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COMPARATIVE STUDY

Differences and similarities in postural alterations caused by sadness and depression

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Summary The present study investigated the existence of a relationship between depression and body posture in 40 women, aged between 20 and 30 years, who had normal body mass indices (or were underweight) and absence of neurological, psychiatric, or musculoskeletal disorders. The aim of the present study was to investigate the existence of a relationship between sadness, depression and the posture represented by the angle of Tales, head inclination, shoulder inclination, and forward head and shoulder protrusion. The degree of depression was rated on analogue scales representing current and usual depression and current and usual sadness and by the Beck Depression Inventory. The results indicated that a relationship exists between: Beck depression and the angle of Tales ($p = 0.01$), current depression and inclination of the head ($p = 0.05$) and inclination of the shoulders ($p = 0.006$), and usual depression and protrusion of the shoulder ($p = 0.02$). Inclination of the shoulders is associated with current sadness ($p = 0.03$; $r = 0.443$) and usual sadness ($p = 0.04$; $r = 0.401$). Usual sadness is also associated with protrusion of the shoulder ($p = 0.05$; $r = 0.492$). No associations were found with protrusion of the head and the emotional variables assessed. The conclusion was that depression and sadness might possibly change posture. Consequently, postural assessment and treatment may assist in diagnosing and treating depression.

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Introduction

Depression is a common adult psychiatric disorder. According to the American Psychiatric Association (2000), the essential feature of a major depressive episode is a depressed mood or a loss of interest or pleasure in nearly all activities. The individual must also experience additional symptoms, such as changes in appetite, weight, sleep, and psychomotor activity; decreased energy; feelings of worthlessness or guilt; difficulty in thinking, concentrating, or making decisions; or suicide attempts. The mood in a major depressive episode is often described by the person as depressed, sad, hopeless, or discouraged (American Psychiatric Association, 2000).

The study of human posture is relatively new compared to other areas of medical science and refers to the alignment and maintenance of body segments in certain positions (Rosário et al., 2004). Some postural deviations may adversely affect muscular efficiency, predispose individuals to pain and pathologic musculoskeletal conditions, and provoke unaesthetic alterations (Rosário et al., 2004; Liebenson, 2008; James et al., 2009; Wallden, 2009). The specific focus on posture is very important because it is related to quality of life, a fact that has stimulated interest in different areas.

Emotional changes can, with proper stimulation, affect any human being and cause muscle changes coherent with the emotional state (Ekman et al., 1983). In this context, posture can be an important tool in the diagnosis and treatment of affective problems (Canales et al., 2010; Rosário et al., 2013). A previous study, found associations between sadness and posture (Rosário et al., 2013). However, the literature includes very few studies that have investigated this correlation. The aim of the present study was to investigate the existence of a relationship between sadness, depression, and the posture represented by the angle of Tales, head inclination, shoulder inclination, and forward head and shoulder protrusion.

Methods

Forty women, aged between 20 and 30 years, who had a normal body mass index of between 16 and 24.9 kg/m2 were assessed (World Health Organization — WHO, 1998). Subjects were not assessed during their menstrual period. The exclusion criteria were any psychiatric, neurologic, or musculoskeletal disorders. Subjects with musculoskeletal problems related to postural disorders, such as scoliosis, were not excluded. However, a postural problem caused by trauma, for example, a history of leg fracture that may have caused a leg discrepancy and, consequently, scoliosis, was excluded. An expert physician screened all subjects to ensure compliance with the inclusion criteria. The present study received approval from the Human Research Ethics Committee of the UNIFESP under protocol number 1391/05, and the participants signed an informed consent form.

The volunteers were subjected to the same assessment protocol, which included demographic data (age, weight in kilograms, and height in meters). A digital camera (Canon PowerShot A400) was used for documentation of the standing right lateral and frontal views of the subjects. The temperature in the assessment room was kept at a constant 25 °C to avoid possible alterations in posture. The image was transferred to an Intel Core 2 Duo computer, and the angle of protrusion of the shoulder was examined by Corel Draw (Fig. 1), as described by Munhoz et al. (2005). The first step was to draw a line parallel to the ground. For the lateral view, another line was drawn perpendicular to the first line, which had the same function as a plumb line. This line was positioned at the very back of the heel of the subject in the photo.

The following angles were involved in the lateral view — see Fig. 1:

- Protrusion of the head (A): Another line was drawn from the heel point to the intertragic notch. The angle between this and the plumb line, with the heel as the fulcrum, revealed the protrusion angle of the head.
- Protrusion of the shoulder (B): Another line was drawn from the heel point to the most anterior part of the shoulder. The angle between this and the plumb line, with the heel as the fulcrum, revealed the protrusion angle of the shoulder.

The following angles were involved in the frontal view — see Fig. 1:

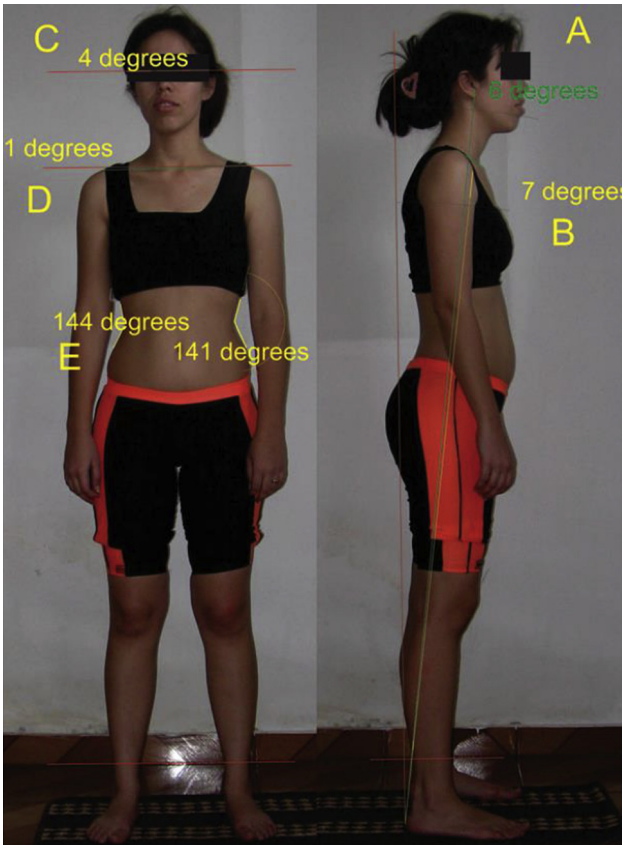

Figure 1 Lateral and frontal photographs with tracings of the angles of protrusion of the head (A), protrusion of the shoulder (B), inclination of the head (C) inclination of the shoulders (D) and angle of Tales (E).

- Inclination of the head (C): An exact copy of the line parallel to the floor (red) crossed the center of the lowest pupil. Another line was drawn leaving this point toward the center of the other pupil, with the center of the lower pupil as the fulcrum.
- Inclination of the shoulders (D): An exact copy of the line parallel to the floor (red) crossed the uppermost part of the acromion. Another line was drawn leaving this point toward the same point on the opposite acromion, with the highest acromion as the fulcrum.
- Angle of Tales (E): This measurement is clinically used as a marker for scoliosis. It is not as reliable as the Cobb angle. On the other hand, it does not have the radiation problem. The idea behind this assessment is that scoliosis will produce body asymmetry. This asymmetry does not happen only in the spine; it appears in the whole trunk. Thus, when assessing a person with scoliosis in the posterior-anterior view, it is possible to compare the lateral lines of the trunk, especially at the lumbar and lower thoracic zones. A person bearing this spinal deformity will show an acute angle on the concave side and an obtuse angle on the convex side (Fig. 2), whereas a healthy person will show even angles. To measure these angles, the fulcrum was on the most medial part of the abdominal region (lateral line on both sides). From this point, a line was drawn toward the most lateral part of the chest (lateral line), and another line was drawn toward the most lateralized part of the hip. Thus, two angles were obtained, one from each side. One angle was subtracted from the other, with a value of zero indicating the absence of thoracolumbar scoliosis.

Analogue scales were used to assess the degree of subjective depression and sadness (Williams et al., 2010), which facilitated an assessment of usual depression (a chronic feeling) and current depression (a momentary feeling present at the time of assessment). The scales consisted of a 10-cm line marked from 0 to 10, with "No depression at all" on the extreme left and "Utter depression" on the extreme right (Fig. 3). The word "depression" was changed into "sadness" in the analogue scale that assessed latter emotion. The volunteers indicated their emotional state according to the scale.

Degree of depression was assessed through a self-assessment score that used parameters based on the Beck Depression Inventory (BDI) developed by Beck and colleagues (1961). The parameters were specific to symptoms of depression and were in line with the diagnostic criteria of DSM III and the literature reviewed. According to Beck and Beamesderfer (1974), the BDI has high reliability (0.86) and satisfactory validity when compared with clinical diagnoses.

Both the BDI and analogue scales were self-reported in a calm and quiet environment. The evaluating physician had worked previously with the subjects to help them understand the BDI questions. Two independent and suitably qualified professionals calculated the BDI scores. The linear regression and the effect of sample size were calculated with the Statistical Package for the Social Sciences (SPSS) software. The level of significance for the linear regression (Pearson correlation) was set at $p < 0.05$. The power of the sample had a small effect when $r = 0.10$ (explained 1% of the total variance), a medium effect when $r = 0.30$ (explained 9% of the total variance), and a large effect when $r = 0.50$ (explained 25% of the total variance).

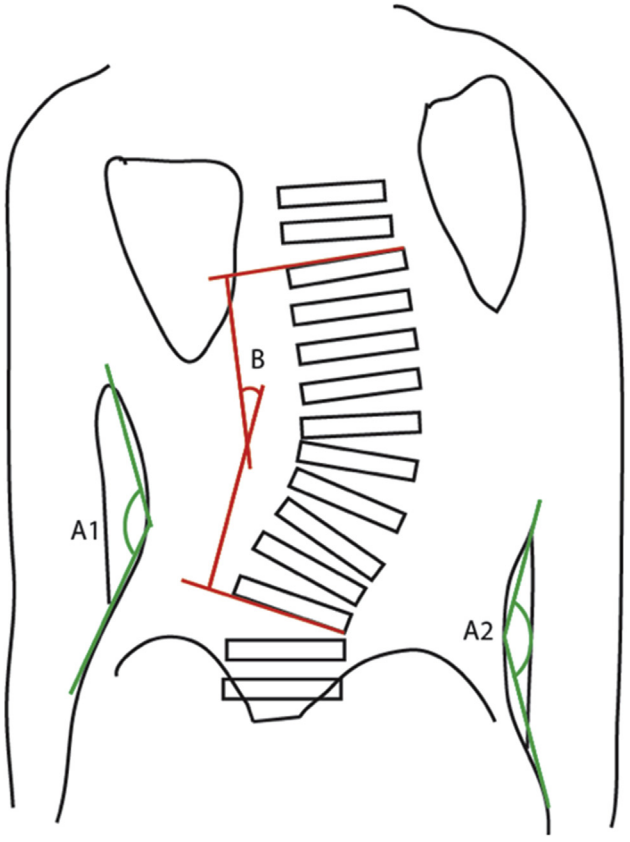

Figure 2 Posterior-anterior view of scoliosis showing the differences between the angle of Tales (A1 and A2) and the angle of Cobb (B). The angle of Cobb is a radiographic measure, whereas the angle of Tales is a clinical measure. A1 must be subtracted from A2 in the module, with a value of 0 indicating no scoliosis. The bigger the value, the worse the scoliosis.

Results

Table 1 displays the data obtained from the calculation of the linear regression between the postural and emotional variables. There is a clear correlation between the constant variable Beck depression and the dependent variable angle of Tales ($p = 0.01$), with a medium sample size effect of

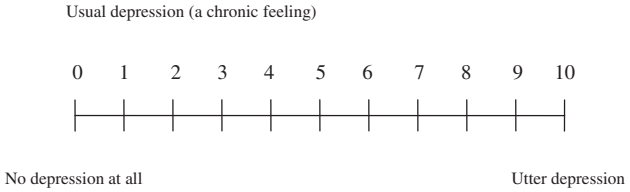

Figure 3 Example of the analogue scales used in the present study — a value of 0 signifies an absence of the emotion studied whereas a value of 10 would be the strongest possible feeling related to that emotion.

Table 1 Correlation index for the degree of depression, sadness and the postural parameters.

Postural variables	Beck depression		Current depression		Usual depression		Current sadness		Usual sadness	
	p	*r*	*p*	*r*	*p*	*r*	*p*	*r*	*p*	*r*
Angle of Tales	0.01	0.446	N.S[a]		N. S		N. S		N.S	
Inclination of the head	N.S		0.05	0.362	N. S		N. S		N.S	
Inclination of the shoulders	N.S		0.006	0.507	N.S		0.03	0.04	0.443	0.401
Protrusion of the head	N.S		N.S	N.S	N. S		N. S		N.S	
Protrusion of the shoulder	N.S		N.S		0.02	0.822	N. S		0.05	0.492

[a] N.S — non-significant values.

$r = 0.446$. Current depression is associated with inclination of the head ($p = 0.05$; $r = 0.362$) and inclination of the shoulders ($p = 0.006$; $r = 0.507$). Usual depression is associated with protrusion of the shoulder ($p = 0.02$; $r = 0.822$). Inclination of the shoulders is associated with current sadness ($p = 0.03$; $r = 0.443$) and usual sadness ($p = 0.04$; $r = 0.401$). Usual sadness is also associated with protrusion of the shoulder ($p = 0.05$; $r = 0.492$). Protrusion of the head was not associated with any of the emotional variables studied.

Discussion

The BDI and analogue scales were used to measure depression. Beck depression was associated with the angle of Tales ($p = 0.01$) representing thoracolumbar scoliosis. Current depression was associated with inclination of the shoulders ($p = 0.006$) and inclination of the head ($p = 0.05$). Thus, the current depression data exhibited different associations from those shown by the BDI. Head and shoulder inclination may be a component of scoliosis. This could explain the association between Beck depression and the angle of Tales.

Usual depression was associated with the postural variable protrusion of the shoulder (0.02). Rosário et al. (2013) used the same assessment and reported that usual sadness was associated with protrusion of the shoulder. This could be attributed to the subjects' understanding of depression as being close to sadness.

This study suggests a statistically significant association between protrusion of the shoulder and usual subjective sadness. These results are similar to those of other authors who have stated that emotions are related to patterns of contraction of the facial muscles (Ekman et al., 1969, 1983) and body posture (Grammer et al., 2004). These findings also indicate that certain postures may be adopted in response to the experience of a specific emotion.

The results related to sadness are similar to those of a previous study (Rosário et al., 2013). The analogue scales are subjective. Thus, what the subjects identified as depression may in fact be a deeper sadness because protrusion of the shoulders and inclination of the shoulders were significant for both sadness and depression, although the depression values were more significant.

Protrusion of the head showed no relationship with any of the emotional variables studied. However, Canales et al. (2010) suggested that, during episodes of depression, individuals with major depressive disorder experience alterations in posture: increased head flexion, thoracic kyphosis, a trend toward left pelvic retroversion, and abduction of the left scapula. The parameter protrusion of the shoulder analyzed in the present study correlated with the findings of Canales et al. (2010) and Darwin (1899). No association between protrusion of the shoulder and Beck depression was identified; the subjects in this study scored minimal to moderate depression, whereas Canales et al. (2010) worked with patients who had been diagnosed as severely depressed. The same sample differences may explain the absence of an association between forward head and depression.

Totton and Edmondson (2009) stated that a caved chest with the shoulders slumped down and forward is an image of defeat and that people who are stuck in this posture, protecting the heart, have generally given up, probably due to constant frustration. The same authors suggest some exercises that free the shoulders and can lead to an emotional improvement. The aim of the present study was not to find a treatment for emotional problems resultant from good posture or a postural treatment based on cultivating positive emotions. However, because a correlation was detected between emotions and postural deviations, further studies in this area are suggested.

To the best of our knowledge, one area that has never been studied is scoliosis represented by the angle of Tales and its relation with Beck depression. Perhaps idiopathic scoliosis, a problem that usually starts at a young age, may be linked to sadness and depression. This subject should be investigated in further studies.

Conclusion

The results of this study may be useful in clinical practice by helping to identify a patient's emotional state even without verbalization. The data also suggest a new aiding method for treating depression through postural correction, or vice versa.

Further studies should be conducted to map and trace postural changes related to emotional states and mood disorders.

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