



Associations between body fat mass and internalizing and externalizing behaviors and anxiety in children and adolescents

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Introduction

Body composition analysis is a painless, bloodless and highly informative method of assessing health indicators that can be used extensively in the pediatric population. This is particularly important granted that the prevalence of childhood obesity has been increasing at a fast pace worldwide.

Increased adiposity in children and adolescents is an important issue for children's growth and psychologic development. Assessing the psychosocial status of children and adolescents with excess body fat and providing appropriate cognitive and behavioral therapy may help with the treatment and amelioration of the negative consequences of obesity.

This study investigates the interrelations between body composition parameters and metabolic and inflammatory biomarkers and the prevalence of internalizing (depression/anxiety, somatic complains and withdrawal) and externalizing (delinquent and aggressive) behaviors reported by parents in a clinical population of obese and overweight children (OC) compared to normal-weight lean children.

Participants

One hundred twenty-one children and adolescents (78 girls and 43 boys) were studied: 40 normal weight (BMI z-scores -0.1923 ± 0.6), 22 overweight (BMI z-scores 0.922 ± 0.4) and 59 obese (BMI z-score 2.669 ± 1.39) aged 5-15 years old (mean age 8.93 ± 2.23). Participants characteristics are presented on Table 1

Table 1. Subjects characteristics and the differences between the two groups. The mean values of each variable are presented along with the estimated standard deviations.

	Normal (N=40)	Overweight and obese (N=81)	p-value
Age	8.74 ± 2.14	9.017 ± 2.276	P=0.522
Sex	70% Female, 30% male	61.7% Female, 38.3% male	P=0.375
BMIz-score	$-1.923 \pm .596$	2.195 ± 1.43	p<0.001
Tanner stage	90% prepubertal 6.5% midpubertal 3.5% postpubertal	80.6% prepubertal 13.9% midpubertal 5.6% postpubertal	P=0.279
Waist to Hip ratio	0.85 ± 0.53	0.9128 ± 0.61	p<0.001
Levels of exercise (hours/per week)	6.16 ± 4.00	5.51 ± 3.29	P=0.359
Screen time (hours/per week)	12.18 ± 9.6	15.6 ± 8.94	P=0.064
Total Body Water (% of body weight)	60.2 ± 8.38	48.47 ± 6.80	p<0.001
Extracellular Water (% of body weight)	52.58 ± 4.72	46.88 ± 5.05	p<0.001
Fat Free Mass (% of body weight)	89.9 ± 6.18	70.72 ± 7.48	p<0.001
Fat Mass (% of body weight)	10.1 ± 6.18	29.28 ± 7.48	p<0.001

Methods and Materials

Physical examination and medical history were obtained by a certified pediatrician. The Anthropometrics were obtained, and body composition analyses were done using an advanced bioimpedance apparatus (BIA-ACC, Biotekna, Venice, Italy). The Child Behavior Checklist questionnaire was completed by parents, whereas the State-Trait Anxiety Inventory for children was completed by the children themselves.

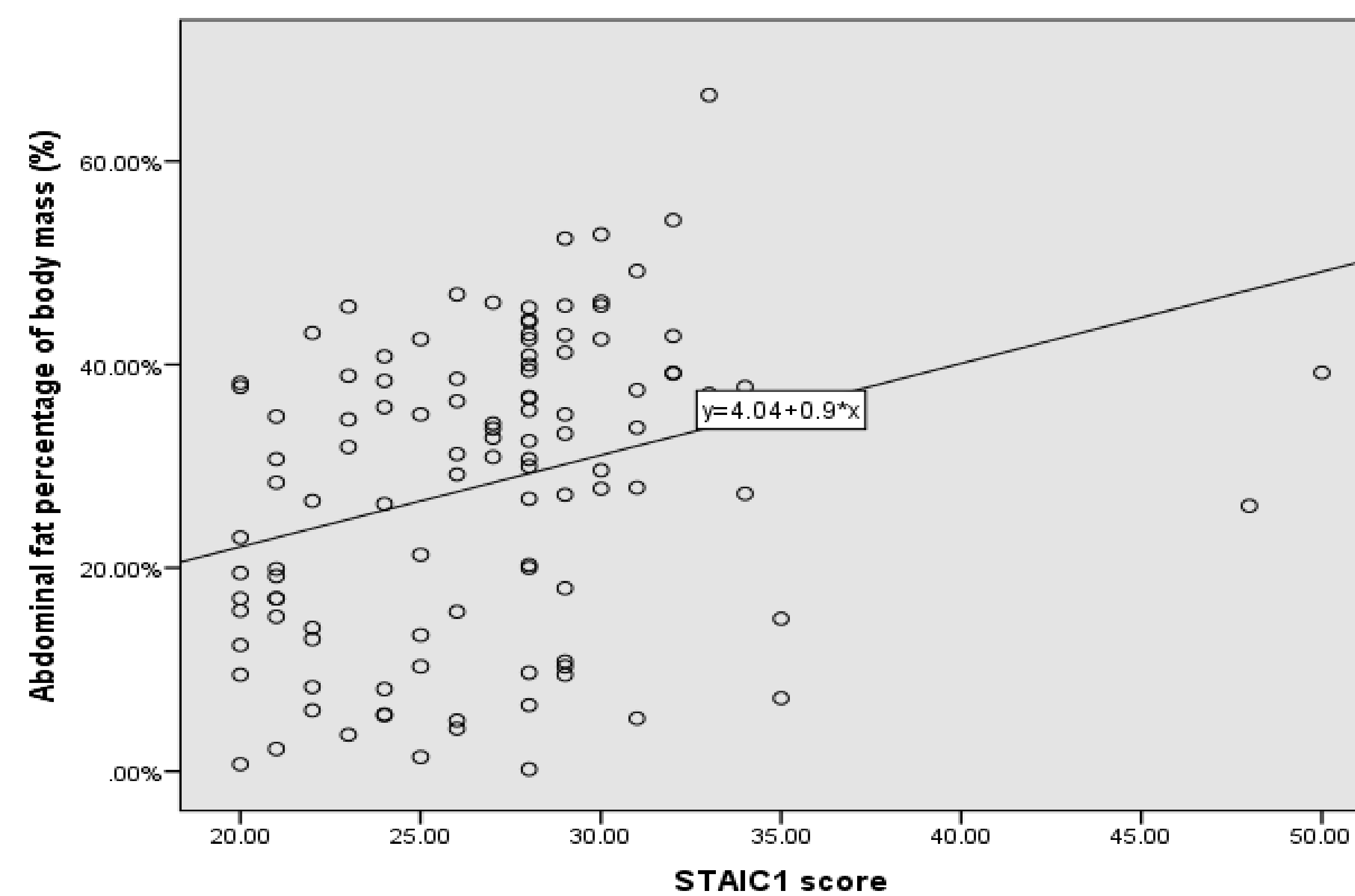
Results

Percent body fat mass (PBFM) correlated positively with externalizing behaviors, such as rule breaking (p=0.027) and aggressiveness (p=0.047). There was a negative correlation between PBFM and social competence (p=0.014) and a positive one between PBFM and thought problems (p=0.011), and conduct (p=0.001), sluggish (p=0.01), and affective behaviors (p=0.017), as shown in table 2. Moreover, PBFM and Percent abdominal fat mass (PAFM) correlated positively with STAIC scoring (p=0.002 and p=0.001 respectively). All the above statistical analyses are adjusted for sex and Tanner pubertal stages.

Table 2. Correlations of Fat Mass percentage with Internalizing and Externalizing problems T-scores, as well as with STAIC scoring controlled for sex and tanner stage

Activities	Fat Mass Percentage
Activities	Rho=-0.213 pvalue=0.047
Social	Rho= -0.296 pvalue=0.006
Thought	Rho= 0,213 pvalue=0.045
Rulebreaking	Rho= 0,216 pvalue=0.042
Total problems	Rho= 0,221 pvalue=0.038
Conduct	Rho= 0,229 pvalue=0.031
Sluggish	Rho= 0,2 pvalue=0.02
STAIC (STATE)	Rho= 0,255 pvalue=0.014

Figure 1. Abdominal Body Fat Percentage correlated positively with STAIC1 scoring (p-value=0.001, rho=0.303)



Conclusions

Body fat accumulation in children and adolescents is associated with behavioural, emotional and cognitive problems. Whether the psychosocial state of children is the cause or the consequence of elevated body fat accumulation remains to be answered. This information is important for the design of prevention and intervention strategies for childhood obesity.

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Topic

Fat, metabolism and obesity

Sources of research support

The authors declare that there are no conflicts of interest. This study received no private corporate financial support. This work was supported by University of Athens and the "Aghia Sophia" Children's Hospital in Athens, Greece

