CORRELATION BETWEEN SCHOOLBAG MASS AND POSTURE IN FIRST YEAR PRIMARY SCHOOL STUDENTS

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Abstract

Background: To this date there have been a number of studies which determined an anterior shift of centre of gravity (COG) in the sagittal plane as the result of carrying a schoolbag. However, few of them measured the exact change of COG and how that change affects postural angles.

Objective: The purpose of this study is to determine the influence of mass of a typical Croatian schoolbag (4.51kg) on standing posture in first year elementary school children, and measure the change of centre of gravity (COG) as well as change in postural angles of head, neck and pelvis using free, open source software and inexpensive anthropometric methods.

Methods: 76 first year elementary school students (35 male, 41 female) from two Zagreb elementary schools participated in this study after written consent was obtained from both parents and headmasters. Anthropometric methods were used to acquire data regarding height, mass and anterior pelvic tilt angle, while digital photography (kinematic methods) was used to ascertain position of COG, craniovertebral and craniocervical angles in lateral view. The data was digitalised and analysed using SkillSpector™ and Kinovea™, open source, video based, motion analysis software. This study has analysed data regarding change of COG in sagittal plane as well as change in anterior pelvic tilt angle, craniovertebral and craniocervical angle in subjects during normal, unencumbered standing position and while carrying a schoolbag.

Results: Results have shown a change of COG in all three anatomical planes (p<0.01) as well as a change in two out of three measured postural angles - craniovertebral (p<0.01) and craniocervical (p<0.01) angle. The most important aspect of changed posture, anterior shift of COG, was
measured to be 2.407 cm and was in moderate negative correlation with students body mass (-0.436, p<0.01) and body height (-0.402, p<0.01). Contrary to hypothesis, a statistically significant difference of COG shift was detected in AP view along the vertical axis in boys and girls. On average, COG in boys has shifted 2.57mm lower than in girls while carrying a schoolbag.

**Conclusions:** Analysis of COG and postural angles have shown that when 1st year primary students are encumbered with a schoolbag (which on average weighs 16.13% of their body mass) their head and neck posture shifts to a more protracted posture.

**Key words:** schoolbag, standing posture, centre of gravity, anterior pelvic tilt, craniovertebral angle, craniocervical angle.