School backpack transportation and its effects on posture: a case study

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Heavy school backpacks, or their incorrect transportation, represent a risk for musculo-skeletal disorders. According to the recommendations of the MIUR and the Ministry of Labor, Health and Agriculture, the weight of the backpack should not exceed 10-15% of body weight. Studies in literature have not shown conclusive data about the effect of the weight of backpack and the duration of its transport on the musculoskeletal system [1]. The objective of this case study is to verify the variation of spatiotemporal gait parameters and pelvis angles walking 10 meters, in a 13-year-old girl (body weight:50 kg, height:155 cm), carrying a school backpack. We performed a clinical and instrumental evaluation with 3 different weight percentages relative to body weight (T1:10%; T2:15%; T3:20%) using a wearable inertial sensor (G-sensor BTS Engineer) placed at L5 level. The T0 evaluation without backpack, showed a scapular and shoulder height-right deviation in the frontal plane. Adam test showed dorsal hump 0,4 cm. Different stature triangles (>right); counterclockwise pelvic rotation (10°). Spatiotemporal parameters were symmetrical: right and left propulsion index 8,5; 9; tilt 98; pelvic obliquity 79,2; pelvic rotation 62,8. Data "on both shoulders" modality transport at T1, T2, T3 were respectively: left propulsion index 9,4; 7,5;7,8; right propulsion index 7,6; 8; 9,2; tilt 98,6; 90,4; 93; pelvic obliquity 96,5; 98,6; 86,7; pelvic rotation 79,6; 98,6; 99. Data "on one shoulder" modality transport (T1, T2, T3) were: left propulsion index 9,4; 9,4; 6,1. Right propulsion index:10,1; 8,7; 6,5. Tilt: 68,7; 37,8; 79,2; Pelvic obliquity: 96,7; 97,3; 51,1; Pelvic rotation: 91,4; 59,7; 95,7. Data trolley modality at 20% of body weight showed left and right propulsion index: 12,5; tilt 81,2; pelvic obliquity 98,6; pelvic rotation 99,2. Data of right "one hand" at 10% of body weight were: left propulsion index 9,8; right propulsion index 8,2; tilt 77,9; pelvic obliquity 75,4; pelvic rotation 57,7. Compared to T0, the best modality seems trolley mode. After that "on one shoulder" and "on both shoulders" show a progressive loss of pelvic movement at 15% of body weight. The worst modality is "one hand" in which pelvis seems fixed. In conclusion, a prolonged period of high weight transport and incorrect modality could produce or worsen postural abnormalities.

Reference

[1] Dockrell et al. Work. 2015; 53 (3):679-88.

Key words

School backpack, musculoskeletal disease, gait, pelvis.