

Energy Balance is Prospectively Related to Change in Abdominal Fat Accumulation among Overweight Children

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Introduction: Childhood obesity is an increasing public health problem in the United States. Visceral fat deposition, in particular, has been linked to an increased risk of diabetes, heart disease and stroke in adults. Few studies have looked at factors that contribute to visceral fat accumulation in children.

Objective: The objective was to determine whether there were any links between diet composition and visceral fat accumulation.

Methods: Forty-two children within 3 months of their 8th birthday were recruited from the Greater Cincinnati area (n=36 completed all assessments). All children were above the 75th percentile of BMI for their age and sex. Children were evaluated every six months for 2 years in this observation study. At each time point, children (with the help of a parent) kept a 3-day food log. Accelerometers were used for 7 days to monitor physical activity. Visceral(VAT) and subcutaneous abdominal (SAT) fat were evaluated using MRI scans of 10cm in the abdomen. Longitudinal analysis using SAS Proc Mixed procedures examined whether dietary factors, both by themselves and when adjusted for physical activity, were dynamic correlates of the change in children's VAT.

Results: VAT, SAT, and total body fat increased linearly and significantly over the 2-year time period. Reported caloric intake did not significantly change, but physical activity declined, so physical activity-adjusted calories increased over time. There was no evidence of relations between absolute caloric intake or any macro-nutrient and whole body, VAT, or SAT. However, calorie intake adjusted for physical activity was found to be positively correlated to VAT ($p=0.0114$) and SAT ($P<0.0188$). Change in physical activity-adjusted caloric intake was not related to change in total body fat. Unexpectedly, a negative correlation was found between calorie intake when controlled for the child's body weight and subcutaneous adipose tissue ($P<0.0001$) and visceral adipose tissue ($P=0.0008$).

Summary and Conclusion:

Greater calories relative to physical activity among overweight children appears related specifically to the accumulation of abdominal fat. There appears to be little evidence of relations between specific macro-nutrients and either whole body or compartments of abdominal fat, although our unexpected findings regarding weight-adjusted calories and whole and abdominal fat highlight the potential limitations of child dietary reports.