### Exercise and Psychological Stress: How Does Exercise Promote the Alleviation of Stress?

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#### INTRODUCTION

Many studies in the past have been done to examine the relationship between stress and exercise (Crews & Landers, 1987; De Geus, van Doornen, De Visser, & Orlebeke, 1990; Holmes & Roth, 1985). Resting adrenocorticotropic hormone levels have been found to be significantly higher in sedentary men at rest when compared to highly fit men (Duclos, Corcuff, Rashidi, Fougere, & Manier, 1997).

**Hypothesis:** Cortisol levels will be higher in low fit individuals at rest, in reactivity to, and during recovery from stress. Reactivity to and recovery from stress have also been researched. However, studies have shown mixed results.

In regards to reactivity, Dishman and Jackson (2000) found that exercise training results in greater reactivity to stress. Conversely, a recent study examined stress reactivity in aerobically trained versus strength trained individuals and found no significant difference between groups in regards to cardiovascular reactivity (Sloan, Shapiro, De Meursman, Bagiella, Brondolo, McKinley, Crowley, Zhao, Schwartz, & Myers, 2011). Since Sloan et al. (2011) merely examined aerobic versus strength trained groups, this study was conducted to determine the relationship of adrenocortical reactivity between high and low fit individuals.

**Hypothesis:** High fit individuals will have a greater reactivity to stress.

In regards to recovery time from stress, Jackson and Dishman (2006) found that highly fit individuals have a faster recovery from stress when compared to low fit individuals. Spalding, Lyon, Steel, and Hatfield (2004) found that highly fit individuals have a faster recovery from stress when compared to low fit individuals. Spalding, Lyon, Steel, and Hatfield (2004) found that highly fit individuals have a faster recovery from stress when compared to low fit individuals. However, studies have shown mixed results. In regards to recovery time from stress, Jackson and Dishman (2006) found that highly fit individuals have a faster recovery from stress when compared to low fit individuals. Spalding, Lyon, Steel, and Hatfield (2004) found that highly fit individuals have a faster recovery from stress when compared to low fit individuals. However, studies have shown mixed results.

**Hypothesis:** High fit individuals will have a faster recovery from stress than low fit individuals.

#### METHODS

**Participants**  
19 women and 26 men

A phone screening was performed and participants were asked questions such as: current or recent history of medical or psychiatric disorders, adrenocortical reactivity may be moderated by fitness level. However, studies have shown mixed results. If the participant met all of the previous criteria, they read and signed the consent form approved by the Institutional Review Board of the University of Minnesota.

**Apparatus**  
The fitness questionnaire requested the average number of hours each participant performed aerobic and anaerobic exercise in a week. The total hours of aerobic and anaerobic exercise per week were summed and split at the median to determine the high and low fit groups.

The median exercise hours were five hours per week.

Public speaking, mental arithmetic, and cold pressor tasks were used to create stress for the participant.

Saliva samples were used to collect salivary cortisol levels: the primary means of analyzing cortisol levels.

**Procedure**  
Saliva samples were collected in the following time periods and durations.

- **Baseline:** 60 minutes
- **Stressors:** 30 minutes (public speaking, mental arithmetic, and cold pressor)
- **Recovery:** 45 minutes

#### RESULTS

**Data Analysis**  
Cortisol concentration was analyzed using a 2 (Group: Hi fit, Low fit) x 7 (Time: 3 samples during the baseline, 2 samples during stress, 2 samples during recovery) repeated measures analysis of variance (ANOVA).

The first three periods were taken when the subject was at baseline. Period four included the reaction in cortisol levels to the psychological stressor. Period five involved the reaction in cortisol levels to a physical stressor. Next, period six and seven were both recovery periods.

**REFERENCES**


#### Figure 1: Comparison of Cortisol Levels in High and Low Fit Individuals

![Figure 1: Comparison of Cortisol Levels in High and Low Fit Individuals](image)

#### Figure 2: Reactivity to Stress

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#### Figure 3: Recovery from Stress

![Figure 3: Recovery from Stress](image)