

ABSTRACT

THE RELATIONSHIPS BETWEEN ENERGY BALANCE DEVIATIONS AND ADIPOSITY IN CHILDREN AND ADOLESCENTS

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Background: Over the past decade obesity has doubled in children aged 6-11 and tripled among adolescents aged 12-19. One trend that has coincided with this increased obesity prevalence is decreased meal frequency, which may impact blood sugar, meal size, cortisol release, insulin release, and appetite controls that include the release of leptin and ghrelin. Ultimately, these changes may result in a simultaneous lowering of the metabolic (i.e., fat-free) mass and a rising of the fat mass. **Purpose:** To assess food/beverage intake in a way that would determine if large deviations in energy balance (EB) during the day were related to body fat percent (BF%). **Methods:** Using an IRB-approved protocol, male and female children were assessed using NutriTiming® (NutriTiming LLC, 2011) software, which simultaneously assesses energy intake from consumed foods and beverages and energy expenditure from activities with different intensities. A 24-hour recall questionnaire and interview, with at least one parent present, was used to obtain data, which represented a typical school day. BF% was assessed using an 8-mode bioelectrical impedance segmental body composition analyzer (Tanita, Model BC-418). Statistical analysis was performed with SPSS (ver. 18). **Results:** A total of 16 children ranging in age from 8-14 years were interviewed. Due to incomplete data on 4 subjects, 12 subjects (6 boys; 6 girls ranging in age from 9-14 years; mean=11.41 ± 1.5) were included in the data analysis. Energy intakes averaged 1,984 ± 510 kcal; and energy expenditure averaged 1,689 ± 351 kcal. Average BF% was 24.3 ± 4.9. Using Spearman correlation and independent group t-test (with the mean energy balance as the cut-point) traditional end-of-day energy balance (24-hr energy in vs. 24-hr energy out) was not statistically associated with body fat %, and there was no difference in BF% between those above and below the end-of-day EB mean. However, more hours spent in an energy surplus (EB > 0) was significantly associated with lower body fat % (r=-0.914; P<0.001), while spending more time in an energy deficit (EB < 0) was significantly associated with higher BF% (r=0.914; P<0.001). **Conclusions:** These data strongly imply that avoiding long periods of time in EB deficits would be useful for reducing body fatness in children. Long times in EB deficits may result from excessive time between eating opportunities, physical activity that results in faster energy expenditure, or any combination of these. Schools and organizations working with children should consider instituting periodic snacking strategies to assure a better dynamic relationship between energy consumed and energy expended throughout the day. This will reduce the chance that children may experience long time periods in EB deficits that, according to these data, are associated with higher BF%.