Validity of Postural Assessment Software in the Analysis of Khyposis and Lordosis


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Summary

Postural assessment is a tool used by Physical Education teachers to analyze and plan exercise programs that make improvement possible to posture of school students and athletes. Among the most used methods are those that produce qualitative and subjective data, which makes it necessary to validate quantitative methods of postural evaluation. Therefore, this study aimed at the validity, encompassing relevance and reliability, of a quantitative method of postural evaluation: Fisiologic. In the relevance study, distances between vertebrae and khyposis and lordosis angles values obtained by the Fisiologic method have been compared by the same measurements obtained by the Motion Analysis System, considered gold standard in this experiment. In the reliability study, the data obtained by the experimental method in distinct acquisitions has been compared. The relevance and reliability studies have shown statistically significant results for distances and angles in the experimental method.

Introduction

In the Physical Education field Postural Assessment is used to identify postural patterns and following, exercise prescription for students from different age groups. Studies have shown that qualitative methods of Postural Assessment are frequently used, which can lead to mistakes due to the subjectivity of observation (PINHO & DUARTE, 1995). The Physical Education field needs less invasive, more objective and quantitative methods of postural assessment.
Postural Assessment conducted recently using optoelectronic devices have shown good reliability inter and intra observer with sound confiability due to the fact that the data obtained by those devices are very close to the ones obtained by the processing of bio signs such as X-ray (LEROUX, ZABJEK, SIMARD, BADEAUX, COILLARD & RIVARD, 2000) and traditional anthropometric measurements (, 1999). The disadvantage of such assessment is that the optoelectronic devices are very expensive and experiments can only be conducted in labs, which demands large spaces for subject assessment, which doesn’t allow its use in large scale, necessary for posture alterations prophylaxis.

Thus, this study intends to contribute to the identification of an analysis tool for postural assessment that is less invasive, more objective and quantitative from those that are commonly being used by Physical Education teachers.

Therefore, this study objective is to verify the relevance and confiability of the Postural Assessment software Fisiologic when measuring the distance between anatomic landmarks from the vertebrae column and angles of kyphosis and lordosis (calculated from these values). This will be done through the study of relevance and reliability.

Materials and Methods

The experimental sample had 10 subjects on the first day of data collecting, and 05 subjects from the previous 10 first ones in the second day, who were all study volunteers, aging from 22 to 36. Two subjects were male and 8 were female. All subjects were wearing bathing suits to facilitate the marking of anatomic landmarks. They filled in a consentment term in order to take part in the experiment. It was also made an anamneses chart to identify any exclusion factor, such as pain of any kind in the locomotor apparatus. Data was collected at rehabilitation Division of the Medical School from Hospital das Clínicas - Universidade de São Paulo, always in the afternoon period.

The anatomic landmarks selected for measurement of distances and thoracic kyphosis angles were the spinous process of the second (T2), the seventh (T7) and the twelfth thoracic (T12) vertebrae. The points selected for measurement of distances and lumbar lordosis angle was the spinous process of the first sacral vertebra (S1) and a point between the third and fourth lumbar vertebrae (L3/L4). The reason to select these points was that with these values it is possible to calculate the angle of thoracic kyphosis and lumbar lordosis, in the same way as the work done by LEROUX et al. (2000). Besides, according to the literature, the limits of the thoracic curve and lumbar lordosis usually comprehend T2 and T12 vertebrae for kyphosis and T12 and S1 for lumbar lordosis GELB, LENKE, BRIDWELL, BLANKE & McENERY, 1995; KAPANDJI, 1980; VOUTSINAS & MacEWEN, 1986).
After identifying each surface anatomic landmark, it was made a small circumference on them with a dermographic pencil, on the five subjects that took part of the data collecting on the second day. Only after this identification, retro-reflexive markers that make part of the Motion Analysis System (MTA) were put on the anatomic landmarks. The subjects went to the place where data was being acquired and were informed that they should stand facing the digital camera, and keep their feet together within a square that was drawn on the floor. It was also informed to the subjects that they should keep themselves in a natural position and that the image acquisition would be done in apnea, kept at the end of exhaling. At this moment the assessor would simultaneously click the buttons from the two image acquisition systems.

In this experiment the following distances between the anatomic points of the vertebrae column were measured: T2-T7; T2-T12; T7-T12; T12-S1; T12-L3/L4 and L3/L4-S1. It was possible to calculate the angles of thoracic kyphosis and lumbar lordosis with the data from these distances. The estimative of these angles, in this experiment, was based on calculations made by LEROUX et al. (2000).

The **Wilcoxon non parametric Test** was used for confirmation of the relevance and confiability, because in this statistic test the differences between the values obtained with the two systems are verified, at the same time as the test considers the data ordination. The P-value measures the quantity of evidence that the samples offer on favor to the lack of the investigated value. In this study, for small values of P the equality of groups were rejected. Large values of P indicated evidence that groups were similar. The limit adopted was 5%.

**Results**

All distance measures made by Fisiologic method (FIS) and MTA, compared pair by pair, by the Wilcoxon Test, presented statistic relevance ($p > 0.05$). Table 1 shows the relevance study for distances and angles.

Unfortunately it was not possible to find in the literature studies that tried to identify the relevance of measuring the distance between the anatomic landmarks from the human body obtained through images generated by digital cameras in relation to optoelectronic systems. There are studies that have analyzed the relevance of image generation devices, among them the optoelectronics, in the measurements of the real distance of objects. In the KLEIN and DE HAVEN (1995) study, known distances were measured by ARIEL optoelectronic device and it presented significative results, even with the variation of the positioning of cameras in relation to the plan in which the marks to measure the distance were put.

On the RICHARDS (1998) study, the MTA was identified as the
third best optoelectronic device for measuring the known distance between points of a parallelogram compared with five optoelectronic equipments. There’s also a study that analyzed known distances between a parallelogram, through digital image and postural assessment software. This experiment was made by NORMAND, HARRISON, CAILLIET, BLACK, HARRISON and HOLLAND (2002) and average differences found by the software of 3.33 mm were dismissed by the authors.

All distance and angles measures done by FiS on the two days of data acquisition and pair by pair comparison done by the Wilcoxon Test presented statistic relevance (p > 0.05). Table 2 shows the reliability study for distances and angles. It was observed similar data in the literature. The REIS study (2003), presents statistically relevant data in the analysis of confiability of distance measure between corporal segments through photograph, in individuals that present scoliosis. NORMAND et all (2002) has also identified high confiability values, with ICC > 0.95 for all distance measures of a parallelogram obtained by the Video Posture Evaluation System.

**Conclusions**

This study made possible to verify the relevance and confiability of the Fisiologic method, when making the measurement of distances between anatomic landmarks of the vertebrae column and when making the measurement of indirect angles (kyphosis and lordosis) in relation to the Motion Analysis optoelectronic system, which is considered gold

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<tr>
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<td>W</td>
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<tr>
<td>T2-T7</td>
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<td>Lordosis</td>
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standard in this study. The Postural Assessment software Fisiologic is less expensive when compared to optoelectronic devices, and it also allows the possibility of usage in varied places where postural assessments are made. The use of this method by Physical Education and sports professionals can allow a more reliability assessment of the parameters of corporal posture from students and athletes, which can contribute to the prophylaxis of postural alterations and lesions in the structure of the locomotor’s apparatus.

References


