Reference

Fantini Pagani, C. H., Willwacher, S., Benker, R., Brüggemann, G.-P.

German Sport University Cologne, Germany.

Effect of an ankle-foot orthosis on knee joint mechanics: A novel conservative treatment for knee osteoarthritis

Prosthet Orthot Int. 2013; 38 (6): 481-491.

DOI: 10.1177/0309364613513297.

Products

Agilium Freestep

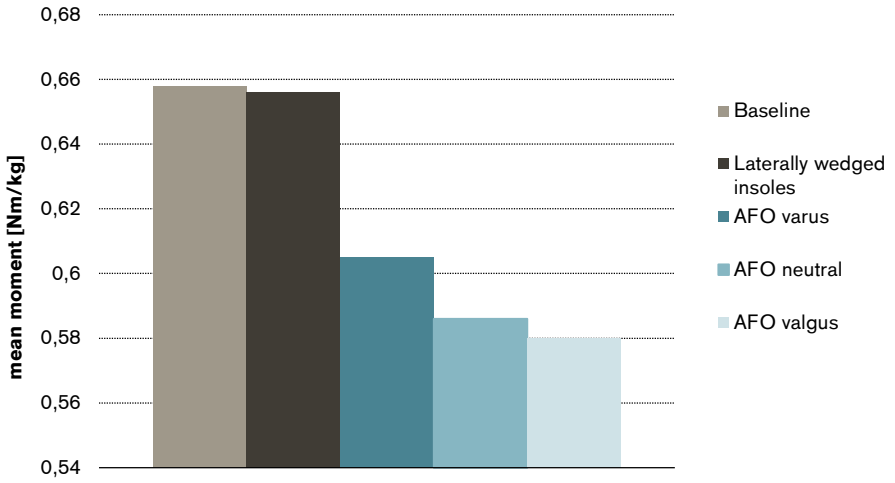
Major Findings

With Agilium Freestep:

→ Static measurements
→ knee lever arm in the frontal plane decreased
→ knee angle in the frontal plane decreased

→ Dynamic measurements
→ knee adduction moment decreased
→ knee adduction angular impulse decreased

Knee adduction moment (KAM, first peak)

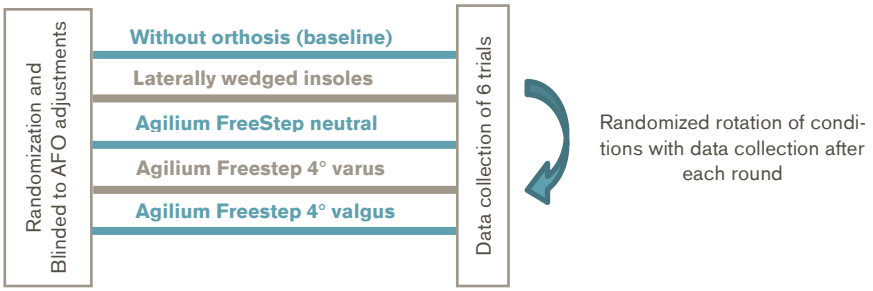


Population

Subjects:	14 healthy subjects
Mean age:	24.0 ± 4.8 years
Gender:	all male
Inclusion criteria:	- varus knee alignment - absence of pain - no previous injuries of the lower extremity - at least 50mm intercondylar distance

Study Design

Controlled laboratory study, repeated measurements, randomized, blinded:



Results

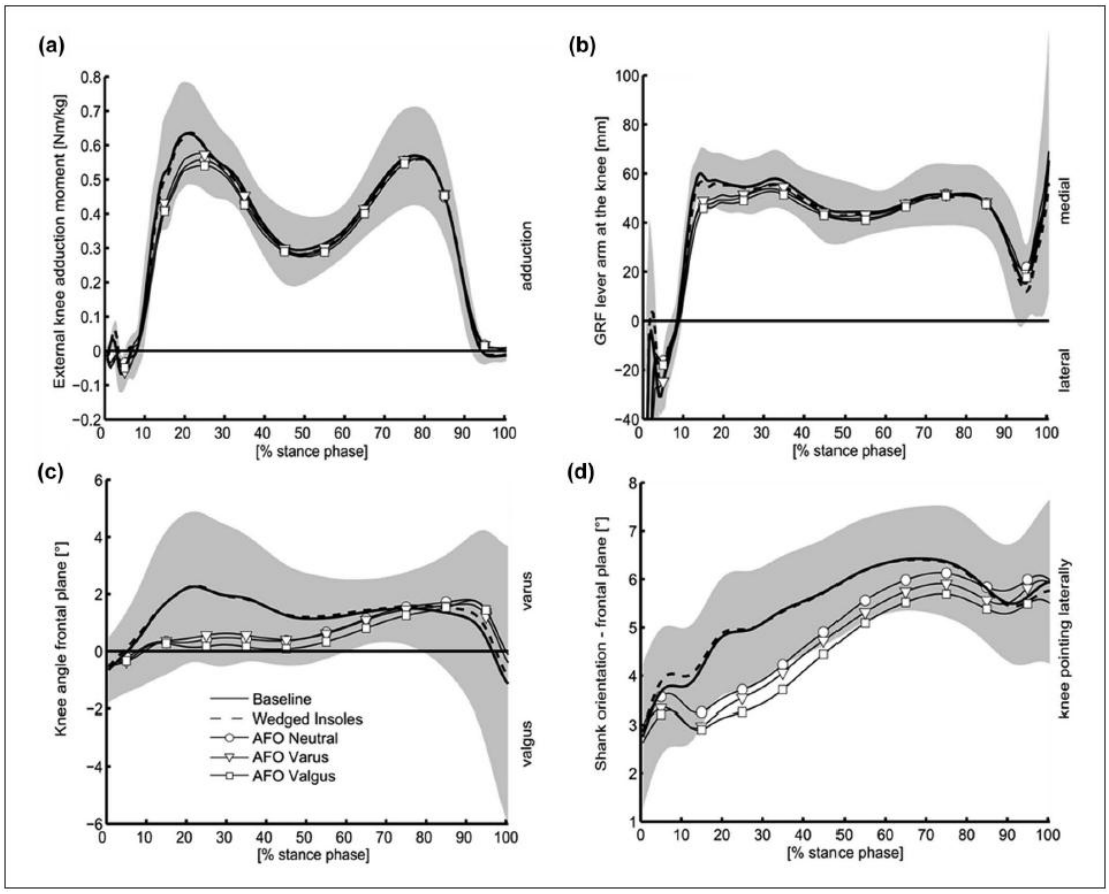
Functions and Activities | Participation

Biomechanics – Static measures | Biomechanics – Gait analysis | X-Ray | EMG | Functional tests | Clinical effects | Satisfaction

Category	Outcomes	Results for Agilium Freestep compared to condition "without orthosis"	Sig.*
Biomechanics – Static measure	Knee lever arm in the frontal plane (knee lever arm = distance between knee joint center to the vector of the ground reaction force (GRF))		
	Laterally wedged insoles	No difference (from 59.37 to 58.26 mm)	0
	Orthosis neutral	Decrease 9% (from 59.37 to 54.15 mm)	**++**, †
	Orthosis varus	Decrease of 7% (from 59.37 to 55.37 mm)	**++**
	Orthosis valgus	Decrease of 10% (from 59.37 to 53.26 mm)	**++**, †
	Knee angle in the frontal plane		
	Laterally wedged insoles	(from 2.24° to 2.26°)	0
	Orthosis neutral	(from 2.24° to 0.49°)	**++**, †
	Orthosis varus	(from 2.24° to 0.59°)	**++**, †
	Orthosis valgus	(from 2.24° to 0.34°)	**++**, †
	The knee angle in the frontal plane decreases significantly with AFO, indicating a change from varus to a valgus position		
Biomechanics – Gait analysis	Knee adduction moment (KAM, first peak)		
	Laterally wedged insoles	No difference (from 0.658 to 0.656 Nm/kg)	0
	Orthosis neutral	Decrease of 11% (from 0. 658 to 0.586 Nm/kg)	**++**, †
	Orthosis varus	Decrease of 8% (from 0. 658 to 0.605 Nm/kg)	**++**, †
	Orthosis valgus	Decrease of 12% (from 0. 658 to 0.580 Nm/kg)	**++**, †

Category	Outcomes	Results for Agilium Freestep compared to condition "without orthosis"	Sig.*
	Knee adduction angular impulse		
	Laterally wedged insoles	No difference (from 0.245 to 0.241 Nm s /kg)	0
	Orthosis neutral	Decrease of 5% (from 0.245 to 0.232 Nm s /kg)	++
	Orthosis varus	Decrease of 3% (from 0.245 to 0.237 Nm s /kg)	++, ‡
	Orthosis valgus	Decrease of 7% (from 0.245 to 0.227 Nm s /kg)	++, †

* no difference (0), positive trend (+), negative trend (–), significant to baseline condition (++), significant to wedges condition (†), significant to valgus condition (‡), not applicable (n.a.)



Mean curves of (a) knee adduction moment, (b) knee lever arm, (c) knee angle and (d) tibia rotation in the frontal plane normalized through the stance phase for all subjects during the different test conditions. The shaded area indicates ±SD of the baseline condition.

Author's Conclusion

"In summary, a significant decrease in the KAM could be observed in subjects with knee varus alignment while using an AFO in different adjustments (4° valgus, neutral, and 4° varus). The orthosis was effective in changing the knee joint alignment and the knee joint lever arm in the frontal plane. Long-term effects on the KAM, symptoms, joint function, and compliance in patients with medial knee OA should be investigated in future studies. The use of AFOs designed to change the tibia position and thereby the knee joint alignment in the frontal plane could represent an alternative for conservative treatment of knee OA." (Fantini Pagani et al. 2013)