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Title: Relationship between childhood overweight/obesity indicators and vigorous physical activity among NHANSE III boys (8 to 11 years old): different interpretation between Body Mass Index and Subcutaneous Adiposity Size and Shape

Abstract: (next page)

The aim of this study was to investigate whether the relationship between BMI and vigorous physical activity (VPA) differs when both the overall and regional distribution of subcutaneous adiposity (SA) are considered as alternative fatness indicators of BMI.

The sample data were obtained from the third National Health and Nutrition Examination Survey (NHANES III). Four skinfolds (triceps, subscapular, supraspinale, thigh), BMI, age, race/ethnicity, height, and VPA (i.e., times per week exercise made you sweat) data of 1,028 boys (8-11 yrs.) were extracted. The overall and regional distribution of the four skinfolds were calculated into Subcutaneous Adiposity Size and Shape (SASS) variables based on the description provided in Healy and Tanner's method (1): transform all four skinfolds into logarithms, 2) calculate average (SA-size estimation), 3) calculate difference between the average and each log-transformed skinfold, 4) run principal component analysis (SA-shape estimation). The samples were categorized into three groups based on participants' VPA levels (very-active: VPA>5 times, active: 2<VPA<4 times, non-active: VPA<1 time). Then, MANCOVA/ANCOVA (BMI) were conducted separately to ascertain whether the fatness indicators provide consistent interpretations of the relationship with VPA.

The MANCOVA showed significant interaction between the SASS and VPA ($p<0.05$). The MANCOVA Bonferroni-adjustment results indicated that SA-size ($F(2,938)=5.528, p<0.005$; partial $\eta 2=0.012$) and subscapular-to-thigh SA-shape was significantly associated with VPA ($F(2,938)=9.587, p<0.0005$; partial $\eta 2=0.020$), but not triceps-supraspinale SA-shape ($F(2,938)=1.485, p=0.227$; partial $\eta 2=0.003$). This means that the very active and active boys had significantly larger SA-size and larger thigh and smaller subscapular SA-shape than the non-active boys. The ANCOVA result showed no BMI difference between the VPA groups ($F(2,1024)=1.296, p=0.274$).

It was concluded that the interpretations made via SASS and BMI when associated with VPA are different. Future studies need to further investigate whether tackling childhood obesity by focusing on BMI-based obesity is affective approach to reduce body fat.

Reference:

1. Healy MJR, Tanner JM. Size and Shape in Relation to Growth and Form. Symp Zool Soc Lond. 1981;46:19–35.