CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)
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Project Number
S1212

Project Title
Fit and Fat: Fact or Fiction?

Abstract

Objectives/Goals
This project will determine if body mass index (BMI) is related to cardiovascular (CV) fitness in children and adolescents aged 12-18 years. I will also examine if the relationship between BMI and fitness changes depending on gender, ethnicity, socioeconomic status of the family, and age groupings.

Methods/Materials
I downloaded demographic, cardiovascular fitness and body mass index data of subjects aged 12-18 years from the National Health and Nutrition Examination Survey website. I classified subjects as normal weight, overweight or obese based on their BMI and as low fit, moderately fit or highly fit, based on their estimated oxygen uptake (VO2max). I computed frequency tables for BMI by CV fitness groups and calculated chi-square statistics using SAS to determine if these two variables were associated with each other. I also ran a regression model, with estimated VO2max as the dependent variable and BMI as the independent variable. I repeated these analyses for males and females, different ethnicities, income levels, and age groupings separately.

Results
The results show that only a small percentage of the children and adolescents aged 12-18 years were fit and fat. In addition, the linear regression demonstrated that BMI was inversely related to estimated VO2max. These findings were consistent within early (12-15 years) and late (16-18 years) adolescents, and within different ethnicities and income levels. However, more females compared to males were both fit and fat, and the relationship between BMI and VO2max was weaker in females than males, suggesting that the fit but fat theory is more likely to be valid in females than males.

Conclusions/Discussion
Obese and overweight children and adolescents had significantly lower cardiovascular fitness levels than did individuals with normal weight. Seventy percent of the obese children and nearly 50% of the overweight children were in the low fit category. However, over a tenth (12%) of the obese and overweight children were highly fit and another 30% of these children were moderately fit. This is encouraging, since it means that even obese and overweight children can achieve a degree of fitness that could potentially minimize their risk of heart disease and other weight-related illnesses.

Summary Statement
Obesity is associated with significantly reduced cardiovascular fitness in children and adolescents.

Help Received
Mother helped download data from NHANES website.