8.37)	71.09 (SD = 7.38)	.005	.061	2.29	.024	.418
RPE ^g	11.52 (SD = 1.53)	11.93 (SD = 1.59)	-.975	.156	-1.43	.155	.263

Note. Statistically significant effects are represented in boldface font; *SD* = standard deviation; 95% CI = 95% confidence interval of the between groups mean difference; PAAS = Physical Activity Affect Scale; HR = heart rate; RPE = Rating of Perceived Exertion scale.

^aMeasured using the Feeling Scale (FS), scored on a -5 – +5 scale with higher scores representing more positive affective valence.

^bMeasured using the Felt Arousal Scale (FAS), scored on a 1–6 scale with higher scores representing greater arousal.

^cMeasured using the PAAS, subscales are calculated as the average of three items scored on a 0–4 scale with higher scores representing greater agreement with the construct.

^dIntentions for aerobic exercise in the next month, calculated as the average of 3 items scored on a 1–7 scale with higher scores representing stronger intentions for aerobic exercise.

^eCurrent aerobic exercise behaviour, calculated as the sum of 3 items scored on a 1–7 scale with higher scores representing more current aerobic exercise behaviour.

^f%HR max computed as average in-task HR/age-predicted HR max.

^gScored on a scale from 6 – 20 with higher scores representing greater perceived physical exertion.

Table 2
ANCOVA Tests for Post-Task Between Groups Differences on Affect and Intentions for Future Aerobic Exercise

Construct	M				95% CI		F statistic	df	p	Partial η^2
	HOOP	WALK	LL	UL	LL	UL				
Affective Valence ^a	3.67 (SE = .215)	2.87 (SE = .207)	.193	1.40	.193	1.40	6.84	5, 114	.010	.057 [†]
Affective Arousal ^b	4.21 (SE = .144)	4.17 (SE = .139)	-.365	.438	-.365	.438	.032	5, 114	.859	.000 [‡]
PAAS										
Positive Activated Affect ^c	2.70 (SE = .109)	2.33 (SE = .105)	.062	.676	.062	.676	5.68	5, 114	.019	.047 [†]
Negative Activated Affect ^c	.092 (SE = .053)	.215 (SE = .051)	-.273	.028	-.273	.028	2.59	5, 114	.110	.022 [‡]
Positive Deactivated Affect ^c	2.03 (SE = .112)	2.22 (SE = .108)	-.504	.123	-.504	.123	1.45	5, 114	.231	.013 [‡]
Negative Deactivated Affect ^c	.570 (SE = .097)	.940 (SE = .093)	-.640	-.101	-.640	-.101	7.40	5, 114	.008	.061 [‡]
Intentions for Aerobic Exercise ^d	5.32 (SE = .153)	4.87 (SE = .148)	.023	.867	.023	.867	4.36	2, 117	.039	.036 [‡]

Note. Statistically significant effects are represented in boldface font; ANCOVA = analysis of covariance; 95% CI = 95% confidence interval of the between groups mean difference; LL = lower limit; UL = upper limit; SE = standard error; PAAS = Physical Activity Affect Scale.

[†] effect size of condition after controlling for pre-task scores, %HR max, current exercise behaviour, and BMI.

[‡] effect size of condition after controlling for pre-task intentions for future aerobic exercise.

^a Measured using the Feeling Scale (FS), scored on a -5 to +5 scale with higher scores representing more positive affective valence.

^b Measured using the Felt Arousal Scale (FAS), scored on a 1 to 6 scale with higher scores representing greater arousal.

^c Measured using the PAAS, subscales are calculated as the average of three items scored on a 0 to 4 scale with higher scores representing greater agreement with the construct.

^d Intentions for aerobic exercise in the next month, calculated as the average of 3 items scored on a 1 to 7 scale with higher scores representing stronger intentions for aerobic exercise.