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Study of body mass (BMI) index and truncal asymmetry (TA) in healthy adolescents

TB Grivas*¹, RG Burwell³, C Mihas², ES Vasiliadis², G Triantafyllopoulos¹ and A Kaspiris²

Address: ¹Department of Trauma and Orthopaedics, "Tzanio" General Hospital - NHS, Tzani and Afendouli, 18536, Piraeus, Greece, ²Department of Trauma and Orthopaedics, "Thrasio" General Hospital - NHS, G, Gennimata Av, 19600, Magoula, Attica, Greece and ³The Centre for Spinal Studies & Surgery, Nottingham University Hospitals Trust, Queen's Medical Centre Campus, Nottingham NG7 2UH, UK, Bernardou 31 str. Brilissia, Attica, 15235, Greece

Email: TB Grivas* - grivastb@vodafone.net.gr

* Corresponding author

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Introduction

Recent findings have linked BMI in girls with thoracic adolescent idiopathic scoliosis (AIS) to skeletal asymmetries of the spine and upper arm.

Purpose

The aim of this study in healthy adolescents is to evaluate the association between BMI and back shape asymmetry, termed here TA.

Methods and materials

A group of 5953 adolescents, ages 11-17 years (2939 boys and 3014 girls) were examined in a school screening program using two standard positions: standing forward bending (FB) and seated forward bending. TA was evaluated in both positions using a Pruijs scoliometer which measured the angle of trunk inclinations (ATIs) across the back at each of three regions: thoracic, thoracolumbar and lumbar. An abnormal ATI was defined as being beyond 2 standard deviations from the mean for region, age, gender and position, and this was termed severe TA. Each child was assigned to a relatively lower or relatively higher BMI group using a median value of BMI by age and sex. The sitting FB position is thought to express intrinsic TA free from extrinsically-induced effects of any leg-length inequality.

Results

In the sitting FB position relatively lower BMIs, after correcting for age, are associated with a greater number of severe TAs than with relatively higher BMIs in both boys (thoracolumbar and lumbar regions) and girls (thoracolumbar region).

Conclusion

It appears that body fat, BMI, menarche and TA have mechanisms in common during development. BMI is a surrogate measure for body fat and circulating leptin levels. We suggest, analogously to a recently suggested hypothesis for AIS pathogenesis, that severe TA is caused by a genetically-determined selectively increased hypothalamic sensitivity to leptin mediated via the sympathetic NS as an adverse response, exacerbated by lower circulating leptin levels probably associated with relatively lower BMIs. This hypothalamic functional asymmetry is expressed phenotypically via the sympathetic NS acting bilaterally to produce left-right asymmetry in ribs and/or vertebrae leading to severe TA when beyond the capacity of postural mechanisms of the somatic NS to control the shape distortion of the trunk. A test of the hypothesis involving skin sympathetic responses is suggested. Significance: TA, BMI and menarche are related in healthy ado-

lescents. Lower BMIs, are associated with TAs and possibly AIS, [1,2].

References

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