CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
S1104

Project Title
Correlation of Thermographic Assessment of Vascular Reactions with BMI, Heart Rate, and Stress

Abstract

Objectives/Goals
The objective of this study is to evaluate if there is a correlation with thermographic assessment of vascular reactions among three distinct groups of participants using BMI, heart rate and stress.

Methods/Materials
To determine if there is a correlation between autonomic vascular reactions, BMI, heart rate and stress levels, a cold stimulation test was performed on 42 participants using a radiometric thermal imager. The participants included diabetics, smokers, and a normal/control group (no known health issues) and were asked to give their height, weight, stress level, and their heart rate was also recorded. The test consists of participants placing their left hand in 62ºF ± 2º water for 20 minutes while the right hand was placed on a wood surface. The participants were asked to keep the left hand moving while it was submerged in the cool water. Participants were also asked to keep their right hand in a flat comfortable position and to keep movement to a minimum. A thermal image was recorded of the right hand every 5 minutes starting with a preliminary test image.

Results
The anomalies from previous research were now specifically categorized. Through analysis of the data there was no correlation with thermographic assessment of vascular reactions and heart rate and stress, however a correlation was present with BMI. Participants in the normal group with a BMI of 30 or greater had a 3° degree less change that those with a BMI of 18 to 24.9. The normal/control group#s vascular reaction to the test showed a steady decline in surface temperature of 8°F (average of 6°F± 2°). In the smoker and diabetic category the effect of BMI was not as significant, with less than 1° change. The diabetic group regardless of BMI, heart rate or stress had decline average of 2°F. The smoker group regardless of BMI heart rate and stress had a decline initially then rising 2°F and holding constant until the end of the 20 minute test period.

Conclusions/Discussion
The uses of the participants stress level and heart rate in thermographic assessment of vascular reactions gave a clear picture of the effective use of thermal imagery to access vascular health. Including the Body Mass Index was the most significant factor in identifying the anomalies that previous research had identified.

Summary Statement
BMI has a significant correlation with thermographic assessment of autonomic vascular reactions.

Help Received
Imager on loan from So Cal Edison