

# Examining the Physiological Response to Hot Water Immersion

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### **INTRODUCTION**

Evidence supports the positive cardiovascular benefits of Finnish dry sauna bathing, likely due to the acute and chronic physiological adaptations to the heat. However, there is limited research on the acute physiological adaptations to hot water immersion. This study aims to provide more insight into the physiological effects of hot water immersion.

#### **METHODS**

Subjects consisted of 10 males (age 21  $\pm$ 2 years, body weight 82  $\pm$ 4.5kg and, fat mass ,15.6%  $\pm$ 2.8%) that exercise at least five days per week for at least 30 minutes per day, with no heat acclimation in the last six months. Heart rate (HR), VO<sub>2</sub>, rating of perceived exertion (RPE), and pre/post-test blood pressure (BP) were measured during 20 minutes of hot water immersion (HWI). Measures were recorded every three minutes while subjects were immersed in 40° C water. HR was measured via finger pulse oximetry, VO<sub>2</sub> via a metabolic cart, RPE using the Borg scale, manual BP, and body composition via the Jackson-Pollock 3-site skinfold method. Comparisons between physiological measurements and RPE were made using a paired t-test.









throughout the test.



Figure 3. The mean of all participants' HR compared to RPE throughout the test.

# **Percent Change Between Resting and Mean HR**

Figure 1. The percent change between each participant's resting HR and mean HR throughout the test.

## **RESULTS**

Group mean heart rate increased by 51% compared to resting heart rate (P < 0.05), and mean VO<sub>2</sub> increased by 16% of resting  $VO_2$  (P < 0.05). Mean RPE during the final stage of testing was 15. Average increase in systolic blood pressure post-test was 7.1% and average decrease in diastolic blood pressure post-test was 1.3%. Mean HR versus VO<sub>2</sub> throughout the duration of the test were inversely correlated, while mean HR versus RPE were directly correlated.

# DISCUSSION

The data suggests that HWI elicits a similar physiological response to that of low intensity aerobic exercise. Finnish sauna bathing (FSB) has often been used by individuals for relaxation and pleasure, until recent evidence has supported that FSB has a positive impact on cardiorespiratory health. Seeing the similar response elicited by HWI suggests that individuals without access to a dry sauna may be able to use HWI as a supplement to their cardiorespiratory health.

While exercising, an individual will have a concurrent increase in HR and VO<sub>2</sub>, but while undergoing HWI this trend is not seen. This can be attributed to there being no skeletal muscle contraction while undergoing HWI. Figure 2 shows an immediate spike in VO<sub>2</sub>, then it decreases and remains relatively constant. This is likely due to an increase in respiratory rate while each participant acclimated to the heat.

#### CONCLUSIONS

HWI elicits a similar acute physiologic response to that of a Finnish dry sauna, suggesting that HWI may be an alternative method of heat therapy for improvements in cardiovascular health.