ABSTRACT

The aim of this study is to assess postural changes in young female adults carrying a personal computer and some auxiliary material in a shoulder bag. Images have been recorded in the frontal and sagittal planes. After recording, the anatomical landmarks were manually digitized with appropriate software. Analyzing the data and comparing the two situations - with and without carrying a load can be registered significant differences in posture and normal gait.

INTRODUCTION

Having as objective the kinematic analyze of young adult females gait, which are in higher education institutions (18-23 years old), carrying a shoulder bag in a single strap with personal computer and containing school materials support. It appears that a large number of persons, for professional reasons or mere pleasure, students, managers, business person, salesman, among others, carry non-negligible weights (Gonçalves, Rocha, Queijo, Barbosa, & Juan, 2011).
The fact of such people tend to carry so often the computer and other material, with relative weights not negligible, when traveling between home and workplace, as well as between spaces in the workplace leads to the need of identification of factors predisposing to postural changes and subsequent occurrences of acute and chronic injuries to be fundamental (Rocha & Barbosa, 2008).

**MATERIAL AND METHODS**

In this study, 12 young adults were involved, all female, who attend higher education. None of the young adults showed any injury or orthopedic disease and / or musculoskeletal in the last year. All procedures complied with the Declaration of Helsinki for research with humans.

For this study each female student was instructed to walk naturally with a comfortable speed, making several preliminary passes for training, in a straight line with and without the shoulder bag.

For image recording each subject were analyzed in two passages, one with and one without bag, in order to compare the normal gait of each subject with and without shoulder bag.

Before recording the images it was recorded the age, height (SECA 242, Germany) and body mass of each participant in this study (SECA, 884, Germany).

<table>
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<th>Table 1 Body mass and height</th>
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<tr>
<td><strong>Body mass</strong></td>
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<td>(Kg)</td>
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<td>average</td>
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Shoulder bag contained the laptop computer and the remaining mass corresponded to books, computer charger and other accessories and/or educational materials. The loaded shoulder bag mass in this study was fixed and was 6.0 Kg, which is approximately correspond to 10% of medium body mass, once it has been verified some postural instability with these values, in preliminary study (Gonçalves, Rocha, Queijo, Barbosa, & Juan, 2011).

Throughout the procedure, each subject was filmed in the frontal and sagittal planes (SONY, DCR-PC120E, Japan). Kinematic analysis was performed (Ariel Performance Analysis System, Ariel Dynamics Inc., USA) for a complete gait cycle, with and without shoulder bag, using the direct capture to PC via i.LINK connection.

For calibration, we have used 4 points on orthogonal axes - horizontal and vertical.
It was adopted anthropometric model of Zatsiorsky, adapted by de Leva (Leva, 1996), including the division of the trunk in 3 articulated parts made in total by 20 scan points per frame.

All scanned gestural cycles were filtered, using the double pass, with a low-pass filter 5 Hz to the center of mass and 9 Hz for the body segments as suggested in the literature (Winter, 1990).

The reliability of the scan-rescan was very high (ICC = 0.97 ± 0.01).

Kinematic analysis was performed for the sagittal plane and the frontal plane, but tridimensional kinematic analysis wasn’t performed.

For this study we evaluated the general parameters of gait cycle (stride frequency and distance cycle), as well as linear kinematic parameters (vertical and horizontal amplitude of the shoulder, hip, knee and ankle).

RESULTS AND CONCLUSIONS

As conclusion, it can be pointed out that postural differences between the gait with load on shoulder and walking unloaded are significant. The gait with load was altered on contrast to the normal gait. Especially interesting is to compare the variation of hip position when the gait takes place with or without load.

![Fig. 2 Position of the right hip with load (A) and right hip with no load (B). Raw Signal](image)
Fig. 3 Position of the right shoulder without load, excel data before treatment. Raw data.

The daily use of bag with laptop and other material having a significant mass and subsequent transport between home and workplace and during work supported by a single shoulder is a precursor of musculoskeletal disorders.

REFERENCES


