



**CALIFORNIA STATE SCIENCE FAIR
2005 PROJECT SUMMARY**

Name(s) Kevin P. Kennedy	Project Number J1012
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Project Title
Surprising Effects of Body Position and Temperature on Blood Pressure and Heart Rate

Abstract

Objectives/Goals
I INVESTIGATED THREE MAIN HYPOTHESES IN MY EXPERIMENT: HYPOTHESIS (1): A 90 DEG FULL BODY INVERSION WITH HEAD DOWN TILT WILL GIVE A SIMILAR DIASTOLIC (DBP) AND HEART RATE (HR) RESPONSE AS A FULL BODY 90 DEG HEAD UP INVERSION (STANDING).
HYPOTHESIS (2): A MILDER FULL BODY 45 DEG HEAD DOWN TILT WILL GIVE A SIMILAR DBP AND HR RESPONSE AS A FULL BODY 45 DEG HEAD UP TILT.
HYPOTHESIS (3): FULL BODY HEATING TO JACUZZI TEMPERATURE (105 DEG F) WILL DECREASE DBP DUE TO BLOOD VESSEL DILATION, AND INCREASE HR TO COMPENSATE FOR THIS REDUCTION IN DBP. MY THIRD HYPOTHESIS ALSO STATES THAT BEING PLACED IN A BATH AT A NEUTRAL TEMPERATURE (85 DEG F) WILL NOT ALTER SBP, DBP OR HR.

Methods/Materials
I USED AN AUTOMATED BP AND HR MEASURING DEVICE TO MEASURE BP AND HR. SUBJECT NUMBERS RANGED FROM 4-7 PER EXPERIMENT WITH AN AGE RANGE OF 13-52 YEARS. EXPERIMENTS WERE ALWAYS CONDUCTED IN QUIET AREAS. FROM 5 TO 10 CONSECUTIVE BP AND HR MEASUREMENTS WERE TAKEN AT 1 MIN INTERVALS PER CONDITION FOR EACH SUBJECT IN EACH EXPERIMENT. DATA WERE ANALYZED BY REPEATED MEASURES ANOVA AND PAIRED T-TEST.

Results
MY RESULTS SUPPORT THE IDEA THAT HR INCREASES MORE IN RESPONSE TO 90 DEG HEAD UP TILT (STANDING) THAN 90 DEG HEAD DOWN TILT. SIMILARLY THERE IS A GREATER RESPONSE TO 45 DEG HEAD UP TILT THAN 45 DEG HEAD DOWN TILT. I ALSO FOUND THAT FULL BODY HEATING AT HOT BATH TEMPERATURE (105 DEG F) LOWERS DBP AND INCREASES HR WHILE IN A ROOM TEMPERATURE BATH (85 DEG F) SBP, DBP, AND HR REMAIN UNCHANGED.

Conclusions/Discussion
I FOUND THAT THE GREATER INCREASE IN HR WITH HEAD UP TILT THAN HEAD DOWN TILT MAY BE DUE TO THE FACT THAT THERE IS A GREATER REDUCTION IN CARDIAC OUTPUT IN THE HEAD UP POSITION THAN IN THE HEAD DOWN POSITION. ANOTHER CAUSE MAY BE A GREATER EVOLUTIONARY INFLUENCE FOR NORMALIZATION OF BP

Summary Statement
MY PROJECT INVESTIGATED SOME OF THE MECHANISMS, SPECIFICALLY BODY POSITION AND TEMPERATURE, THAT AFFECT BLOOD PRESSURE AND HEART RATE.

Help Received
AQUIRED ANALYZING AND GRAPHING SOFTWARE FROM DAD