

## **Project Summary**

All fired up or chilling out? Does temperature affect how we feel about exercise?

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### **Background**

It is well established that moderate intensity aerobic exercise has at least short-term benefits on mood in both clinical and healthy populations. Although people experience moods as a single feeling, researchers suggest that mood is composed of two separate dimensions that occur at the same time. Positive affect (PA) refers to the extent to which an individual feels enthusiastic, active and alert; with high PA being a state of high energy, full concentration, and pleasurable engagement whereas low PA is a state of sadness and lethargy. Negative affect (NA) in contrast is a state of emotional distress and unpleasurable engagements with high NA encompassing a number of aversive mood states, including guilt, fear, nervousness, and anger, while low NA is described by feelings of calm and serenity.

Despite the extensive evidence for a link between mood and exercise, there are several things that we don't know. Firstly, most experimental studies have been conducted in clinical or athletic samples and we cannot be certain how well their findings generalise to the broader population. Secondly, relatively few disambiguate the effects on PA and NA. Thirdly, very few studies have investigated *why* exercise improves mood.

Two broad kinds of explanation have been proposed. Psychological explanations focus on people's thoughts and beliefs about exercise. Specifically, it has been proposed that if a person feels that exercise is moving them closer to valued goals (such as becoming fit) this should increase feelings of PA. Additionally, if the person feels as though they are moving away from feared antigoes (such as becoming fat) this should decrease NA.

Physiological explanations focus on the physical effects of exercise on the body. The hyperthermic model proposes that the brainstem, a structure of the brain, plays a key role in the regulation of both temperature and mood, and that the responses to increases in body temperature promote feelings consistent with low NA.

### **Project Aims**

Firstly, this study aimed to establish whether moderate exercise would increase feelings of PA and decreased feelings of NA. Beyond this, we sought to test whether people felt closer to exercise-related goals, and further away from feared antigoes, after exercising. Further, we aimed to investigate whether changes goal proximity were associated with changes in PA and NA.

To test the role of temperature in mood change with exercise, we tested whether pre-cooling before exercise prevented the usual changes in NA from occurring.

## **Methodology**

Thirty-five undergraduate students from Murdoch University participated in the study. Participants attended five sessions at the Murdoch Exercise Science laboratories.

In the first session, they filled out questionnaires rating their general feelings of PA and NA over the past two-years and a questionnaire about their exercise-related goals and how important they rated them. Participants then underwent a continuous incremented cycle ergometer test maximum exertion test on a stationary cycle. We used their maximum exertion to set a comfortable personal exertion level (60% of maximum) for subsequent sessions.

Participants were then randomly assigned to a counterbalanced order of four conditions. Two sessions involved 20 minutes of cycling. The other two sessions (control sessions) involved sitting quietly. Within the exercise and control sessions, one session involved pre-cooling and the other did not. In the pre-cooling sessions, participants consumed an ice slushy prior to cycling (or sitting quietly). In the non-cooling sessions, participants consumed an equivalent amount of beverage at room temperature.

To determine change in PA, NA and perceived goal attainment, participants completed questionnaires pre- to post-activity. To see how long any changes in mood lasted, participants received a follow-up mood questionnaire 10-minutes and 1-hour post activity. Throughout the activities participants' skin and ear temperature and perceived rating of exertion was monitored.

## **Findings**

The aim of this study was to test the idea that exercise can induce change in PA and NA in non-clinical individuals. Exercise was associated with increases in PA, while the sedentary conditions experienced a decrease in PA. Although conditions differed in NA pre- to post-activity, this was not limited to exercise, as the slushy conditions also decreased in NA regardless of activity.

Additionally, people felt closer to achieving their exercise-related goals after exercise and this change in proximity explained 22% of the variance in PA. In the sedentary conditions, people reported a decreases in proximity to goals, and experienced decreases in PA. These findings support the goal attainment hypothesis. However, in this sample of healthy individuals there was no relationship between feared antigal proximity and NA, suggesting that if people feel more relaxed after exercise, it is not because they feel that they have put distance between themselves and their feared antigals.

Consumption of a slushy was sufficient to cool participants' body temperature, however, no further beverage-related differences occurred. In both exercise conditions, people warmed up as they exercised and both conditions reached the same temperature by the end of their exercise session. While, on average, the exercise conditions continued to experience a decrease in NA for up to an hour post-activity, the sedentary conditions increased or did not change in their overall NA over the follow-ups.

In conclusion, both PA and NA improve with exercise in non-clinical, non-athlete people. Perceiving progress towards exercise-related goals partly explains changes in PA. Temperature increases with exercise but this does not seem to influence mood. Mechanisms of change for NA remain unknown.