

## Research article

# PREFERRED MODALITY INFLUENCES ON EXERCISE-INDUCED MOOD CHANGES

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### ABSTRACT

The present study tested, both retrospectively and prospectively, exercise-induced mood changes among regular exercisers. Specifically, it examined the extent to which preferred exercise modality promoted greater mood benefits. A group of 25 exercise participants ( $M = 35.5$  yr.,  $SD = 10.5$  yr.) took part in the study. All participants had exercised at least three times a week ( $M = 3.5$ ,  $SD = 2.3$ ) during the previous year. Participants completed a 14-item Exercise Preference Questionnaire to provide retrospective evaluations of their most- and least-preferred type of exercise. For the prospective investigation, participants completed the Brunel Mood Scale (BRUMS) 15 minutes before and immediately after their most- and least-preferred exercise sessions. One week separated completion of each exercise session. Retrospective assessment of exercise-induced mood changes showed strong support for enhanced mood following the preferred mode of exercise. Also, as hypothesized, prospective results showed that mood enhancement was greater following the preferred exercise modality, but significant mood enhancement also occurred following the least-preferred modality among experienced exercisers. In conclusions, findings support the principle that exercise can provide psychological benefits to its participants, in the form of positive affective outcomes, something that appears to be enhanced by preferred exercise modality. Given the important public health implications of exercise adherence, future research should seek to further investigate the mechanisms of exercise-induced mood enhancement.

**KEY WORDS:** Mood, emotion, affect, exercise, preferred modality, POMS, BRUMS.

### INTRODUCTION

Exercise-induced mood enhancement is a frequently investigated topic in exercise psychology, although the mechanisms involved are not well understood (Biddle, 1995; Buckworth and Dishman, 2002; Mutrie and Biddle, 1995). The importance to public health of understanding these mechanisms is evidenced by the findings of Thayer et al (1994), who showed that 44% of a sample of the general population reported exercise as an effective strategy to regulate mood. In a review of salient research, Berger and Motl (2000) cited evidence of both acute

and chronic mood enhancement following exercise, and identified several factors proposed to maximize its mood-enhancing effects. These factors included duration of 20 - 30 minutes, moderate intensity, regular frequency (3 x week), rhythmic breathing, predictable and repetitive movements, and an absence of interpersonal competition. They also cited enjoyment as a variable that may moderate mood changes. Recent research has also shown that perceived satisfaction with performance during exercise exerts significant influence on mood enhancement (Bartholomew and Miller, 2002). Generally, there has been a paucity of research to

assess the impact of individual factors, such as enjoyment and perceived satisfaction with performance, on mood changes following exercise.

Previous research into mood changes following exercise has tended to focus on the type and intensity of exercise (Bartholomew, 1999; Bartholomew et al., 2001). Although findings generally show that exercise enhances mood, the degree of mood enhancement varies between studies. Berger and Motl's (2000) proposal that moderate exercise is associated with greater mood enhancement was based on the balance of evidence (i.e., more studies supported this proposal than refuted it). It is suggested that attitudes toward exercise, in particular, preference for a specific exercise modality and perhaps for one exercise intensity over another, may have contributed to the equivocality of research findings.

Research into exercise-induced mood changes may have underestimated the impact of at least three important variables – preferred modality of exercise, naturalistic exercise settings, and the exercise experience of participants. For example, most investigations of exercise-induced mood changes have used experimental or quasi-experimental designs (Bartholomew, 1999). Such research designs have tended to involve participants in exercise modalities prescribed by the researcher (s) rather than self-selected modalities. Thus, participants in such studies may have been unfamiliar with the prescribed form of exercise, which may have limited its mood-enhancing effects. Compared to prescribed forms of exercise, self-selected modalities would appear to offer greater potential for mood enhancement.

In a recent study, Daley and Maynard (2003) compared affective responses to a prescribed exercise session (i.e., cycling) and a preferred exercise session. Daley and Maynard used the Positive and Negative Affect Schedule (PANAS; Watson et al., 1998) to assess mood. No differences in exercise-induced mood responses were found, although given that 10% of participants also chose cycling as their preferred mode of exercise, this was perhaps unsurprising. However, Daley and Maynard acknowledged as a limitation of their design that exercise testing took place in laboratory conditions rather than in the usual exercise setting of participants, and suggested that future research should investigate the effects of preferred activity on mood in a naturalistic setting.

Finally, the importance of considering the exercise experience of participants in research investigating mood changes has recently been emphasized (Lane and Lovejoy, 2001). Given that regular exercisers are more likely to endorse the benefits of exercise over the effort required to

complete the exercise session (Bartholomew and Miller, 2002) it is appropriate from the perspective of both ecological validity and the potential for experimental effects, to use experienced exercisers as participants in investigations of exercise-induced mood changes.

The purpose of the present study was to test, both retrospectively and prospectively, the effectiveness of exercise as a strategy to improve mood among individuals who exercised regularly. The research sought to control for experience effects by selecting participants whose exercise habits met the criteria for mood improvement proposed by Berger and Motl (2000). Specifically, an exploration of whether preferred exercise modality promoted mood regulation benefits was the key issue of interest. It was hypothesized that the most-preferred exercise modality of participants would induce more positive mood changes compared to their least-preferred modality.

## METHODS

### *Participants*

Twenty-five volunteer exercisers participated in the present study (Age:  $M = 35.5$  yr.,  $SD = 10.5$  yr.). Seven participants were males and 18 were females. All participants had exercised three times a week or more ( $M = 3.5$ ,  $SD = 2.3$ ) for at least one year.

### *Measures*

Mood was assessed using the Brunel Mood Scale (BRUMS; Terry et al., 1999; 2003). The BRUMS, a shortened derivative of the Profile of Mood States (POMS, McNair et al., 1971) contains 24 items to assess six dimensions of mood -- Anger, Confusion, Depression, Fatigue, Tension, and Vigor. Validation studies have demonstrated satisfactory psychometric characteristics for the BRUMS among more than 3000 participants, in support of its factorial and predictive validity (Terry et al., 1999; 2003). Recent research has provided evidence of factorial validity for the BRUMS among a sample of 975 exercisers who completed the measure before and after exercise (Lane et al., 2002). Confirmatory factor analysis indicated acceptable fit indexes both pre- and post-exercise.

Items are rated on a 5-point scale anchored by *not at all* (0) and *extremely* (4). In the present study, BRUMS factor scores were transformed into standard score format ( $M = 50$ ,  $SD = 10$ ) using normative data for adult exercisers. The BRUMS was chosen as the preferred measure of mood because, unlike alternative measures, it was validated for use with a British population.

### *Exercise Preference Questionnaire*

Participants completed a 14-item questionnaire to provide retrospective evaluations of their most- and least-preferred type of exercise, based on a measure developed by Thayer et al (1994). They first chose their most-preferred exercise modality from among those they had experienced over the past month. Most-preferred exercise modalities were abdominal exercises ( $n = 2$ ), circuit training ( $n = 4$ ), cycling ( $n = 2$ ), running ( $n = 9$ ), walking ( $n = 2$ ), and weight training ( $n = 6$ ). Participants rated the extent to which their most-preferred exercise session had been effective in promoting mood benefits generally and in changing six specific dimensions of mood, corresponding to the BRUMS subscales (Anger, Confusion, Depression, Fatigue, Tension and Vigor). This process was repeated for their least-preferred exercise modality over the past month. Least-preferred exercise modalities were abdominal exercises ( $n = 2$ ), arm strengthening ( $n = 2$ ), cycling ( $n = 2$ ), leg strengthening ( $n = 2$ ), rowing ( $n = 2$ ), running ( $n = 4$ ), stepper ( $n = 9$ ), and weight training ( $n = 2$ ). Perceptions of the effectiveness of exercise to change mood were recorded on a 9-point Likert scale, anchored by 1 = *not at all effective* and 9 = *extremely effective*.

### Procedure

Data were collected over a three-week period. In the first week, participants completed the Exercise Preference Questionnaire, to retrospectively assess the mood-regulating qualities of their most-preferred and least-preferred exercise session during the past month. Participants were randomly assigned to two different orders of presentation in terms of doing a most-preferred and least-preferred exercise session during subsequent weeks. In weeks 2 and 3, mood changes associated with these sessions were

assessed prospectively. Half the sample completed their most-preferred exercise session in week 2 followed by their least-preferred session in week 3. The other half completed the exercise sessions in the opposite weeks to control for order effects. Each exercise session lasted 30 minutes.

Ethical approval for the research was granted from the University of the second author. Written informed consent was obtained from participants before testing commenced and assurances of confidentiality were provided. Participants completed the BRUMS approximately 15 minutes before and immediately after exercising, using the response timeframe "How are you feeling right now?"

All exercise sessions were performed at a fitness club in the London area. From previous experience as exercisers at the club, all participants were familiar with the exercise equipment and exercise protocols used in the present study. Participants were treated in accordance with the ethical guidelines of the American Psychological Association and no incentives for participation in the study were offered.

## RESULTS

A repeated-measures MANOVA was used to compare retrospective reports of the mood-regulating effects of participants' most- and least-preferred exercise sessions during the past month. As hypothesized, participants reported that their most-preferred exercise session had been significantly more effective in enhancing mood. As shown in Table 1, participants reported the advantages of their most-preferred exercise modality in enhancing mood generally and, more specifically,

**Table 1.** Retrospective reports of mood-regulating effects of most- and least-preferred exercise (LPE) modalities ( $n = 25$ ). Data are means ( $\pm$ SD).

	Most-preferred exercise	Least-preferred exercise	F <sub>1, 24</sub>
If you are feeling in a bad mood, how effective is exercise in changing this mood?	6.38 (1.50)	3.29 (1.94)	37.87 *
If you are feeling angry, how effective is exercise in changing this mood?	6.38 (1.56)	3.21 (1.87)	18.95 *
If you are feeling confused, how effective is exercise in changing this mood?	4.67 (2.06)	2.75 (1.68)	29.49 *
If you are feeling depressed, how effective is exercise in changing this mood?	5.46 (1.32)	2.92 (1.64)	27.94 *
If you are feeling fatigued, how effective is exercise in changing this mood?	6.00 (1.50)	3.71 (2.03)	40.83 *
If you are feeling tense, how effective is exercise in changing this mood?	6.04 (1.23)	3.46 (1.98)	12.53 *
If you are not feeling vigorous, how effective is exercise in changing this mood?	6.00 (1.59)	3.42 (1.79)	35.03 *

Note. Wilks' Lambda  $_{6,18} = 0.42$ ,  $p < .001$ ; \*  $p < 0.001$

**Table 2.** Pre- and post-exercise mood reports for most- and least-preferred exercise modalities (n = 25). Data are means ( $\pm$ SD).

Mood	Pre-exercise	Post-exercise
<b>Anger</b>		
Most-preferred exercise	58.64 (22.68)	48.56 (8.18)
Least preferred exercise	53.40 (15.45)	52.65 (11.12)
<b>Confusion</b>		
Most-preferred exercise	45.87 (6.02)	42.56 (1.78)
Least preferred exercise	45.04 (8.13)	43.88 (3.70)
<b>Depression</b>		
Most-preferred exercise	52.28 (12.27)	46.29 (3.01)
Least preferred exercise	54.89 (12.90)	51.50 (9.40)
<b>Fatigue</b>		
Most-preferred exercise	54.50 (12.94)	50.55 (12.23)
Least preferred exercise	56.69 (11.55)	53.62 (10.50)
<b>Tension</b>		
Most-preferred exercise	40.11 (4.20)	38.16 (2.15)
Least preferred exercise	42.05 (6.93)	39.26 (2.96)
<b>Vigor</b>		
Most-preferred exercise	44.03 (10.57)	59.19 (6.57)
Least preferred exercise	41.28 (8.94)	44.56 (8.68)

in decreasing scores for Anger, Confusion, Depression, Fatigue and Tension, and increasing scores for Vigor.

Descriptive statistics for the prospective assessment of mood changes during exercise are contained in Table 2. A 2 x 2 repeated-measures MANOVA (time x exercise modality) showed a significant main effect of time (Wilks' lambda<sub>6,18</sub> = .72,  $p < 0.01$ ,  $Partial\ Eta^2 = 0.28$ ), no main effect of exercise modality (Wilks' lambda<sub>6,18</sub> = 0.92,  $p > 0.05$ ,  $Partial\ Eta^2 = 0.02$ ), and a significant interaction effect (Wilks' lambda<sub>6,18</sub> = 0.84,  $p < 0.05$ ,  $Partial\ Eta^2 = 0.17$ ). Univariate effects showed that Depression ( $F_{1,24} = 5.09$ ,  $p < 0.05$ ,  $Partial\ Eta^2 = 0.05$ ) and Tension ( $F_{1,24} = 6.82$ ,  $p < 0.05$ ,  $Partial\ Eta^2 = 0.07$ ) scores decreased, while Vigor scores increased ( $F_{1,24} = 26.34$ ,  $p < 0.001$ ,  $Partial\ Eta^2 = 0.22$ ) regardless of exercise modality. Importantly, the interaction effect showed that the increase in Vigor scores ( $F_{1,24} = 10.91$ ,  $p < .01$ ,  $Partial\ Eta^2 = 0.11$ ) was significantly greater following the most-preferred exercise session compared to the least-preferred session. Reductions in Anger, Confusion, Depression, and Fatigue scores were greater for the most-preferred exercise modality, although these differences were not significant.

Given the number of variables and the relatively few participants involved, the statistical

significance of observed differences would have been affected by low statistical power. Therefore, to summarize improvements in mood more succinctly, we calculated a measure of Total Mood Disturbance (TMD: Anger + Confusion + Depression + Fatigue + Tension - Vigor). A repeated-measures ANOVA (time x exercise modality) of TMD scores showed a significant main effect of time ( $F_{1,23} = 17.53$ ,  $p < 0.001$ ,  $Partial\ Eta^2 = 0.43$ ), a significant main effect of mode of exercise ( $F_{1,23} = 20.39$ ,  $p < 0.001$ ,  $Partial\ Eta^2 = 0.47$ ), and a significant interaction effect ( $F_{1,23} = 7.69$ ,  $p < 0.05$ ,  $Partial\ Eta^2 = 0.26$ ). These effects showed that the most- and least-preferred forms of exercise both produced significant mood enhancement, but that mood enhancement was significantly greater for the most-preferred exercise modality compared to the least-preferred modality.

## DISCUSSION

The present study investigated how preference for exercise modality influenced exercise-induced mood changes in a naturalistic setting. Retrospective ratings endorsed the notion that participation in most-preferred exercise activities was a more effective strategy for improving mood than participation in least-preferred activities. This is not

surprising; especially given the possibility that the mood benefits that participants associate with a particular exercise modality might be the very characteristics that cause them to prefer that form of exercise in the first place. However, it is important to contextualize the meaning of the term *least-preferred session* described in the present study. All participants were regular exercisers, whose least-preferred session was performed as a normal part of their weekly program, not one imposed by the researchers. Therefore, even least-preferred sessions could be assumed to have more attraction, either in terms of perceived physiological or psychological benefits, than exercise modalities not included in their weekly program at all.

Prospective assessment of exercise-induced mood changes showed, as hypothesized, that the most-preferred exercise modality was associated with greater mood enhancement, in particular increased perceptions of vigor. Consistent with previous research, results also showed that exercise was associated with mood enhancement regardless of exercise modality (Berger and Motl, 2000). An important feature of the present study was that participants were regular and experienced exercisers. Among this population, it appears that mood enhancement is a normal outcome of exercise, even for the least-preferred elements of their weekly program, but preferred exercise modalities bring about additional improvements in mood. The taxonomy for mood enhancement from exercise proposed by Berger and Motl (2000) suggested that enjoyment is an important factor in determining mood benefits. If enjoyment can be operationalized in terms of a *preference* for a particular exercise modality, then the present results are supportive of Berger and Motl's suggestion.

Findings of the present study contrast with those reported by Daley and Maynard (2003). At least two factors might explain these differences. First, participants in the present study indicated their least-preferred activity, against which to compare the effects of their most-preferred activity; whereas Daley and Maynard prescribed cycling as the comparison activity, which some participants also reported to be their preferred activity. Second, Daley and Maynard tested participants in a laboratory rather than a naturalistic setting where the individuals typically exercised. We suggest that our findings support the notion that research to examine exercise-induced mood responses should be conducted in ecologically valid settings.

Previous research into exercise-induced mood changes has particularly implicated exercise intensity as an influential variable (Bartholomew, 1999; Berger and Motl, 2000). For example, Berger and Motl (2000) proposed that moderately intense

exercise was the mode of choice if mood enhancement is the goal. In the present study, some participants reported high intensity exercise sessions as their most-preferred modality whereas others preferred high-intensity forms of exercise least. This suggests that individual differences would play an influential role in the exercise intensity – mood enhancement relationship, and their moderating influence might form the focus for future research. A second line of future research should investigate reasons why individuals learn to enjoy one form of exercise over another. It should be noted that retrospective mean scores for the effectiveness of preferred exercise was 6.38 ( $SD = 1.50$ ) on a scale anchored by 9, thus it is possible to further enhance the benefits of exercise even when participants use their preferred modality. Enhanced knowledge on why individuals learn to enjoy exercise could help the design of intervention strategies designed to improve the psychological benefits from exercise.

The importance of the present findings lies in at least three distinct areas. First, the results confirm the significant mood-enhancing effects of exercise, regardless of modality, among regular exercise participants in a naturalistic setting. Second, the results show that preferred exercise modality is associated with even greater mood-enhancing effects, especially in terms of generating perceptions of increased vigor. Third, the results support the notion that significant mood enhancement accrues from exercise that is consistent with the recommendations of Berger and Motl (2000) but may also accrue from exercise that is not consistent with those recommendations.

## CONCLUSIONS

Overall, these findings support the principle that exercise can provide psychological benefits to its participants, in the form of positive affective outcomes. Future research into exercise-induced mood changes should seek to further understand the reasons why individuals prefer one modality of exercise over another and to develop strategies to enhance the psychological benefits from exercise.

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## KEY POINTS

- A great deal of exercise shows that exercise is associated with positive mood following exercise. Previous research has sought to determine whether one form of exercise improved mood states more than others.
- The present study investigated the extent to which personal preference of exercise modality influenced mood changes following exercise.
- Participants completed mood state scales before and after exercise.
- Results support the notion that exercise can provide psychological benefits to its participants, in the form of positive affective outcomes, something that appears to be enhanced by preferred exercise modality.

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