



**CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY**

Name(s) Danielle Sanfilippo; Molly Shanks	Project Number S0316
Project Title Four on the Floor: A Comparative Study of the Physiological Effects of Bipedal vs. Quadrupedal Locomotion in Humans	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The theory of human evolution has been a subject of debate since its conception. Recently, scientists stumbled across a family in Turkey that walks on all fours, which some believe is the missing link between bipedal humans & their quadrupedal ancestors. This project was designed to determine whether differences in physiological functions such as blood pressure (BP), heart rate (HR), respiratory rate (RR), and minute volume (MV) are substantial enough to be considered factors contributing to human evolution from quadrupedal to bipedal locomotion.</p> <p>Methods/Materials The project involved 30 subjects between ages 15 & 18. Subjects underwent 2 trials. In the first test, subjects walked with a bipedal gait on a treadmill at 1.3 mph for 2 min. BP, HR, RR, & tidal volume (TV) were measured before & after the trial. Trial 2 was conducted with the same methods as trial 1, except subjects were required to use a quadrupedal bear crawl. The change of before & after measurements in each trial was calculated to determine the degree of physiological change incurred by the different methods of locomotion. Avg. change was calculated for the entire sample, & comparisons were made between subsets according to age, gender, height, and BMI.</p> <p>Results Quadrupedal locomotion subjected the body to more physical stress than bipedal locomotion. The bipedal trial increased systolic BP by 1 mmHg, diastolic BP by 5 mmHg, HR by 3 beats/min, RR by 3 beats/min, & MV by 0.002 L from initial resting measurements. TV decreased by 2 mL. The quadrupedal trial increased systolic BP by 10 mmHg, diastolic BP by 8 mmHg, HR by 39 beats/min, RR by 14 breaths/min, TV by 198 mL, & MV by 0.018 L.</p> <p>Conclusions/Discussion The most significant changes in physiological function occurred in HR, RR, & MV. The increase in BP was not significant enough to suggest that BP acts as an influential factor causing humans to prefer bipedal over quadrupedal locomotion. However, the increase in HR during the quadrupedal trial was much greater than during the bipedal trial, as well as the tested aspects of respiratory function. The data suggest that quadrupedal locomotion is significantly more physiologically exerting than bipedal locomotion in modern humans, indicating that an increase in cardiac and respiratory stress may be a contributing factor towards the evolution of a preference towards a characteristic bipedal gait the present day human species.</p>	
Summary Statement This project was designed to compare the changes in physiological function incurred by bipedal vs. quadrupedal locomotion in humans.	
Help Received No help was received.	