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Structured Light Surface Topography Of The Sagittal Spinal Curvatures - Cohort Studies

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Introduction

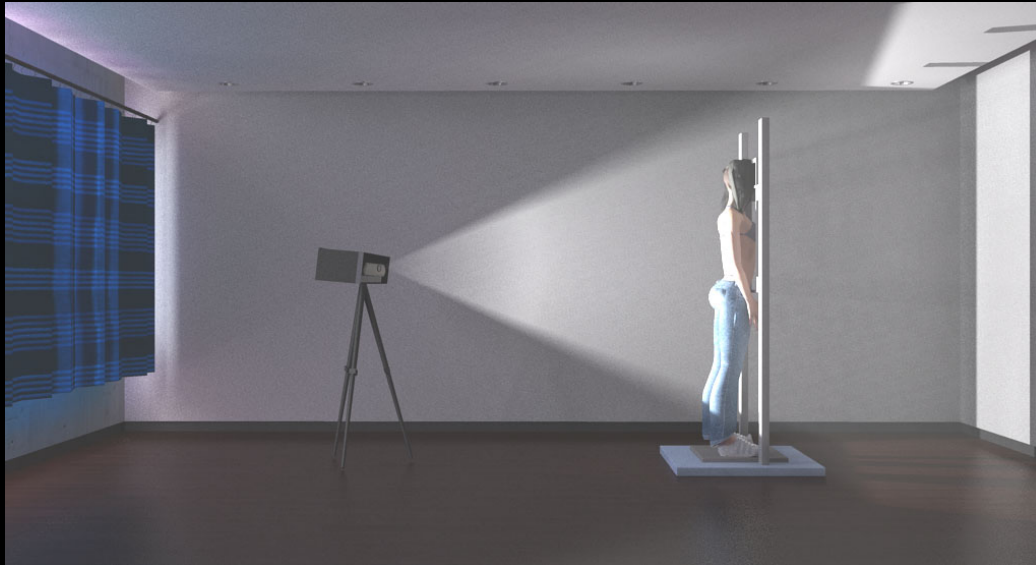
- The natural history of the spinal curvature in humans remain unknown.
- Noninvasive methodologies may facilitate clinical practice by monitoring trunk posture among patients with spinal deformities, including scoliosis, kyphosis and lordosis.
- These methods may contribute to a reduction in the use of radiographs to monitor the deformity progression.

Introduction & aim of the study

- Good reproducibility and the reliability of the rasterstereography for kyphotic and lordotic angles, trunk length, and trunk inclination measurements was determined.
- The aim of this study was to find a pattern of spinal curvatures changes during growth and its trends in the cohort population.

Methods

- This study was performed using a newly developed back surface topography measurement system, based on the structured light.
- The diagnostic device built in-house was used for posture and scoliosis screening (hardware and 3D Orthoscreen software).
- The LMS method was used to establish z-score values for kyphosis, lordosis in the sagittal plane.
- Subjects with the angle of trunk rotation (ATR) as high as 7 degrees or more were excluded from this analysis.

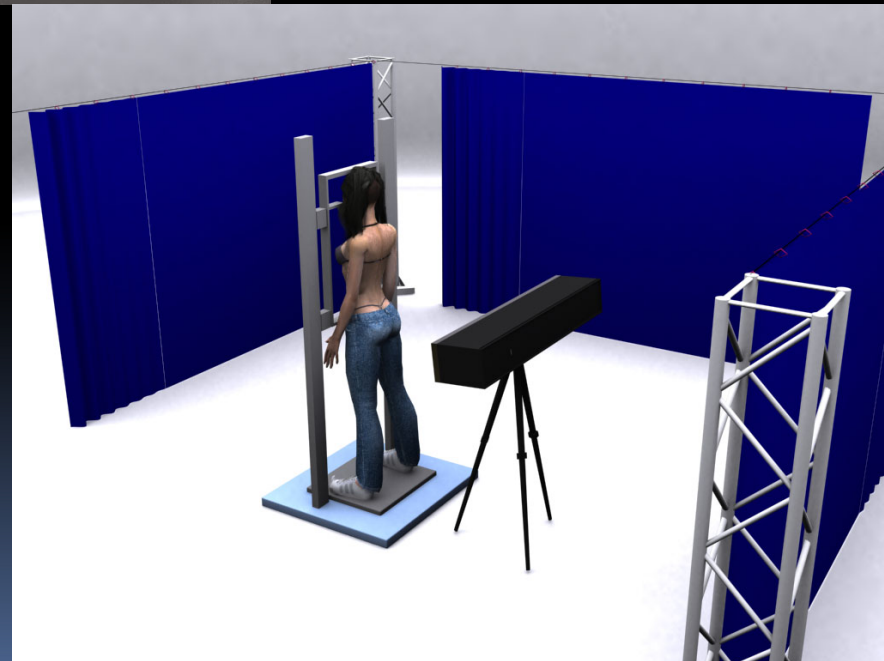


Parameters:

- time: up to 4s aquisition
- 1,2x1.2x1m³
- 1 mln dots
- 100 / day

Measurement System

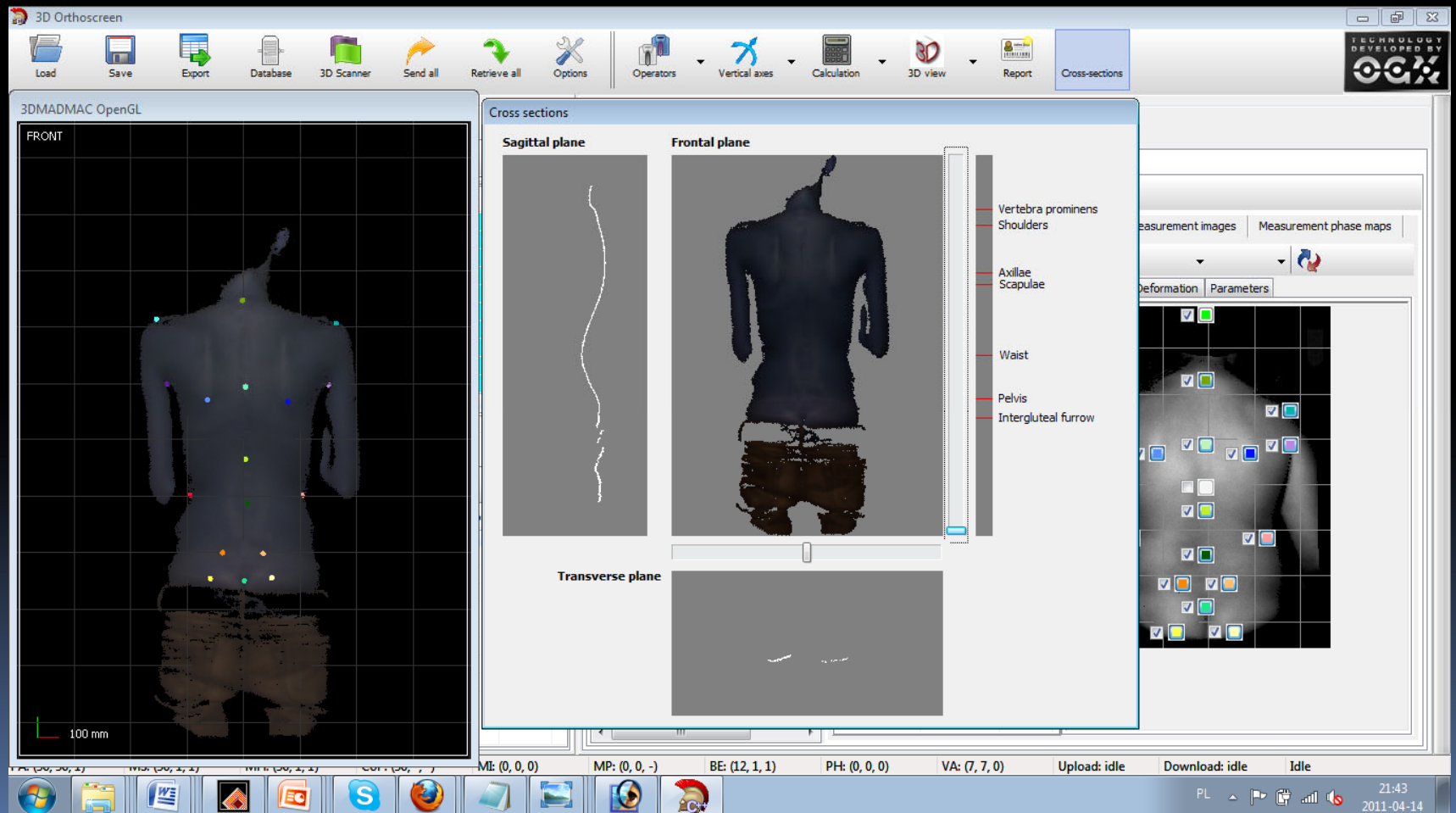
Uni-directional system



Material

- A group of 7972 children out of 9151 primarily examined (4042 girls and 3930 boys) remained valid.
- LMS Chartmaker version 2.54 was used to perform the analysis.
- A program calculating age-related reference centiles using LMS method allows to fit smooth centile curves to reference data using the LMS method.

Screenshot of the 3D Orthoscreen during the assessment of the subject without faulty posture



Results

- The mean kyphosis in girls was $11,27^{\circ}$ and $10,34^{\circ}$ in boys.
- Significant differences of median values of kyphosis angles for age groups between boys and girls were found at the age of 7, 9, 10, and 16 years.
- The mean lordosis in girls was $33,25^{\circ}$ and $30,35^{\circ}$ in boys with significant median values for age groups at all ages.
- Associations were found for kyphosis and lordosis angle in the groups of boys and girls in relation to the age.

Results

- Generalized linear model (GLM) was used. It confirmed the need for the creation of a percentile net for age and sex groups.
- The z-scores for surface topography measurements were calculated.
- The best-fitted model was found for L, M, S parameters.
- Similarly as it was seen in sex groups, the distribution of the values of z-score for variables that approximated to normal.
- Mean values, SD, Median value and the ranges determined by SD values from $-3SD$ to $+3SD$.

Conclusions

- The average kyphosis angle was found as low as $10-11^{\circ}$ and lordosis angle $30-33^{\circ}$.
- That presents a tremendous difference to the results presented previously in the literature for similar age group.
- The LMS models allow to draw the percentiles of spinal curvature in non-scoliotic cases.

References

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