THE INFLUENCE OF THE TASK PERFORMED BEFORE THE POSTURAL ASSESSMENT USING THE PHOTOGRAMMETRY METHOD

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SUMMARY

When the photogrammetry is used to measure postural deviation, it´s important to know if the task performed previously the picture affects the measures. This study analyzed the influence of the task performed before the postural assessment in photogrammetry method. Therefore, 29 volunteers aged between 17 and 35 years old participated in the study. The C7, T12 and L5 vertebras were identified by palpation by an examiner previously trained and external markers (5cm and 1cm^2 base) were attached on participants' skin with double-sided tape. The first task was to sit on a plastic stool (40cm) and the second one was to walk 3 meters distance. After each task they stood in orthostatic position staring at a point in front, at the eye´s height, and a picture in saggital plan was taken. This procedure was repeated 3 times randomizing the conditions. The photos were transferred to the computer, the 'x' and 'y' spatial coordinates of each marker were identified (PAINT software) and used to calculate the thoracic and lumbar angles (Microsoft Excel). High reliability was found for the thoracic (ICC=0.98 with 95% IC of 0.96→0.99) and lumbar angles (ICC= 0.99 with 95% IC of 0.97→0.99). However, T Student test with repeated measures found differences between the thoracic (T_{seated}=35.79^o, DP=8.61; T_{walk}=36.99^o, DP=9.59; t=-2,73, P=0,01) and lumbar angles (T_{seated}=19.87^o, DP=9.09; T_{walk}=20.68^o, DP=9.29; t=-2,11, P=0,04). The task performed before the photo influenced the posture's angles. Therefore, it's important to take account of the acute effect that the previous task can provide on the posture analysis

INTRODUCTION

The musculoskeletal balance that is able to protect the body structures from damage or deformities is defined as good posture. In the other hand, bad posture is understood as the interaction between many parts of the body increase the tension in the structures support, promoting an imbalance [1]. The postural assessment helps to investigate de joints dysfunctions, making possible to quantify disturbances and register the intervention effectiveness [2].

There are lots of ways to assess the posture, some of them are quite subjective, based on the examiner´s experience, which sometimes cannot be applied in researches [3]. Still, there is the photogrammetry, the method used to obtain measures from the forms and human body dimensions of images, becoming able to quantify the angles in the postural assessment [4]. This method seems to be high reliable and accurate, however it is not known if the performance of a different task previously a posture analysis can influence the results. For example, if a subject walks and then stops in an orthostatic position to be analyzed, or was seated on a chair during a certain period and stand up for the analysis, probably there will be different posture adjustments on the orthostatic standing posture in function of musculoskeletal adaptation.

Within this scope, the present study analyzed the influence of the task performed before the postural assessment in photogrammetry method. This study will provide information about the influence of the previous task on postural analysis to verify if a protocol must be realized before taking the pictures.

METHODS

The sample consisted in 29 volunteers, 14 males and 15 females, aged between 17 to 35 years old. The weight and height were asked to the participants and were included in the sample the ones who presented BMI considered normal (18.6 to 24.9 Kg/m^2) by the World Health Organization (WHO) [5]. The procedures were explained to the participants and a free consent term was signed.

The tests were performed at the Group of Studies and Research of Motor development and Learning of Londrina State University. The procedures were performed by an examiner, previously trained who asked the participants to sit on a plastic stool (40cm), while the examiner identified the vertebral processes of C7, T12 and L5, using the palpation method, that consist in locate the C7 process and palpating all the processes individually, identifying the T12 and L5. The C7, T12 and L5 vertebral processes were marked with black eyeliner (AVON) and external markers of 1cm^2 base and a filament of 5cm, made of cardboard, were attached to the participants´ skin with double-sided tape. Men were not wearing T-shirt and the women were wearing bikini on top.

Firstly the participants were asked to sit in a plastic stool (40cm) for 5 seconds and stand up in orthostatic position, staring at a point in front, at the eye´s height. In saggital plan, a photo was taken with a digital camera (OLYMPUS, 12 megapixels). The camera was placed in a 1,5 meters distance of the participant and on a tripod of 1 meter height. After that, the participants walked 3 meters and went back to the orthostatic position, staring at a point in front at the eye´s height and another photo was taken. These procedures were repeated 3 times consecutive, alternating the conditions (seated or walking). The markers were removed from the participants' skin and cleaned with soft cotton and alcohol (70% VEJA brand). The photos were transferred to a computer, the 'x' and 'y' spatial coordinates of each marker were identified (PAINT software) and used to calculate the thoracic and lumbar angles (Microsoft Excel) (figura 1).

The *ICC* (interclass correlation coefficient) was applied to check the reliability of the measures and to check the differences between the task a *T Student* test was applied. It was adopted a significance of 5% ($P>0,05$).
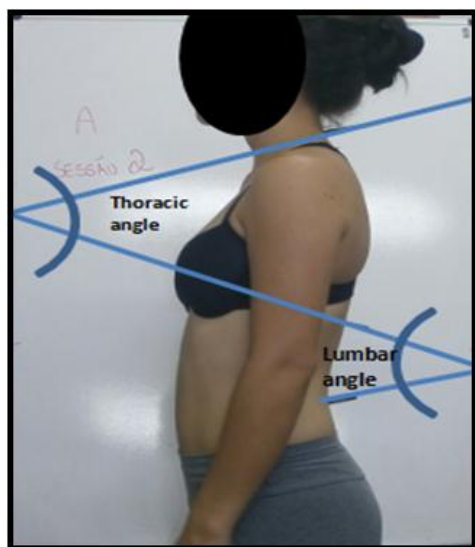

Figure 1: markers attached showing the thoracic and lumbar angles.

RESULTS AND DISCUSSION
High reliability was found for the thoracic (ICC=0.98 with 95% IC of 0.96→0.99) and lumbar angles (ICC= 0.99 with 95% IC of 0.97→0.99). These results suggest all subjects showed the same behavior after the influence of the different conditions they were submitted.

The comparison analysis (*T Student* test with repeated measures) found differences between the thoracic (t=-2,73, gl=28, P=0,01) and lumbar angles (t=-2,11, gl=28, P=0,04). In which, after walking, it was observed greater angles for both, thoracic and lumbar angles, in comparison to the seated task performed before the analysis (figure 2).
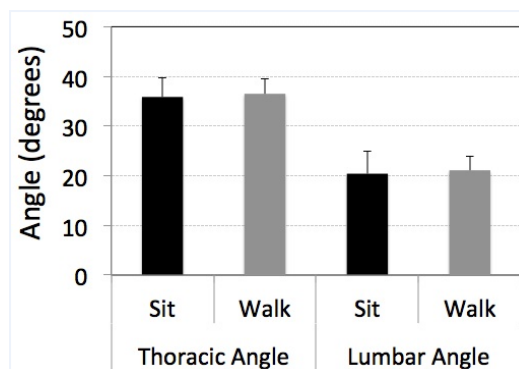

Figure 2: mean and standard deviations of the thoracic and lumbar angles for posture analysis after the performance of the seated task and walking task.

The greater thoracic angle found after walking, in comparison to the seated task, was explained by the free constraint provided by the spine during walking movement. The lower lumbar angle found after seated task seems to be due to the rectification that occurs on lumbar region while subject was seated.

Despite this differences found for thoracic and lumbar angles, after different task performed (sit and walk), the magnitude of difference between the conditions was lower than 2 degrees. Therefore, in some circumstances these differences may not be crucial to evaluate posture. However, for clinical or research analysis, mainly when some intervention is applied or is necessary a high level of accuracy and reliability, it seems important to establish a protocol considering the task performed before the analysis.

CONCLUSIONS
The task performed before the photo influenced the posture's angles. Walking task showed greater thoracic and lumbar angles in comparison to sitting task. The greater thoracic angle in walking task was explained by the lower constraint provided by this task during the movements. The lower angle in seated task was explained by the rectification of the lumbar region while subject remain seated. Therefore, it seems important to take account of the acute effect that the previous task can provide on the posture analysis.

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