



**CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY**

Name(s) Shay C. Edwards	Project Number S1107
Project Title Prospective Study of the Effectiveness of Thermal Imaging in the Diagnosis of Arthritis	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this study is to see if a radiometric thermal imager can detect pre-clinical stages of arthritis in a quick and noninvasive method.</p> <p>Methods/Materials To establish the effectiveness of thermography as a useful tool for diagnosis pre-clinical stages of arthritis in participants hands using a radiometric thermal imager a double blind test was performed. Participants filled out medical history about general health, height, weight, diabetes, smoking, and known diagnoses of arthritis. Participants were then assigned an identification number. During the 16 minute test participants were asked to submerge their left hand and to keep it moving while it was in $63^{\circ}\text{F} \pm 2^{\circ}$ water for 1 minute. The left hand would then be dried and placed on a wood surface. A thermal image was recorded of the left hand every 4 minutes starting with a preliminary test image.</p> <p>Results Inflammation in the interphalangeal joints is the first sign of arthritis. Inflamed joints are warmer. The distal interphalangeal (or DIP; the first knuckle), proximal interphalangeal (or PIP; the middle knuckle), and metacarpophalangeal (MCP; the knuckle at the base of the finger) were closely observed and evaluated. All participants with medical history of confirmed cases of arthritis by conventional methods were detected by the use of the radiometric thermal imager showing an elevated temperature of $4^{\circ}\text{-}5^{\circ}$ in the interphalangeal joints.</p> <p>Conclusions/Discussion The data from the test supports my hypothesis that thermal imaging can be a used to diagnosis arthritis. My data also identified 5 additional participants displaying pre-clinical stages of inflammation of the interphalangeal joints. This was a brief and simplified preliminary study designed to evaluate a cold stimulation test to learn whether it would be likely to yield valuable results.</p>	
Summary Statement Thermography simply identifies thermal anomalies using an infrared imager. This research proves that thermal imaging can be used effectively to detect pre-clinical stages of arthritis in the interphalangeal joints.	
Help Received	