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Global postural re-education in idiopathic scoliosis: immediate effect of self-correction posture on curve reduction

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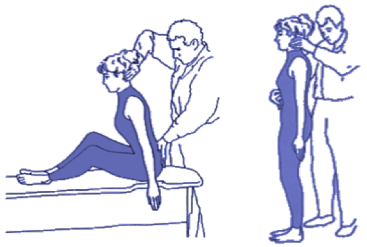
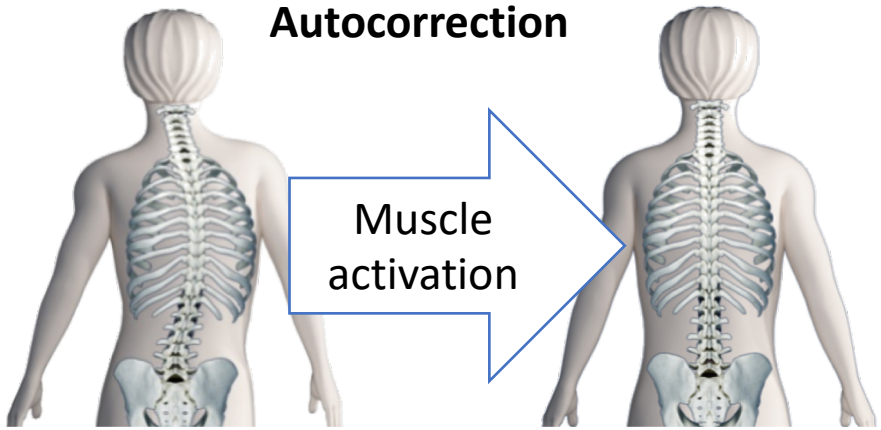
Introduction

- Idiopathic scoliosis (IS) causes trunk posture impairments affecting self-image/appearance, activity performance and quality of life and generates more chronic back pain in adolescents with IS (50-78%) compared to healthy adolescents (28-48%).
- Early and personalized physiotherapy specific exercises are recommended to improve trunk posture and avoid scoliosis progression[1].
- Global Postural Re-education (GPR) aims at improving posture, function and reduce back pain[2,3]. This approach consists of active stretching postures and motor control exercises to avoid scoliosis progression.
- Currently, there is a lack of evidence regarding the effect of GPR self-correction posture on scoliotic curve reduction.



Objectives

- To assess the immediate effect of GPR self-correction posture on scoliotic curves (Cobb angle)
- To develop a trunk stiffness index from simulations using a finite element modeling (FEM) approach.



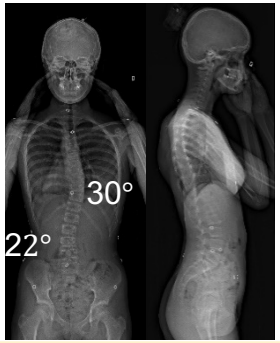
1. Negrini et al., SOSORT guidelines, Scoliosis Spinal Disord, 2016
2. Bonetti et al., BMC Musculoskel Disord, 2010
3. Pillastrini et al., Phys Ther, 2016

Methods

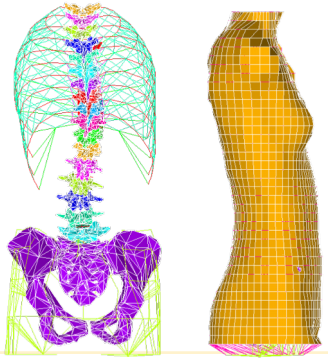
Participants: 16 adolescents (15 ♀, 1♂), 13.5 ± 1.3 y.o. with right thoracic IS: 33° ± 9° (11° - 45°)

Finite element modeling (FEM)

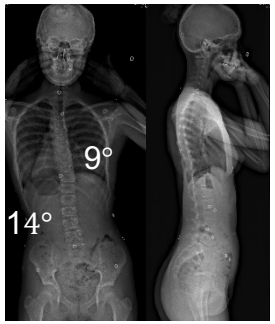
Reference posture



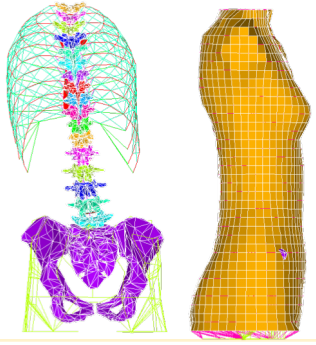
Patient's reference posture



Autocorrection posture

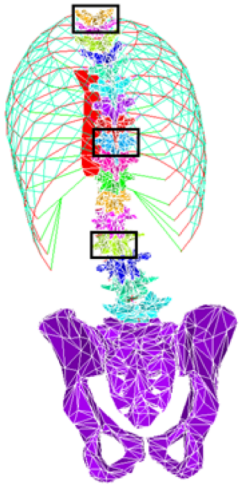


Patient in autocorrection

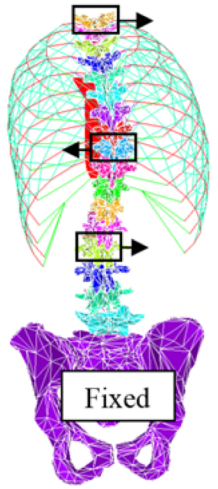


Simulation (FEM) of autocorrection (AutoC)

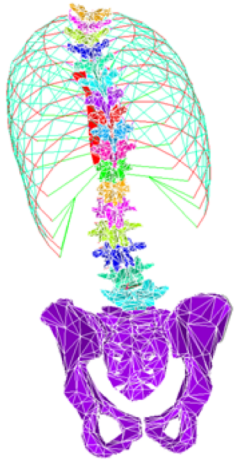
Preliminary step (Apex & T1 selection)



Simulation (Apex & T1 displacement)



Result



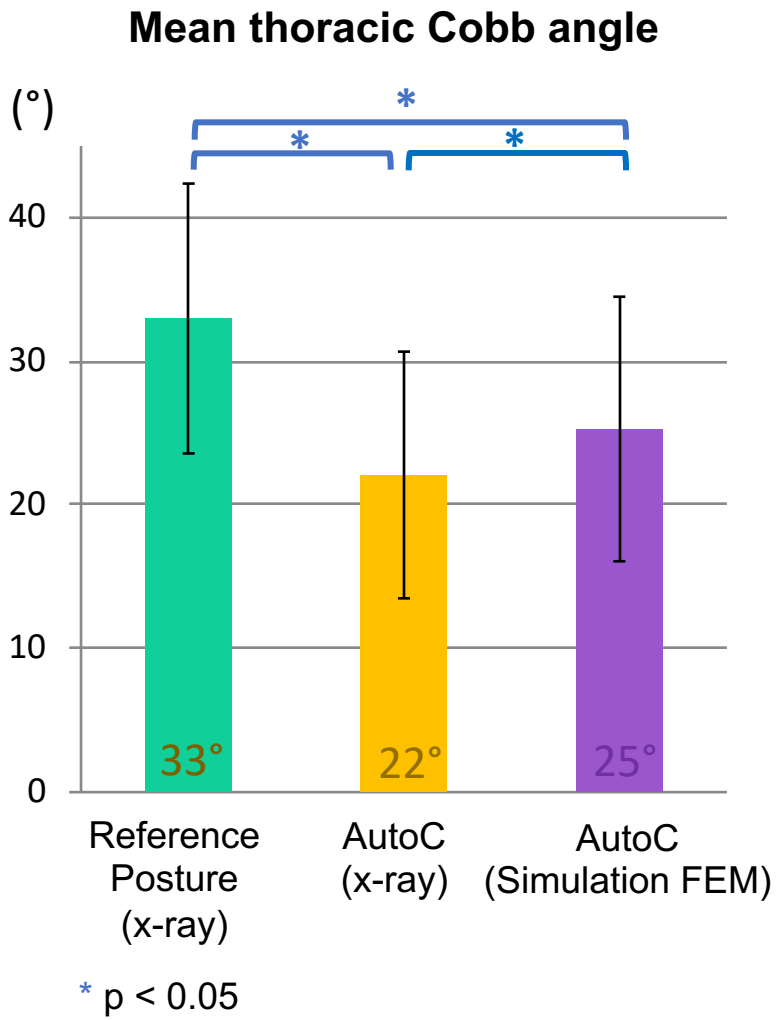
$$Trunk\ stiffness\ index = \frac{Reaction\ force}{\Delta\ Cobb\ angle}\left[\frac{N}{°}\right]$$

Statistical analyses:

ANOVA with Tukey post-hoc test (95% CI, $p < 0.05$): Cobb angle in frontal and sagittal planes

Correlation between AutoC x-ray and AutoC simulation: Pearson coefficient (r), $p < 0.05$

Results



Correlation between AutoC (x-ray) and AutoC (simulation) : r = 0.9

Thoracic frontal Cobb angle: mean ↘ 11° * (↘ 33%)

Lumbar frontal Cobb angle: no significant difference

Thoracic kyphosis: mean ↘ 6° *

Lumbar lordosis : mean ↘ 5° *

Vertebral rotation: ↘ from 11° to 7° on average

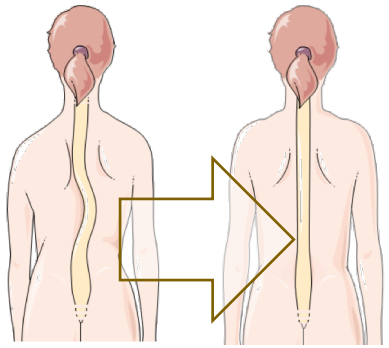
Mean reaction force at the thoracic apex: 45 N

$$Trunk\ stiffness\ index\ =$$

$$\frac{Reaction\ force}{\Delta\ Cobb\ angle}\left[\frac{N}{°}\right] : 0\ -21\ N/°$$

For more details see open access article: Dupuis et al., BMC Musculoskel Disord, 2018, 19:200

Conclusion



- GPR self-correction posture is effective to momentary reduce the scoliotic curve indicating patient's motor control ability for an immediate and momentary spine correction.
- Self-correction exercises should be added progressively to avoid negative posture compensations such as decrease of the thoracic kyphosis or coronal slit.
- Although simulation underestimated the correction, this study highlights the feasibility of using finite element modeling (FEM) to better understand the effect of self-correction exercises used in GPR.
- FEM allowed to quantify trunk stiffness index (the active resistance of the trunk) and may contribute to set personalized therapeutic objectives for posture correction.
- Further studies are required to determine long-term benefits of GPR on scoliosis.

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Our participants

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