CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
Daniel C. Roholt

Project Number
J1026

Project Title
Muscles: Scrawny or Brawny?

Abstract

Objectives/Goals
My objective is to determine the relationship between the bicep muscle size, forearm length, and the ability to develop force, by calculating the amount of torque created. My hypothesis states that the subject#s strength will be in proportion to the size of their muscle.

Methods/Materials
Step 1: Measure the subject#s forearm length in meters.
Step 2: Measure the circumference of the subject#s bicep size (when contracted) in meters.
Step 3: Measure the force a subject can develop by pulling upward on the handle of the measurement scale while stepping on the opposing end to create an anchor point. The subject will use a lever-like motion to produce force. Each subject will be tested three times.
Step 4: Bicep circumfrence, forearm length, and force developed will be recorded in a log book. Torque will be calculated for each subject. The subjects measurements will be separated by gender and graphed for analysis.
and calculations

List of Materials: 1. Measurement tape in meters, 2. Force measuring device, 3. Data log, 4. 24 subjects.

I designed my experiment by taking a fish scale (up to 25 kg) and attaching it to a rope with variable lengths (to allow subjects four various heights to establish a 90 degree angle between their upper arm [bicep] and forearm). I then attached two handles; one to the rope, and one to the end of the fish scale.

Results
The results show bicep size is independent of the torque developed. For example: 3 subjects had similar torque (2.92-2.98 NM); however, the bicep size ranged between .216-.280M. This suggests there is no direct relationship between bicep size and the torque developed. In addition, the majority of boys and girls fell into the same range of torque (from approximately 2.7-4.7 NM), regardless of gender or bicep size. There were three exceptions. These were boys who developed significantly more torque. Their bicep size was not a factor.

Conclusions/Discussion
My initial hypothesis was incorrect. Muscle size was not a factor. There may be other components involved. It would be interesting to conduct further research on muscle makeup and how slow or fast twitch muscles affect strength.

Summary Statement
My project is about testing the relationship between a subject's bicep muscle circumfrence, and the amount of torque they are able to develop.

Help Received
Father helped me create display model, and provided some research books. Mother helped me design and construct display board.