

Low cost assessment of sagittal plane posture for everyday clinical use and screening during growth

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1 Introduction

Sagittal posture variations (hyperkyphosis, junctional kyphosis, etc) during growth are possible consequence-origin of pain. Apart from Scheuermann disease, that is a direct cause of back pain (BP) in childhood and adolescence, hyperkyphosis has been shown to be correlated with shoulder pain in adulthood. The relationship among posture and BP in adulthood is yet to be solved. While for scoliosis screening and everyday clinical follow-up some instruments have been validated, this is not true for sagittal posture assessment. In the literature plumbline distances have been used, but never validated.

2 Aim of the study

The aim of this paper is to verify their intra and inter-observer repeatability and propose a normative data set in the group ages at risk.

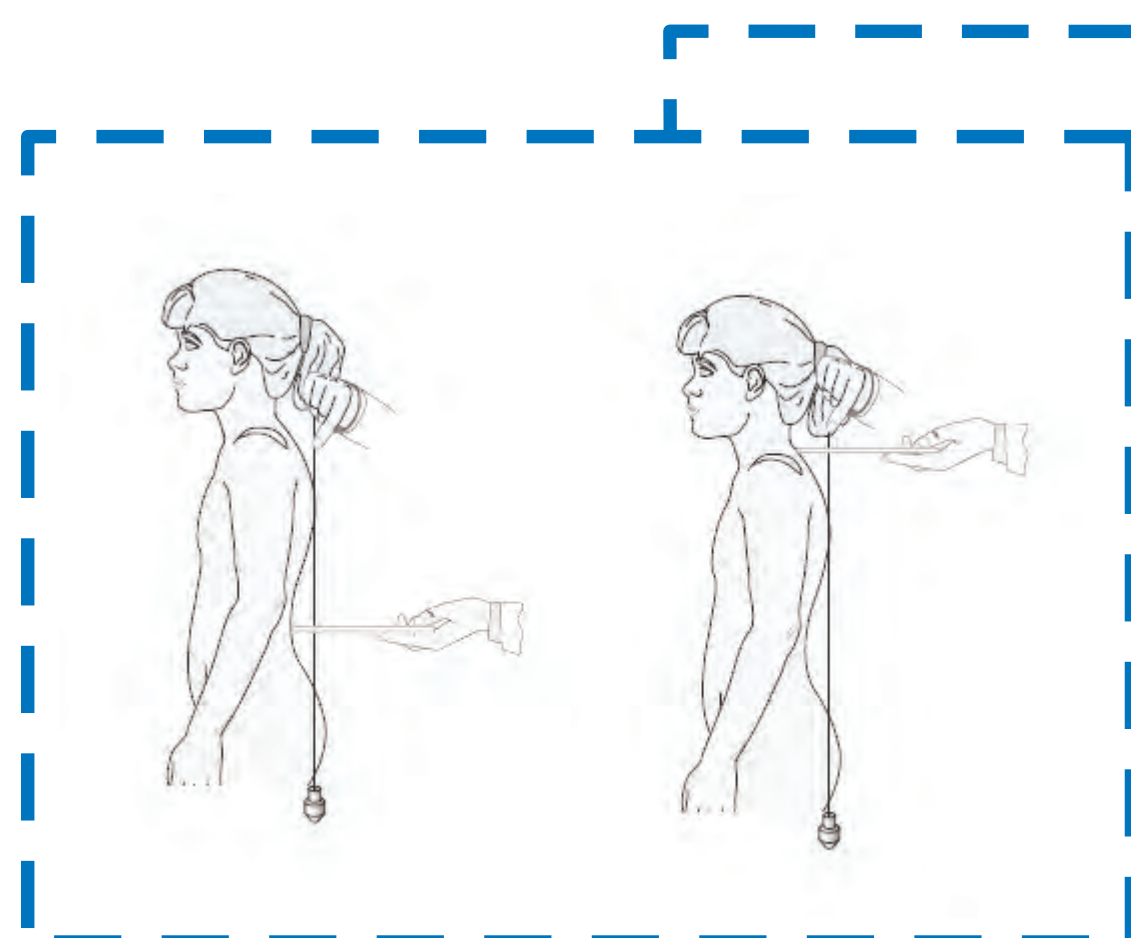
3 Methods

We evaluated in a relaxed, standing posture the following parameters:

- the plumbline distances from the apex of kyphosis of C7, T12 and L3
- the Sagittal Index (sum of C7 and L3 distances - sagittal shape of the spine)
- the Sagittal Ratio (C7/L3 - relationship between kyphosis and lordosis).

In a medical setting, 61 patients were consecutively evaluated for inter-observers and intra-observer variability (after 5 minutes): repeatability has been evaluated according to Bland and Altman.

Then in a community setting, 180 males in the age range 11-16 were evaluated to set the normal data according to 95% of the population.



4 Results

Intra and inter-observer repeatability have been obtained: values are quite high, but usable in everyday clinics in front of patients with big variations of posture.

The normality range for these parameters has been obtained in males and reported in the table.

	Repeatability		Normality range (males)
	Intra-observer	Inter-observer	
Plumbline distance apex of kyphosis - C7 (cm.)	0.9	1.7	1.5-5.5
Plumbline distance apex of kyphosis - D12 (cm.)	1.3	1.9	1.0-4.0
Plumbline distance apex of kyphosis - L3 (cm.)	1.2	2.2	2.8-7.0
Sagittal Index (cm.)	2.1	2.9	5.5-11.0
Sagittal Ratio	0.12	0.25	0.37-1.31

5 Discussion

Apart from radiographs (that are invasive), and inclinometers (that require specific equipments and training, as well as some calculations to be applied), we do not have any low cost screening tool, nor an everyday clinical instrument to evaluate sagittal posture.

Plumbline distances from the apex of kyphosis, widely used in Europe, have not been validated. Stagnara in the past proposed limits comparable to those we found (C7 2.0-5.0 - L3: 3.0-6.0). Until now we have obtained the normality parameters only in males, and not yet in females. Nevertheless we have to consider that sagittal posture diseases are more common in males.

According to our data, 1 cm. is the minimum clinically significant change for C7, 1.5 for T12 and L3, 2.1 for SI, and 0.12 for SR when measured by the same treating physicians.

Distances from the plumbline should be used cautiously in cases where sagittal curves are not harmonic, while if they are harmonic these parameters are correlated with spinal curvature, as it has been previously shown.

References

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