

Editorial

Beyond diet and exercise: Stress management as a novel promising strategy for childhood and adolescent obesity

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Overweight and obesity in children and adolescents represents a challenging health problem of the 21st century, as its prevalence has dramatically increased during the last three decades (Hill 2006). Indeed, in the United States, the prevalence of overweight and obesity among children aged between 6 and 11 years increased almost four times from 1965 to 2002, and might have reached a plateau during the first ten years of our century (Cunningham *et al.* 2014). In the United Kingdom, about 30% of children at the age of 2 to 15 years are overweight or obese (Carter *et al.* 2012). In Greece, a recent epidemiologic study showed that 14.6% of children aged 2 to 5 years are overweight, while 5.7% of the studied population are obese. The numbers are two-fold higher for the age of 6 to 12 years, since 30.9% are overweight and 10.3% are obese (Brug *et al.* 2012).

The ever-increasing fat mass starting from childhood to middle age, in association with high concentrations of circulating cortisol and inflammatory cytokines, contribute to the development of several pathologic cardiometabolic conditions with increased mortality and morbidity (Carter *et al.* 2012, Hill 2006, Stefanaki *et al.* 2016). We now know that overweight and obese children and adolescents are more likely to become obese as adults. Moreover, hypertension, glucose intolerance, insulin resistance, type 2 diabetes mellitus, dyslipidemia, fatty liver disease, atherosclerosis, hypogonadism and orthopedic problems are well known obesity-related complications, which all account for a significant increase in public health costs.

The initial approach to an overweight or obese child or adolescent consists of diet and exercise. However, it seems that this combination is necessary but not sufficient to effectively reduce and maintain the body mass index (BMI) within the normal range. On

the other hand, accumulating evidence suggests that excessive or prolonged stress may strongly participate in the pathogenesis of numerous contemporary pathologic conditions. The concurrent increased activation of the hypothalamic-pituitary-adrenal (HPA) axis and the locus caeruleus/autonomic nervous systems cause obesity and several other components of the metabolic syndrome (Chrousos 2009). Therefore, stress management seems to be a novel promising strategy to combat these diseases.

In the current issue, Stavrou and collaborators (2016) investigated the effectiveness of an 8-week intervention program, which included an association of stress management methods, in overweight and obese Greek children. Both control and intervention groups followed the same dietary instructions and physical exercise, and were asked to complete four questionnaires at the beginning and the end of the study, which evaluated depression and anxiety symptoms and several behavioral problems. The authors effectively showed a statistically significant reduction in the BMI of the children and adolescents in the intervention group compared with those of the control group. In addition to weight loss, the methods applied resulted in amelioration of depression and anxiety symptoms and internalizing and externalizing problems. Although the sample of population is small, this study shows for the first time that stress management methods could be effective in reducing the BMI of overweight and obese children and adolescents. It also highlights the importance of such intervention programs in changing routine and daily habits that undoubtedly contribute to weight gain. Future studies with larger samples are needed to confirm the interesting results of this study.

References

- Brug J, van Stralen MM, Chinapaw MJ, De Bourdeaudhuij I, Lien N, Bere E, Singh AS, Maes L, Moreno L, Jan N, Kovacs E, Lobstein T, Manios Y & Te Velde SJ 2012 Differences in weight status and energy-balance related behaviours according to ethnic background among adolescents in seven countries in Europe: the ENERGY-project. *Pediatr Obes* **7** 399-411
- Carter R, Mouralidarane A, Ray S, Soeda J & Oben J 2012 Recent advancements in drug treatment of obesity. *Clin Med* **12** 456-460
- Chrousos GP 2009 Stress and disorders of the stress system. *Nat Rev Endocrinol* **5** 374-381
- Cunningham SA, Kramer MR & Narayan KM 2014 Incidence of childhood obesity in the United States. *N Engl J Med* **370** 403-411
- Hill JO 2006 Understanding and addressing the epidemic of obesity: an energy balance perspective. *Endocr Rev* **27** 750-761
- Stavrou S, Nicolaides NC, Papageorgiou I, Papadopoulou P, Terzioglou E, Chrousos GP, Darviri C & Charmandari E 2016 The Effectiveness of a Stress-management Intervention Program in the Management of Overweight and Obesity in Childhood and Adolescence. *J Mol Biochem* **5** 63-70
- Stefanaki C, Peppas M, Boschiero D & Chrousos GP 2016 Healthy Overweight/Obese Youth: Early Osteosarcopenic Obesity Features. *Eur J Clin Invest* doi: 10.1111/eci.12659