Post-Exercise Affect: The Effect of Mode Preference

BRIDGET M. MILLER

Oklahoma State University

JOHN B. BARTHOLOMIEW

The University of Texas at Austin

BARBARA A. SPRINGER

Walter Reed Army Medical Center

It has been suggested that the performance of preferred modes of exercise will serve to maximize the affective response to exercise. Support has come from work that has shown the effect of exercise on affect to be mediated by enjoyment. However, there is a need to compare modes of exercise that differ in preference and enjoyment, yet are similar in intensity, duration and muscle group. This experiment was designed to achieve this aim. Thirty-four college-aged women completed 20 minutes of exercise on high and low preference modes of continuous exercise. Intensity was maintained at 65–75% of HRR. Affect was measured by the PANAS, collected prior to and at 5, 20, and 40 min post exercise. Results provided partial support for the hypothesis as mode preference moderated the improvement in positive affect, with no effect on the reduction in negative affect. Interestingly, regardless of mode preference, enjoyment ratings were found to mediate the change in both positive and negative affect.

Acute (single) bouts of exercise have long been recognized as an efficacious, non-pharmacological method to regulate a wide array of positive and negative psychological states. For example, acute bouts of exercise have been shown to reduce state anxiety (Bahrick & Morgan, 1978), depression (Martinsen, 1987), fatigue (Kennedy & Newton, 1997), tension (Thayer, 1987), tiredness (Thayer, 1987) and negative affect (Bartholomiew & Miller, 2002); while improving positive well-being (Lox & Rudolph, 1995), vigor (Kennedy & Newton, 1997), energy (Thayer, 1987) and positive affect (Choi, Van Horn, Picker, & Roberts, 1993). In fact, Yeung (1996) reviewed two decades (1976–1995) of peer-reviewed literature on the effects of acute exercise on mood and affective states. The 81 studies consisted of pre-experimental (n = 40), quasi-experimental (n = 18), and experimental (n = 23) designs, with over 85% of the studies reporting some degree of exercise-induced enhancement. A variety of exercise modes including weight lifting (O'Connor, Bryant, Veltri, & Gebhardt, 1993), yoga

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Address correspondence to John B. Bartholomiew, Ph.D., Department of Kinesiology and Health Education, 222 Bellmont Hall, Austin, TX 78712. E-mail: john.barr@mail.utexas.edu

Although these data clearly indicate that the majority of exercise modes can result in improved psychological states, they do not indicate whether the improvement differs as a function of exercise mode. For example, Berger and Motl (2000) suggest that post-exercise psychological states will vary as a function of exercise enjoyment and mode. This hypothesis, if supported, has clear implications for exercise prescription. Specifically, the enhanced psychological response to a particular mode of exercise is expected to reinforce that choice and, as a result, increase the utilization of that mode of exercise. Thus, individuals are expected to respond most positively and, as a result, continue to choose to engage in those bouts of exercise that they most enjoy. Thus, one would expect a clear relationship amongst exercise preference, enjoyment and post exercise psychological states. These relationships were supported in research comparing rock climbing to a health education class (Motl, Berger, & Leuschen, 2000). Results indicated that rock climbing lead to improved mood relative to the health education class and that this improvement was mediated by enjoyment, as measured by the Physical Activity Enjoyment Scale (PACES; Kendzierski & De Carlo, 1991). Unfortunately, this experiment failed to compare different modes of exercise. Thus, although enjoyment does appear to play an important role in post-exercise mood, it is not clear how enjoyment is related to different modes of exercise.

Many of the studies that have examined the role of exercise mode on psychological state have allowed participants to self-select into a type of exercise. For example, Szabo and colleagues collected post-exercise affective data from 174 habitual exercisers who engaged in their normal amount of aerobic dance, weight training, tai-chi or Hatha yoga (Szabo, Mesko, Caputo, & Gill, 1998). Similar designs were utilized by Dyer and Crouch (1988), Berger and Owen (1988), and McGowan and colleagues (1991); all of whom supported differences in psychological states as a function of exercise mode. For example, participants in one study were students voluntarily enrolled in swimming \((n = 21)\), body conditioning \((n = 16)\), coeducational fencing \((n = 20)\), yoga \((n_s = 37, 26)\), a health science lecture \((n = 35)\), or a physical education lecture \((n = 15)\), who completed one class session in conjunction with psychological assessment (Berger & Owen, 1988). Only the yoga participants reported significant short-term reductions in state anxiety. In another study, 17 participants were enrolled in either a jogging and conditioning class \((30 \text{ min running and 10 \text{ min of calisthenics}})\), an aerobics dance class \((15 \text{ min warm-up and 45 min aerobic dance})\), weight training classes \((10 \text{ min warm-up and 40 \text{ min weight lifting}})\), or an introductory psychology class (Dyer & Crouch, 1988). The acute bout of exercise was, again, one class session. Runners reported generally more positive moods than controls and weight lifters, but their mood profile was not significantly different from that of aerobic dancers. Thus, these studies support clear differences in psychological state as a function of exercise mode. Unfortunately, none of these studies directly assessed exercise enjoyment or varied preference. In addition, no study randomly assigned exercise mode. As a result, group assignment is confounded by issues of exercise intensity and duration, as well as any number of unmeasured, pre-existing conditions that may have lead the participants to self-select into a particular class or mode of exercise. These designs, therefore, limit the ability to infer a causal role for exercise mode on any observed differences in post-exercise psychological states, and they are unable to contribute to an understanding of the relationships among exercise preference, enjoyment, and the resulting psychological state.

Where true experimental designs have been utilized, the comparison of exercise modes has been done on a relatively gross level. In one of these studies, the authors randomly assigned college varsity athletes \((11 \text{ females and 15 males})\) to a 30-minute session of either weight
training or leg cycle ergometry completed at 70–80% of maximal capacity (Raglin, Turner, & Eksten, 1993). Results indicated that state anxiety increased immediately after weight training but then returned to baseline levels during recovery. In contrast, state anxiety decreased below baseline within 60 minutes of completing cycle ergometry. This experiment limited exercise to the lower body and controlled for exercise duration and intensity. Thus, the results can be used to support causal differences between continuous and intermittent exertions on post-exercise anxiety. However, these data do little within the finer distinctions of exercise mode. That is, why do people select a particular mode of either continuous, sub-maximal exercise, for example, cycling versus jogging, or a given mode of intermittent weight lifting?

If differences in mood enhancement play a role in this decision (Motl et al., 2000), then it is particularly important to examine the role of exercise mode on post-exercise psychological states for continuous, sub-maximal exercise. These “aerobic” forms of exercise are the foundation of the American College of Sports Medicine (1995) and Surgeon General (U.S. Department of Health and Human Services, 1996) recommendations for regular physical activity. In addition, given the range of available options for these forms of exercise, these provide the greatest ability to manipulate exercise mode as a function of personal preference and, thus, exercise enjoyment as a means to maximize post-exercise affect.

This experiment was, therefore, designed to test the impact of exercise preference on post-exercise affective states. This was conducted in an attempt to test Berger and Motl’s (2000) hypothesis with regard to exercise preference, enjoyment, and post-exercise mood. Specifically, it was predicted that most and least preferred modes of exercise would differ in both subjective ratings of enjoyment and the resulting affective state.

METHODS

Participants

Participants were 34 undergraduate females recruited from aerobics classes offered by a large southwestern university. The average age of the participants was 20.6 (±2.5) years. They were generally healthy with an average BMI of 23.46 (±3.8). The sample had a moderate amount of previous exercise experience, for they had been participating in an aerobics class for at least 3 months at the time of data collection. They reported exercising for an average of 40–60 minutes a day, 3–4 days a week.

Procedure

The key experimental manipulation was the exposure to five modes of cardiovascular exercise equipment: 1) stair stepper, 2) treadmill, 3) rower, 4) stationary cycle ergometer, and 5) simulated cross-country skiing. The different pieces of cardiovascular equipment were chosen because they offered the greatest range in commonly used aerobic exercise equipment and they were rhythmic and aerobic in nature. Thus, all five modes provide cardiovascular benefits with prolonged exposure. The chosen modes maximized the individual variability in skill and enjoyment which influences compliance to exercise programs (ACSM Guidelines, 1995). To ensure that participants demonstrated proper form and were familiar with each mode of exercise, they completed 10 min of exercise on each of the five pieces of equipment during an orientation session. Following exposure, participants rank ordered the five modes of exercise from most to least favorite. Lastly, each individual’s maximum heart rate was calculated using the Karvonen Method.

Each participant completed five experimental sessions: their two most favorite modes of exercise, their two least favorite modes of exercise, and a no-exercise control. The order of
the five experimental sessions was randomly assigned, each of which occurred at a set time and day, separated by one week. The 20-minute exercise sessions included a proper warm-up and cool down and were completed at an intensity of 70% of HRR, ± 7 BPM, which results in a training zone of 65–75% of HRR. During training sessions, heart rates were monitored using Polar Protrainer NV Heart Rate monitors to ensure that the participants stayed within their predetermined HR zone, with intensity adjusted as needed. The 20-minute session at 70% HRR protocol was used because ACSM Guidelines (1995) note that caloric and cardiorespiratory goals can be met with exercise sessions that vary from 20–60 minutes (excluding warm-up and cool down). ACSM Guidelines also recommend that exercise intensity fall within the range of 50 to 85% of HRR. Thus, the current protocol utilized a mid-range intensity of 70% HRR.

**Testing**

Participants performed all exercise sessions in the same, somewhat bland, exercise environment. The post-exercise period was spent in a private cubicle located within the gym where participants sat quietly. To control for pre-test affective response to the mode of exercise, baseline affect was assessed prior to notification of the exercise mode to be completed. Once informed of the exercise mode, each session began with a 5-minute warm-up on the assigned piece of equipment. When HR was within 10 bpm of the lower boundary of their training zone, the 20-minute exercise session began and the starting HR and RPE were noted. HR was recorded every five minutes during each exercise session. Exercise intensity was adjusted to maintain HR within the target zone. In addition, Borg’s Ratings of Perceived Exertion (RPE) were recorded at 5-minute intervals. Following the 20-minute exercise session, the intensity or resistance was decreased and participants cooled down for 2–3 minutes to safely reduce heart rate. Ratings of exercise performance and enjoyment were assessed 5 min following exercise. Post-exercise affect was assessed at 5, 20, and 40 minutes following exercise. For the control session, participants sat quietly for 20 minutes in a private cubicle in the gym environment instead of participating in a physical activity and then completed affect surveys at the same time points as the exercise trials.

Although each participant completed four bouts of exercise we will limit the results to their most and least preferred bouts of exercise as these provide the most direct test of the hypotheses. This decision was made because the inclusion of all exercise trials complicated the presentation of the data, with no effect on the results. (See the notes that follow this manuscript for the complete analysis.)

**Dependent Variables**

Participants completed a series of questionnaires to assess their psychological state in conjunction with exercise. However, this analysis will be limited to measures of affective state. Affect was measured using the Positive Affect Negative Affect Schedule (PANAS; Watson, Clark, Tellegen, 1988). The PANAS is a 20-item questionnaire with positive (interested, excited, alert, etc.) and negative (guilty, nervous, upset, etc.) affect subscales. It is scored on a 5-point Likert-type scale anchored with “very slightly or not at all” and “extremely.” The PANAS has successfully been used to indicate affect in conjunction with exercise (McIntyre, Watson, & Cunningham, 1990). In the present study, the subscales demonstrated acceptable reliability (positive affect $\alpha = .80$, negative affect $\alpha = .95$). Participants completed the psychological states surveys prior to, and at 5, 20, and 40 minutes following exercise. Participants also rated their enjoyment, performance, and effort on a series of single-item 5-point Likert-type scales (see Table 1). These three questions have been used to assess feelings of mastery in conjunction with cardiovascular exercise and have successfully predicted post-exercise psychological states.
Table 1
Performance Rating Following Exercise by Preference

<table>
<thead>
<tr>
<th>5-pt likert scale anchors</th>
<th>High preference</th>
<th>Low preference</th>
<th>Effects size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How well did you perform today?a</td>
<td>Very poor (1)</td>
<td>4.06 (.85)</td>
<td>3.32 (1.01)</td>
</tr>
<tr>
<td>Very well (5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. How much did you enjoy your workout today?b</td>
<td>Very little (1)</td>
<td>4.03 (.83)</td>
<td>2.12 (.98)</td>
</tr>
<tr>
<td>Very much (5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. How would you describe you effort today?</td>
<td>Very weak (1)</td>
<td>3.91 (.83)</td>
<td>3.68 (1.07)</td>
</tr>
<tr>
<td>Very strong (5)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Means are different between most and least favorite groups with \( p < .01 \).

b Means are different between most and least favorite groups with \( p < .05 \).

(Bartholomew & Miller, 2002). This was selected in lieu of the PACES, as the underlying factor structure of the 18-item scale has been questioned (Crocker & Bouffard, 1995; Motl et al., 2001).

Statistical Analysis

Baseline comparisons were compared via two-way ANOVAs with repeated measures. Differences in affective states were tested through separate 3 (Group) × 4 (Time) ANOVAs with repeated measures on positive and negative affect. A significant Group × Time interaction was predicted. This interaction would be decomposed using individual 3 (Group) × 4 (Time) ANOVAs with repeated measures for each individual subscale along with the simple effects of time within each group. To assess the contribution of enjoyment, a series of ANCOVAs were performed where enjoyment ratings for the related bout of exercise served as the covariate. Planned contrasts were used to compare changes from baseline within each group, with a modified Bonferroni correction used to protect against alpha inflation (Keppel, 1992). Finally, all effect sizes (ES) are calculated using the mean difference divided by the pooled standard deviation.

RESULTS

Separate two-way (Preference) ANOVAs with repeated measures were used to test for differences amongst the exercise ratings and HR between high and low preference exercise. Participation in the high preference exercise was associated with significantly higher ratings of enjoyment, \( F(1,33) = 72.278; p < .001 \); and significantly higher ratings of exercise performance, \( F(1,33) = 11.984; p < .01 \), see Table 1. However, no significant difference occurred between most and least preferred modes of exercise for ratings of effort, \( p > .15 \); or for the average HR during exercise, \( p > .15 \). Thus, the manipulation of mode preference resulted in significant differences in enjoyment while controlling for exercise intensity.

Positive Affect

A3 (Most Preferred, Least Preferred, and Control) × 4 (Time) ANOVA with repeated measures was conducted to determine if preference moderated the level of post-exercise positive affective states. These data are presented in Table 2. There was a significant Group × Time interaction, \( F(6, 198) = 5.45, p < .001 \) (see Figure 1). To decompose the interaction, the
Table 2
Affective States: Means and Standard Deviations

<table>
<thead>
<tr>
<th></th>
<th>High preference</th>
<th>Low preference</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Affect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>25.03 (7.91)a</td>
<td>23.38 (8.84)a</td>
<td>25.71 (8.43)a</td>
</tr>
<tr>
<td>5 minutes post</td>
<td>29.47 (6.69)a *</td>
<td>25.68 (9.52)b</td>
<td>23.74 (7.31)b</td>
</tr>
<tr>
<td>20 minutes post</td>
<td>27.79 (7.45)a *</td>
<td>25.56 (9.06)c</td>
<td>22.53 (7.88)c *</td>
</tr>
<tr>
<td>40 minutes post</td>
<td>27.71 (7.88)a *</td>
<td>25.74 (10.48)b</td>
<td>21.97 (8.79)b *</td>
</tr>
<tr>
<td>Negative Affect</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>14.53 (6.44)a</td>
<td>12.91 (4.27)a</td>
<td>13.68 (5.34)a</td>
</tr>
<tr>
<td>5 minutes post</td>
<td>12.76 (3.92)a *</td>
<td>12.50 (3.46)c</td>
<td>13.00 (5.52)c *</td>
</tr>
<tr>
<td>20 minutes post</td>
<td>11.71 (2.89)a *</td>
<td>11.35 (2.72)c</td>
<td>13.53 (6.20)c</td>
</tr>
<tr>
<td>40 minutes post</td>
<td>11.76 (3.15)a *</td>
<td>11.53 (3.39)c</td>
<td>13.09 (5.95)c *</td>
</tr>
</tbody>
</table>

Note: Means sharing the same superscript do not differ between groups, with $p < .01$. Means marked with * are significantly different from baseline.

Simple effects of Time were assessed within each level of Group. For high-preference exercise, there was a significant Time effect, $F(3, 99) = 6.84, p < .001$, representing an increase in positive affect following exercise. Planned contrasts indicated that positive affect was significantly higher than baseline at all time points: 5 min post-exercise, $F(1, 33) = 13.67, p < .01, ES = .61$; 20 min post-exercise, $F(1, 33) = 6.61, p = .01, ES = .36$; and 40 min post-exercise, $F(1, 33) = 5.51, p = .02, ES = .34$. For low-preference exercise, there was a marginally significant Time effect, $F(3, 99) = 2.38, p = .07$. However, none of the post-exercise ratings of positive affect were significantly different from baseline. For the Control condition, there was a significant effect of time, $F(3, 99) = 7.91, p < .001$. Planned contrasts indicated that positive affect was significantly lower than baseline at 20 min post-exercise, $F(1, 33) = 9.96, p < .01, ES = -.39$; and 40 min post-exercise, $F(1, 33) = 10.49, p < .01, ES = -.43$.

To determine the role of enjoyment in these effects, an ANCOVA was done on the simple effects of Time within each of the experimental groups (enjoyment scores were specific to exercise and, as a result, did not exist for the Control condition). Results indicated that controlling for enjoyment served to remove the significant effects of Time for the high-preference modes of exercise, $F(3, 96) = 1.55, p = .21$; and the marginally significant low-preference exercise

![Figure 1. Changes in positive affect as a function of exercise preference.](image-url)
modes, $F(3, 96) = 0.37, p = .78$. Thus, the effects of exercise on positive affect appear to be fully mediated by enjoyment.

**Negative Affect**

A 3 (Most Preferred, Least Preferred, and Control) $\times$ 4 (Time) ANOVA with repeated measures was conducted to determine if preference moderated the level of post-exercise negative affective states. These data are presented in Table 2. There was a significant Group $\times$ Time interaction, $F(3, 198) = 6.57, p < .001$ (see Figure 2). To decompose the interaction, the simple effects of Time were assessed within each level of Group. For high-preference exercise, there was a significant Time effect, $F(3, 99) = 7.45, p < .001$, representing a reduction in negative affect following exercise. Planned contrasts indicated that negative affect was significantly lower than baseline at all time points: 5 min post-exercise, $F(1, 33) = 5.53, p < .01, ES = -.34$; 20 min post-exercise, $F(1, 33) = 8.46, p < .01, ES = -.60$; and 40 min post-exercise, $F(1, 33) = 7.78, p < .01, ES = -.58$. For low-preference exercise, there was a significant Time effect, $F(3, 99) = 6.96, p < .01$. Planned contrasts indicated that the reduction in negative affect was significant at both 20 min post-exercise, $F(1, 33) = 11.25, p < .01, ES = -.45$, and 40 min post-exercise, $F(1, 33) = 6.92, p = .01, ES = -.36$. For the Control condition, there was a marginally significant effect of time, $F(3, 99) = 2.35, p = .07$. Planned contrasts indicated that negative affect was significantly lower than baseline only at 5 min post-exercise, $F(1, 33) = 8.09, p < .01, ES = -.13$.

To determine the role of enjoyment in these effects, an ANCOVA was conducted on the simple effects of Time within each of the experimental groups. Results indicated that controlling for enjoyment served to lessen the effects of Time for high preference modes of exercise, $F(3, 96) = 2.99, p = .04$. However, none of the post-exercise ratings of negative affect were significantly different from baseline. In contrast, controlling for enjoyment served to eliminate the effects for Time for low preference exercise modes, $F(3, 96) = 0.98, p = .41$. Thus, the effects of exercise on negative affect also appear to be mediated by enjoyment of the exercise mode.

**DISCUSSION**

This experiment was designed to examine the effect of exercise preference on affective state and the role of exercise enjoyment in this effect. Results indicated that differences in
exercise preference resulted in differences for positive affect. Specifically, participants reported greater improvements in positive affect following high preference exercise modes than for low preference exercise modes. In contrast, there was no effect for exercise preference on negative affect. Participants reported similar reductions in negative affect regardless of exercise preference or enjoyment. As a result, these data partially support the recommendations of Berger and Motl (2000) that psychological states will vary as a function of exercise preference. This appears to be the case for positive affect, but not for negative affect. This invariant pattern of effects for positive and negative affect has been demonstrated previously. For example, feelings of mastery have been shown to moderate positive affect following group, aerobic dance exercise, with no effect on negative affect (Bartholomew & Miller, 2002). Thus, it may be that feelings of positive affect are more sensitive to variation in the participant's perception of their exercise experience.

It may be that these data are limited by the exercise options (a total of five) that were available for participants. The selected modes of exercise are commonly used and the exercise intensity is in line with both ACSM (1995) and the Surgeon General (1996) recommendations for daily, moderate intensity physical activity. Thus, this experiment represents an appropriate beginning for this line of research. However, the utilization of common exercise modes may be problematic as a particular mode of exercise rated "least preferred" may have been amongst the range of exercise choices made by these relatively experienced exercisers. The "least preferred" option, therefore, may not have been sufficiently unpleasant for this sample to serve as a useful comparison to the "most preferred" option. However, there was a two standard-deviation difference in subjective ratings of enjoyment between most and least preferred exercise modes. Thus, it appears that manipulation of mode preference was sufficient to test the hypothesis as it was successful in producing significant differences in exercise enjoyment.

Interestingly, despite the significant differences in self-reports of exercise enjoyment between high- and low-preference exercise modes, there remained a considerable amount of variability in these ratings. Specifically, 26% of the participants reported neutral to negative enjoyment ratings for the high-preference mode of exercise, while 32% reported neutral to positive ratings for the low-preference mode of exercise. As a result, we conducted a second analysis where the ratings of enjoyment were controlled within each mode of exercise. When ratings of enjoyment were controlled, the improvement in affect was no longer significant for either low- or high-preference exercise. This held for both positive and negative affect. Thus, ratings of enjoyment appear to be a clear mediator of the changes in post-exercise affect, replicating the work of Motl and colleagues (2000). These effects, however, must be taken with caution. The ratings of enjoyment were assessed retrospectively, a few minutes following exercise. These ratings are likely to be strongly related to the participants' present affective state. Although this limitation is of less concern given the assessment of affect at 20 and 40 min following the ratings of enjoyment, the design would have been strengthened considerably had enjoyment been assessed during exercise.

Because exercise preference was related to enjoyment, one would expect the interpretation of these results to converge with the analysis in which enjoyment was controlled. However, the inference from the comparison of exercise conditions—that the effect of exercise preference is limited to positive affect—differs from the inference from the analysis of covariance—that enjoyment mediates the change in both positive and negative affect. It may be that a third, unmeasured variable is accounting for these differences. For example, there may be a dispositional trait, such as Social Physique Anxiety (Hart, Leary, & Rejeski, 1989) or a general tendency to enjoy physical activity, that would be expected to drive ratings of enjoyment across different modes of exercise. It may also be that while intensity was controlled relative to heart rate, that differences existed relative to lactate threshold. Exercise at 70% of HRR can
place some individuals above their lactate threshold, resulting in a negative affective response (Ekkekakis & Petruzzello, 1999). However, these possibilities assume correlated enjoyment ratings across modes of exercise. This, in fact, was not the case in the present study. The correlation between enjoyment ratings for high and low preference exercise modes was not significant ($r = -.04$). It, therefore, seems more likely that exercise preference is one of many factors that contribute to exercise enjoyment. Diet, hydration status, setting, life stress, social interaction, and so forth, would all likely play a role in exercise enjoyment. For example, affective benefits have been shown for socially enriched exercise environments (Turner, Rejeski, & Brawley, 1997) and high group cohesion within an exercise setting (Spink & Carron, 1993). Unfortunately, these data do not allow for an analysis of why individuals prefer or enjoy their exercise. It may be that this is due to previous exposure, differences in in-task response, or any number of other factors. Future research should, therefore, target the impact of the entire exercise experience on post-exercise affect.

Although these data raise a number of possibilities for future research, the present experiment does provide a useful test of the recommendations of Berger and Motl (2000) and a clear extension of the work of Motl and colleagues (2000). Specifically, it is the first experiment to compare the affective response to exercise modes that control for intensity and duration and, as a result, serves to extend existing affect research concerning both exercise preference and enjoyment. It is hoped that future work in this area will serve to broaden our understanding of why people choose a particular exercise mode as well as those variables that contribute to their psychological response to exercise.

**AUTHORS’ NOTE**

A 5 (4 exercise conditions and Control) × 4 (Time) MANOVA with repeated measures was conducted using all subscales. As was the case with the 3 (Group) × 4 (Time) MANOVA reported in text, the Group × Time interaction was significant, $F(84, 2397) = 2.486, p < .001$. Likewise, 5 (Group) × 4 (Time) ANOVAs with repeated measures were conducted for each sub-scale. Again, as was the case with the 3 (Group) × 4 (Time) ANOVAs reported in text, significant Group × Time interactions occurred for both positive affect, $F(9, 282) = 5.359, p < .001$, and negative affect, $F(5, 189) = 3.692, p < .05$. Thus, it does not appear that there was any limitation to reporting a 3-group rather than a 5-group analysis.

**REFERENCES**


