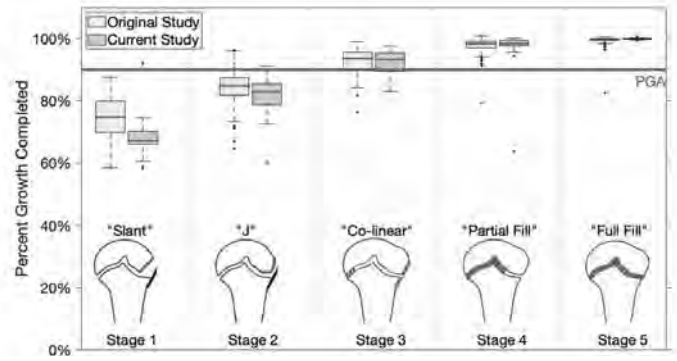
3 immediately followed PGA with 8% (+/-4.3) GR. Stage 4 and 5 had 3% (+/-7.3) and <1% (+/-0.2) GR, respectively. Compared to the study by the PHOS developers, there were 88% exact matches, 10% of the scores differed by 1 stage, and only 2% differed by 2 stages.

Conclusion
The PHOS generates reproducible results beyond the developers' use and reliably assesses skeletal maturity and remaining growth. The system can be adopted into practice with minimal training, because there are only a few, unique osteologic markers; furthermore, it can be retrospectively applied to radiographic assessments that lack a hand x-ray for Sanders staging.

Take Home Message
Measuring skeletal maturity using PHOS is now validated independently from the originating investigators and can easily be taught to individuals of varying training levels without prior experience with the system.



Current PHOS staging scores map similarly to the results published by the system developers, quantified as growth completed (current vs. final standing height). Learning was enhanced by associating stage feature names with key osteologic markers (red).

17. Idiopathic Scoliosis Cobb Angle Prediction from Clinical Measures: A Geometrical Study of a 7591 Subjects Cohort

Francesco Negrini, MD; Sabrina Donzelli, MD; Giulia Angela Antonella Rebagliati, MD; Francesca Di Felice, MD; Fabio Zaina, MD; Stefano Negrini, MD

Summary
We studied 5550 consecutive radiographed Idiopathic Scoliosis with ATR≥5° and 2041 radiographed uncontrolled youngsters with ATR<5°. Curves below 10°-20° were 10-44% for 5° ATR, and 5-31% for 7° ATR, respectively. A 7° threshold would miss 10% of patients >20° and 2% >30°; in the uncontrolled group these rates were 20% and 4%. Hump Height model performed better than ATR: when above 10 mm sensitivity was 75%, specificity 65% and area under the ROC curve 0.70.

Hypothesis
Combining the complementary measures of the prominence given by the Angle of Trunk Rotation (ATR - degrees) and the hump height (HH - mm) can predict expected Cobb degrees and consequently guide the radiographic prescription.

Design
Cross-sectional evaluation of 7591 consecutive first consultations of a tertiary level clinic specialized on spinal deformities.

Introduction
ATR and HH are complementary measures of the same Idiopathic Scoliosis (IS) prominence. The usual 7° ATR threshold for screening could lead to underdiagnose in a specialized conservative setting.

Methods
Inclusion criteria: age 4-18, IS, first consultation, x-rays within 3 months, no previous bracing. Study Group: 5550 consecutive patients with prescribed x-ray for ATR≥5° (22.8% males; age 12.7±2.5; 23.9±13.2°). Uncontrolled Group: 2041 pupils with ATR<5° who already had a radiograph. Subgroups: sex, curve location and age. We checked correlation between °Cobb and ATR, HH, their sum and the geometrical measures of the triangle identified by HH and ATR (hypotenuse inclination). We ran forward/backward stepwise regressions, and adjusted for the covariates age, familiarity, BMI, sex, menarche, aesthetics. A histogram, quantile plot and Akaike Index Criterion (AIC) were used to verify the models. The ROC curve was used for the best cut off to predict °Cobb.

Results
Curves below 10°-20° were 10-44% for 5° ATR, and 5-31% for 7° ATR, respectively. Using 7° instead of 5° would lead to miss 574 patients >20° and 135 >30°. In the <5° group we found 20% >20° and 4% >30°. We developed models for ATR, HH, SUM, and area since they correlated with ° Cobb (0.61-0.67; r2 0.38-0.45). They all performed well, with HH the best. The covariates didn't change the crude coefficient (Table). When HH is above 10, it is 0.17 more likely to find a curve exceeding 20 Cobb degrees (CI95% OR 0.17-0.18). The area under the ROC curve was 0.70, with 75% sensitivity, 65% specificity, 61% positive and 78% negative predictive values.

Conclusion
In a tertiary level institute, a 5° ATR threshold is better than 7° to identify conservative patients. ATR, HH and Sum are good predictors of the expected Cobb angle at X-rays.

Take Home Message
In a specialised setting using 7° instead of 5° ATR for radiograph

*Hibbs Award Nominee for Best Basic Research Paper †Hibbs Award Nominee for Clinical Research Paper

prescriptions lead to miss 10% patients >20° and 2.5% >30°. Hump Height allows better prediction (cut-off 10 mm).

Cobb prediction		Crude coef. (95% CI)	p value
ATR		0.17(0.17-0.18)	<0.001
	Adjusted	0.17(0.17-0.18)	<0.001
	Age (years)	0.07(0.04-0.11)	<0.001
	BMI	-0.11(-0.14—0.09)	<0.001
	Asimmetry	0.36(0.16-0.56)	<0.001
HH		0.33 (0.32-0.34)	<0.001
	Adjusted	0.33 (0.32-0.34)	<0.001
	Age(years)	0.22(0.16-0.28)	<0.001
	BMI	-0.16(-0.20—0.11)	<0.001
	Sex	-0.45(-0.78—0.13)	0.007
SUM		0.50(0.48-0.51)	<0.001
	Adjusted	0.51(0.49-0.52)	<0.001
	Age(years)	0.30(0.21-0.38)	<0.001
	BMI	-0.28(-0.35—0.21)	<0.001
	Sex	-0.51(-1.00—0.03)	0.039
Area		17.36(16.77-17.95)	<0.001
	Adjusted	17.60(16.92-18.29)	<0.001
	Age(years)	14.53(16.93-18.08)	<0.001
	BMI	-6.60(-9.47—3.73)	<0.001
	Sex	-38.65(-58.75—18.55)	<0.001
	Asimmetry	-21.57(-43.11—0.03)	0.05

Models developed and effect on the covariates. ATR: angle of trunk rotation; HH: Hump Height; SUM: sum of HH and ATR; area: area of the triangle described by ATR and HH

18. Dynamic Spinal Posture Changes 2 Years After Posterior Spinal Fusion for Adolescent Idiopathic Scoliosis Patients

Sebastien Pesenti, MD, PhD; Solène Prost, MD; Guillaume Authier; Elke Viehweger, MD, PhD; Benjamin Blondel, MD, PhD; Jean-Luc Jouve, MD

Summary
Changes in spine biomechanics were assessed using gait analysis in 24 AIS patients with a 2-year minimum follow-up. Posterior spinal fusion allowed for restoration of a normal gait pattern, especially in the transverse plane.

Hypothesis
Spinal deformity correction affects dynamic posture in adolescent idiopathic scoliosis (AIS) patients

Design
Prospective study

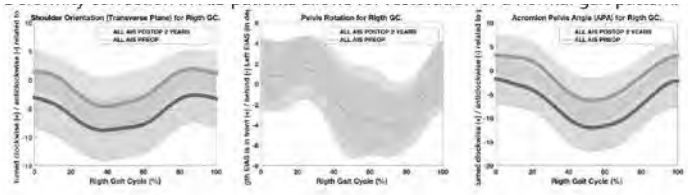
Introduction
AIS is known to alter postural control. However, the effect of spinal deformity correction on dynamic posture remains unclear. Using gait analysis, it is possible to determine changes in spine kinematics induced by spinal deformity correction.

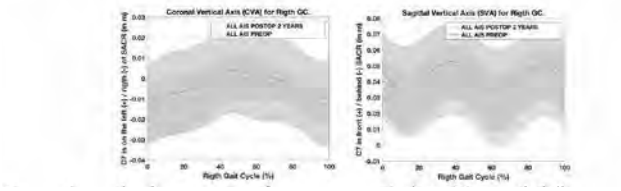
Methods
24 consecutive AIS patients planned for surgical correction were prospectively enrolled in this study. The day before surgery and at 2-year follow-up, AP and lateral x-rays and gait analysis were performed. Dynamic parameters evaluated were: shoulders line orientation, pelvis orientation, acromion-pelvis angle (APA), coronal and sagittal vertical axis (CVA, SVA).

Results
Average follow-up was 31 months and mean age at surgery was 16 yo. Main Cobb angle improved from 53° to 23° at last follow-up (p<0.01). At 2-year follow-up, there was an improvement of shoulders line orientation (-6° vs -2°, p<0.01), pelvic orientation (-1.5° vs 0°, p=0.04) and APA (-7° vs -2°, p<0.01). Global spinal balance remained unchanged between preoperative and 2Y assessment. UIV and LIV position did not influence spinal biomechanics.

Conclusion
This is the largest series of gait analysis in AIS patients at 2-year follow-up. Our results show that posterior spinal fusion allows for restoration of normal gait pattern, especially in the transversal plane. Interestingly, UIV and LIV did not influence dynamic spinal balance, but larger series are warranted in order to shed light on this particular point.

Take Home Message
Deformity correction in AIS patients allows for restoration of a normal gait pattern.





Comparison of gait parameters from preoperatively to 31-month follow-up. Shoulders line and pelvic orientation became more symmetric. There was no change in coronal or sagittal spinal balance. Bold points indicate significant difference <0.01

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