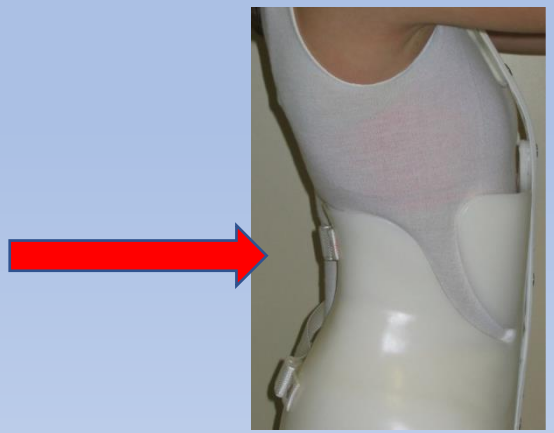
Thoracolumbar Lordotic Intervention (TLI) in braces as treatment for the frequent postural deviations kyphosis and scoliosis.



P.J.M. van Loon[1], A.M. Soeterbroek[2], J.A.Grotenhuis [3] and T.H. Smit[4]

[1] Orthopedic surgeon, Proktovar, Hengelo, the Netherlands;

[2] Analyst, Chairman of Posture Network Netherlands, the Netherlands

[3] Em. Prof. of Neurosurgery Radboud University Nijmegen, the Netherlands;

[4] Professor of Tissue Engineering; Mechanobiology of development and disease; Amsterdam

UMC, the Netherlands

Authors

Piet JM van Loon

- Orthopedic and spine surgeon since 1989
- Founder Dutch Spine Society
- Cofounder Posture Network
- Inventor TLI bracing technique and Zami active sitting

Prof. Andre JA Grotenhuis

- Neurosurgeon RadboudUMC Nijmegen
- expert spinal cord malformations, CSF circulation disorders and endoscopic neurosurgery.

Andre M Soeterbroek

- Chairman Posture Network. Analist and translator science to common sense

Prof. Theo Smit

- Professor of Tissue Engineering; Mechanobiology of development and disease; UMC Amsterdam

Houding Netwerk Nederland

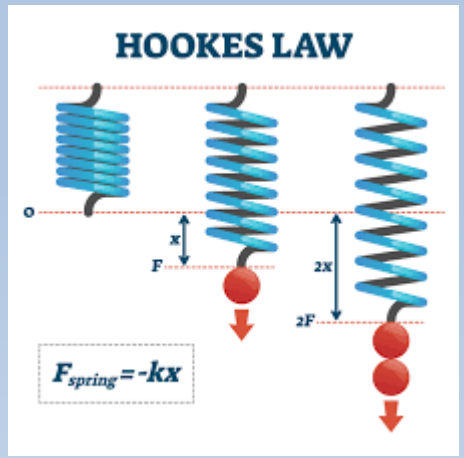
Radboudumc university medical center

Houding Netwerk Nederland

Amsterdam UMC

TLI-bracing started by serendipity in 2000: extension in lordosis in Scheuermann and scoliosis works!

Scientific proof by “reversed engineering”

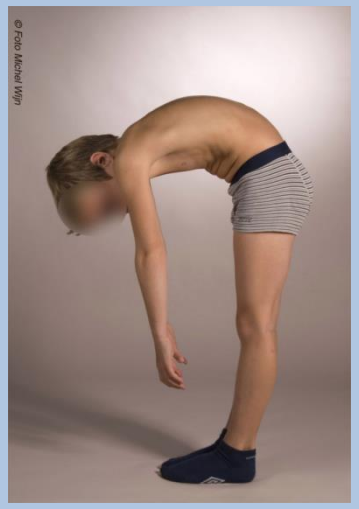


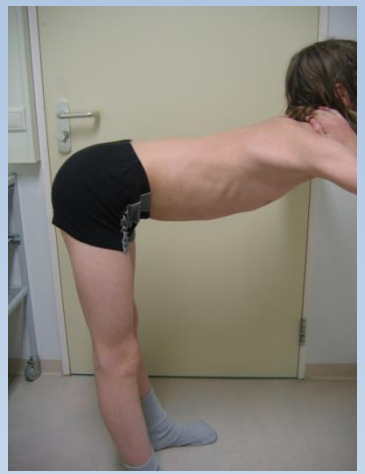
Roth: “A short cord can cause scoliosis”

Roth made connection between the basic Natural Laws of Hooke and the deepest biological knowledge on growth in Nature: posture is a matter of tension regulation

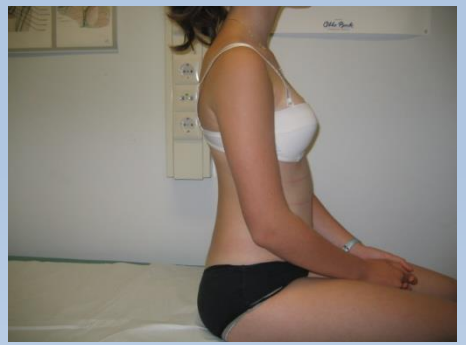
Testing on tension

Bending





Sitting

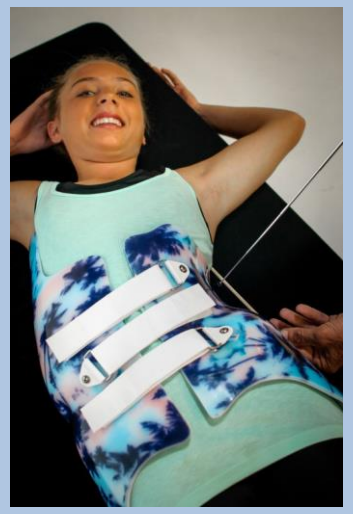


Supine

Tension disappears with proper extension exercises and in TLI bracing

TLI bracing: Opposition to Dickson's Axiom on causes : No lordosis allowed!(???)

- Boston and Cheneau based on this axiom: Lordosis is "dangerous" and it must be counteracted in bracing by bringing the thoracic spine in kyphosis.



- I started to doubt this , also by dissatisfaction with own results with Boston braces

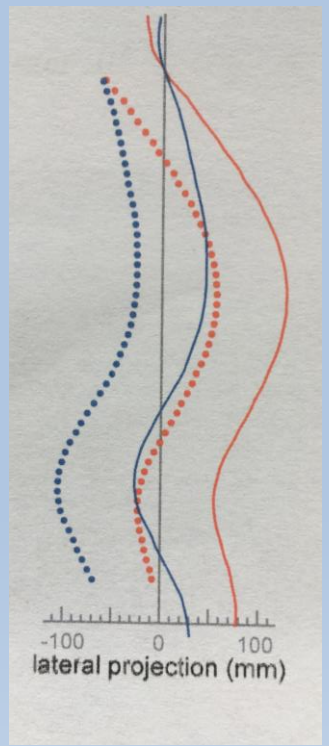
Own observations in examination and at surgery

- Scoliosis shows neuromusculair thightness (as Scheuermann does)
- Finger floor distance is greater during progression of scoliosis (as in kyphosis)
- Thoracolumbar joint is contracted (as in kyphosis)
- Thoracolumbar is spine is kyphotic on X ray (in both)
- Central cord/ roots very thight in canal at osteotomies and visible on MRI (in both)

No support from SRS
or American textbooks:

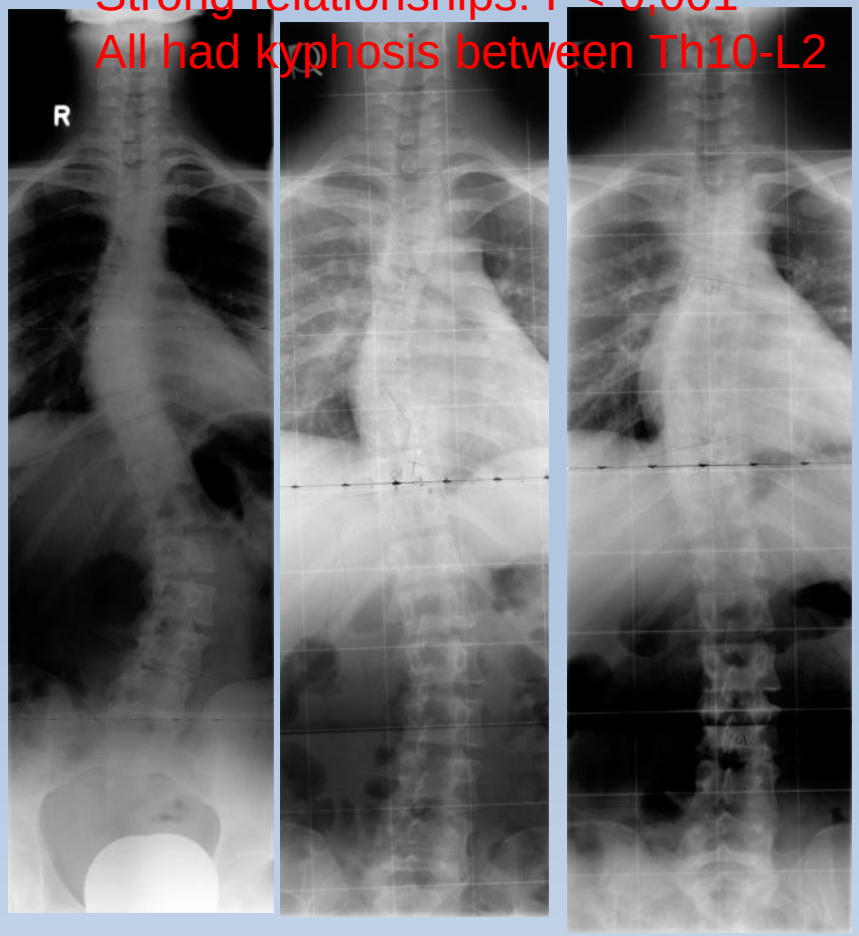
It's idiopathic, you stupid!

Progressive passive correction possible because of progressive active extension

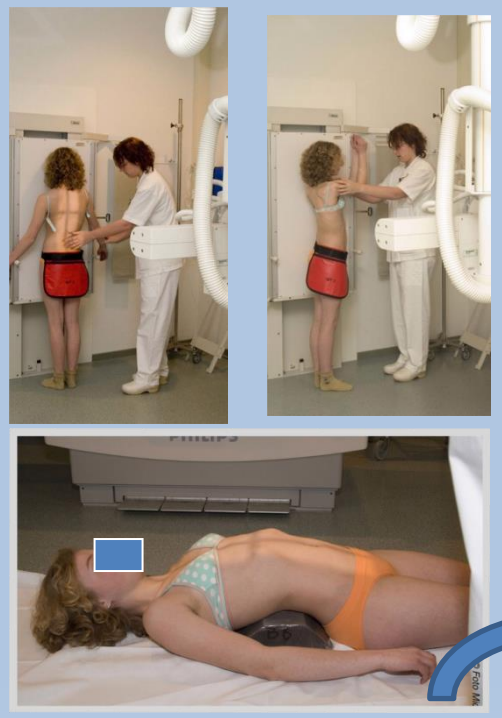


Spine 2008: Scientific proof of action in TLI

40 children with double major scoliosis
Strong relationships: P< 0,001
All had kyphosis between Th10-L2

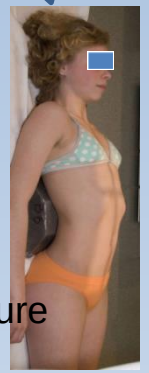


standing supine on fulcrum



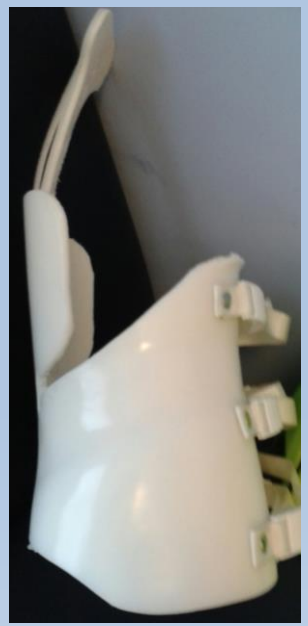
SPINE Volume 33, Number 7, pp 797–801

Forced lordosis on the thoracolumbar junction can correct frontal plane deformities

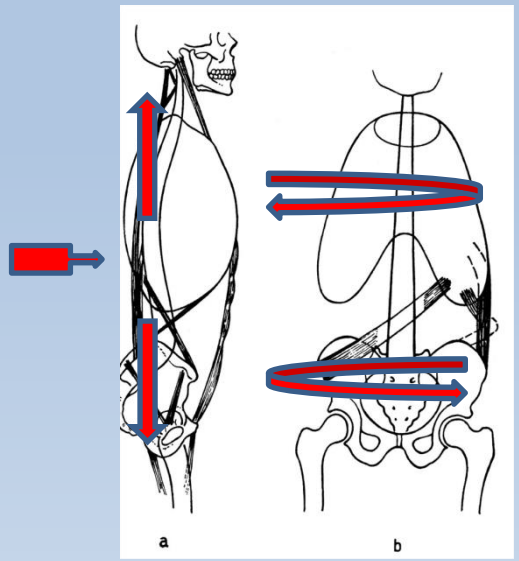


TLI gives an immediate optimisation of the posture

Confirming support China

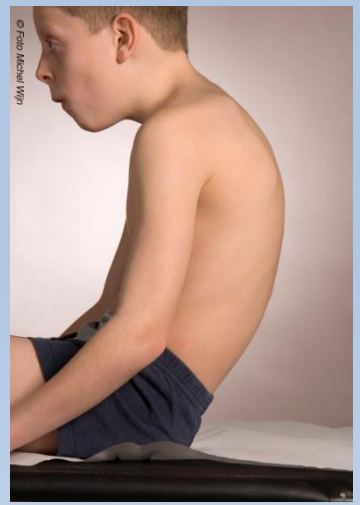


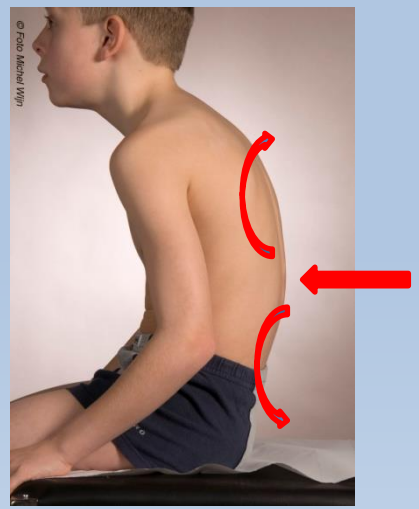
- SPINE Volume 35, Number 23, pp E1334–E1338
- **An Increased Kyphosis of the Thoracolumbar Junction is Correlated to More Axial Vertebral Rotation in Thoracolumbar/Lumbar Adolescent Idiopathic Scoliosis**
- Haijian Ni, Jin Xu, RN, and Ming Li, MD Shanghai, China



On this background of TLI we formulated and tested a congruent treatment concept:

- Pure focus on TL joint
- Symmetrical application of forces
- Extension, extension, extension (Klapp, Schroth, Heilgymnastik, yoga, Pilates etc.)
- Freedom in movement, but avoids flexed posture
- Promotes active sitting





Results

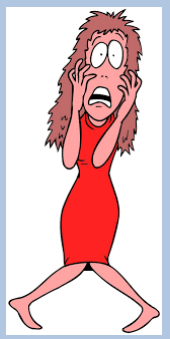
van Loon et al. Scoliosis 2012, 7:19
http://www.scoliosisjournal.com/content/7/1/19

A new brace treatment similar for adolescent scoliosis and kyphosis based on restoration of thoracolumbar lordosis. Radiological and subjective clinical results after at least one year of treatment
Piet JM van Loon, Monique Roukens, Joop DJ Kuit and Frederik BTM Thunnissen

91 children.
Prospective. Consecutive. At least 1,5 year wearing time
2 groupes:
- A: scoliosis at least 25º Cobb angle
- B: kyphosis with no or minor scoliosis

Results. Progression is > 5 degrees Cobb

Curve localisation	Pair	Group B Kyphosis +/- Scoliosis <25° n mean ± SD p value	**Progression rate** n (%)	Group A Scoliosis ≥25° n mean ± SD p value	**Progression rate** n (%)
Thoracic right	$T0^{OB\_IB}$	7 1.6 ± 6.6 0.55		29 6.7 ± 1.2 <0.001	
	$T0^{OB}$-T1	5 -1.8 ± 3.8 0.35	0 (0%)	28 8.9 ± 1.7 0.38	6 (21%)
Lumbar left	$T0^{OB\_IB}$	4 7.3 ± 6.8 0.12		6 8.0 ± 3.2 0.045	
	$T0^{OB}$-T1	3 5.0 ± 2.0 0.049	0 (0%)	6 7.2 ± 2.9 0.53	1 (20%)
Thoracolumbar left	$T0^{OB\_IB}$	9 7.8 ± 6.1 0.005		26 9.0 ± 6.3 <0.001	
	$T0^{OB}$-T1	8 1.8 ± 6.7 0.49	1 (12%)	24 0.92 ± 4.8 .36	1 (4.2%)
Pelvic obliquity	$T0^{OB-IB}$	4 6.5 ± 2.1 0.008		25 3.1 ± 4.1 0.001	
	$T0^{OB}$-T1	7 2.8 ± 4.2 0.12	0 (0%)	23 1.1 ± 4.9 0.24	1 (4.3%)
Thoracic sagittal	$T0^{OB\_IB}$	40 13.3 ± 8.9 <0.001		21 8.2 ± 7.8 <0.001	
	$T0^{OB}$-T1	6 15.7 ± 6.2 0.002	0 (0%)	14 9.6 ± 10.0 0.008	0 (0%)
Thoracolumbar sagittal	$T0^{OB\_IB}$	43 7.0 ± 7.1 <0.001		26 6.0 ± 6.7 <0.001	
	$T0^{OB}$-T1	10 7.4 ± 6.9 0.008	0 (0%)	20 7.6 ± 6.6 <0.001	0 (0%)
Lumbar sagittal	$T0^{OB\_IB}$	38 8.7 ± 2.7 <0.001		21 6.7 ± 7.7 <0.001	
	$T0^{OB}$-T1	6 10.3± 13.6 0.13	0 (0%)	14 2.3 ± 7.1 0.29	3 (21%)
Pelvic incidence	$T0^{OB-IB}$	36 6.8 ± 6.3 <0.001		21 5.8 ± 6.2 0.001	
	$T0^{OB}$-T1	6 9.3 ± 9.8 0.07	0 (0%)	14 5.0 ± 6.3 0.011	0 (0%)
Sacral inclination	$T0^{OB-IB}$	36 2.6 ± 5.9 0.01		2 1.7 ± 4.6 0.001	
	$T0^{OB}$-T1	6 2.2 ± 6.8 0.47	(0%)	14 -1.1 ± 4.9 0.41	2 (14%



Scoliosis curves: progression in TLI

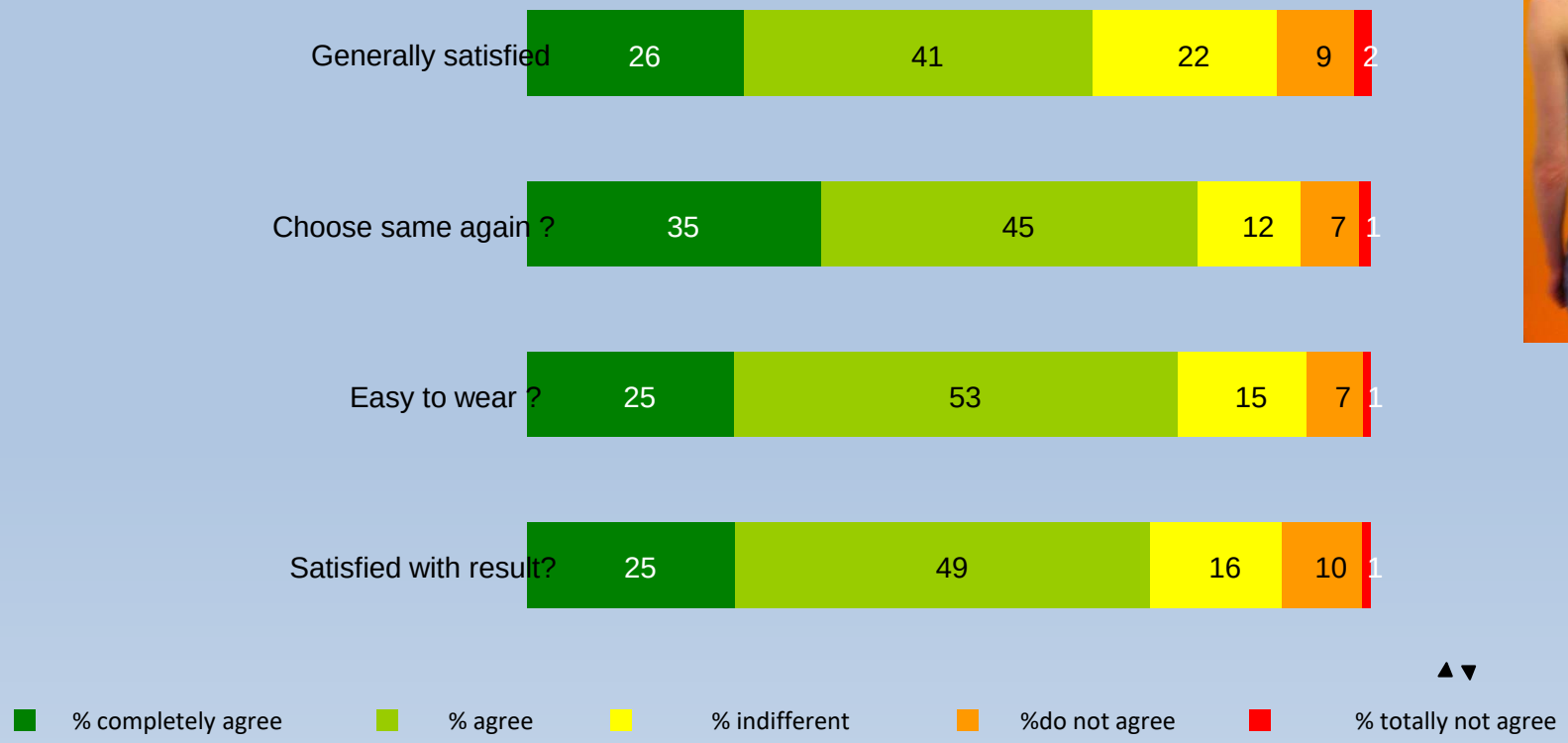
Curve localisation	Pair	Group B Kyphosis +/- Scoliosis <25° n mean±SD p value	**Progression rate** n (%)	Group A Scoliosis ≥25° n mean±SD p value	**Progression rate** n (%)
Thoracic right	$T0^{DB-IB}$	7 1.6±6.6 0.55		29 6.7± 1.2 <0.001	
	$T0^{DB}$-T1	5 -1.8± 3.8 0.35	0 (0%)	28 8.9± 1.7 0.38	6 (21%)
Lumbar left	$T0^{DB-IB}$	4 7.3± 6.8 0.12		6 8.0± 3.2 0.045	
	$T0^{DB}$-T1	3 5.0± 2.0 0.049	0 (0%)	6 7.2± 2.9 0.53	1 (20%)
Thoracolumbar left	$T0^{DB-IB}$	9 7.8± 6.1 0.005		26 9.0± 6.3 <0.001	
	$T0^{DB}$-T1	8 1.8±6.7 0.49	1 (12%)	24 0.92± 4.8 .36	1 (4.2%)

Why at's different in TLI bracing in relation to other TLSO?

- No direct pressure on bony structures only on muscle bellies to get autocorrection by forcing the "cables"(muscle, fascie and tendons) in a compound pulley system
- Always symmetric forces in any indication
- Gently forces the total body in time to autocorrect the deformity (reversing Volkmann-Hueter principle)
- Focus on events in sagital plane
- Simple and efficient technique for orthotists

Characteristics / Technique	Based on Coronal 3 point forces	Directed at sagittal contour	Symmetric forces	Dynamic action required	Based on moulds or scans	Static /rigid in all Parts of TL spine	Meantime adaptations to enhance correction	Other Indications Kyphosis
CTLSO (Milwaukee type)	+	-	-	-	+/-	++	-	+
TLSO (Boston type)	++	+/-	-	-	-	+	-	-
TLSO (Cheneau type)	++	+/-	-	-	+	+	-	-
TLI	-	++	+	+	+	-	++	++
Dynamic (Spine-cor)	-	-	-	++	-	-	+	-
TriaC	+/-	-	-	+	-	-	-	-
Physio-Logic	+	+	+	-	-	-	-	-
Night time overcorrection brace	++	-	-	-	-	+	-	-

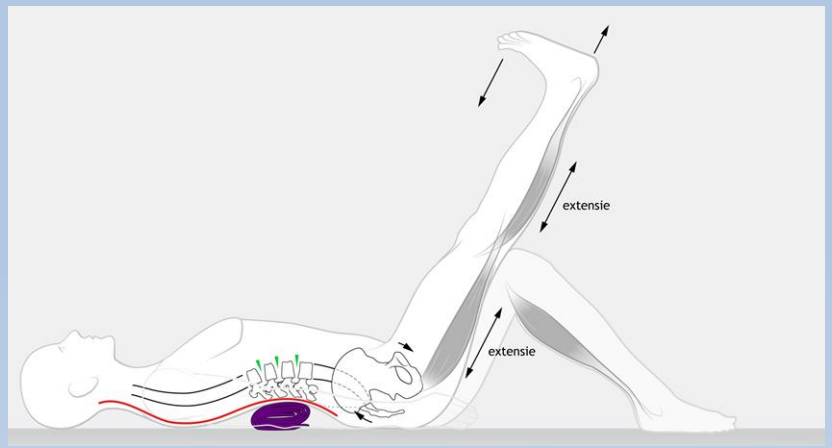
Results published in Scoliosis Journal 2012
Customer satisfaction and compliance

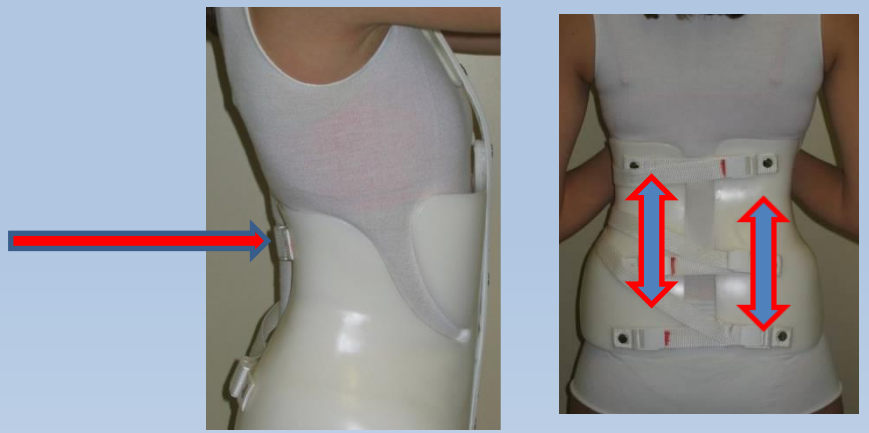


TLI concept

EXCERSISE

DYNAMIC BRACING



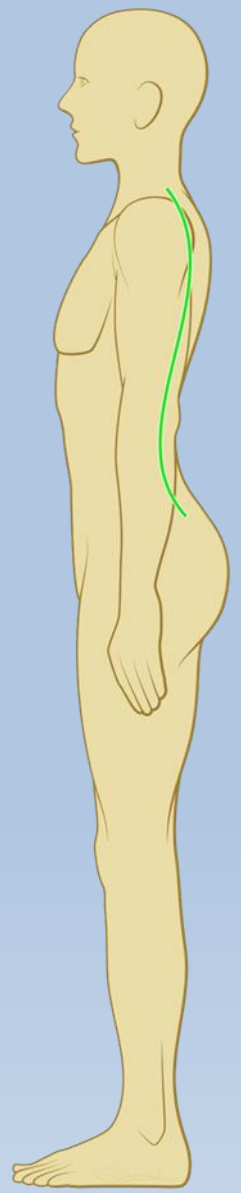


Conclusions on TLI bracing

- Based on indisputable knowledge on growth and tension (Roth).
- Lordotic intervention on the thoracolumbar joint **restores physiologic features TL joint**
- TLI is a **dynamic** treatment , augmented by exercises
- **Good compliance**: the child loves to get a natural posture
- TLI **remodels the integrated body** , not an X-ray. The muscles do the work, if they are replaced in the midline
- **Simple** technique for all deformities in growth

- Results: **Correction is lasting** and statistically significant;

THANKS!THANKS !



Houding Netwerk Nederland