

Reference

Fantini Pagani CH, Potthast W, Brüggemann G-P.

Institute of Biomechanics and Orthopaedics, German Sport University Cologne, Germany.

The effect of valgus bracing on the knee adduction moment during gait and running in male subjects with varus alignment

Clinical Biomechanics 2010; 25:70-76.

Products

Genu Arthro

Major Findings

With Genu Arthro:

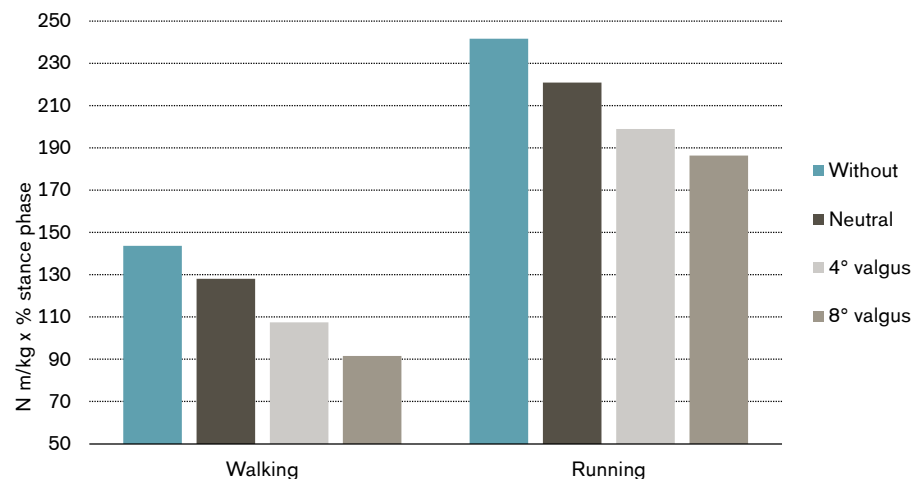
→ A valgus moment is applied at the knee

External knee adduction moments are reduced up to 12.5% in walking

Net knee adduction moments are reduced up to 36.6% in walking and up to 23% in running

→ Greater valgus adjustments of the orthosis produce greater valgus moments

Reduction of the net peak adduction moments



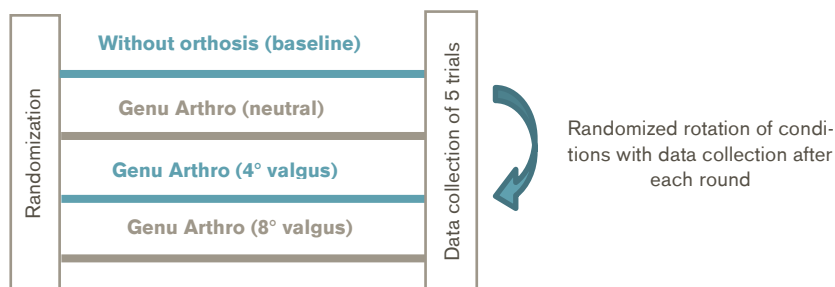
The adduction moments of the second peak at the stance phase were measured and compared under the four different conditions.

Population

Subjects: 16 healthy, male subjects
Mean age: 26.7 ± 3.9 yrs
Mean body mass: 74.3 ± 8.6 kg
Inclusion criteria: varus knee alignment (mean 8° ± 4°)
absence of clinical diagnosis of osteoarthritis, rheumatoid arthritis, history of knee trauma, surgery or pain
free from activity-restricting medical or musculoskeletal condition

Study Design

Observational, comparative:



Each condition (without orthosis, Genu Arthro with neutral adjustment, 4° and 8° valgus adjustment) was tested at two velocities: Walking at self-selected velocity and running at 3 m/s.

The moments calculated using the kinematic and GRF data collected during these trials were defined as external knee adduction moments. For the conditions with orthosis (neutral, 4° and 8°), net moments were calculated by subtracting the orthosis moments from the external knee adduction moments.

Results

Functions and Activities						Participation
Biomechanics – Static measures	Biomechanics – Gait analysis	X-Ray	EMG	Functional tests	Clinical effects	Satisfaction

Category	Outcomes	Results for Genu Arthro					Sig.*
Biomechanics – Gait analysis	External knee adduction moments during walking	The external knee adduction angular impulse was significantly lower:					
		Neutral vs without	4° vs without	8° vs without	4° vs neutral	8° vs neutral	8° vs 4°
		9.7% lower	10.2% lower	12.5% lower	0.5% lower +	3.1% lower	2.6% lower
		++	++	++		+	+
Biomechanics – Gait analysis	External peak knee adduction moment (second peak) during walking	The external peak knee adduction moment (second peak) was significantly lower:					
		Neutral vs without	4° vs without	8° vs without	4° vs neutral	8° vs neutral	8° vs 4°
		15.3% lower	15.3% lower	18.6% lower	No difference	4% lower	4% lower
		++	++	++	0	+	+
	Orthosis moment during walking	The orthosis valgus moment varied significantly from 0.03 Nm/kg (neutral) and 0.1 Nm/kg (8°) in the first and second peak of the stance phase.					
Biomechanics – Gait analysis	Net knee adduction moments during walking	Reductions of the net knee adduction angular impulse:					
		Neutral vs without	4° vs without	8° vs without	4° vs neutral	8° vs neutral	8° vs 4°
		11% lower	25.2% lower	36.3% lower	16% lower	28.5% lower	15% lower
		++	++	++	++	++	++

Category	Outcomes	Results for Genu Arthro					Sig.*
		Also the net peak adduction moments (second peak) decreased:					
		Neutral vs without	4° vs without	8° vs without	4° vs neutral	8° vs neutral	8° vs 4°
		13.6% lower ++	22.0% lower ++	33.9% lower ++	9.8% lower +	23.5% lower ++	15.2% lower ++
	Gait velocity	Only between the neutral (1.55 m/s) and without orthosis condition (1.6 m/s) there was a significant difference in gait velocity.					
	External knee adduction moments during running	No significant differences.					
	Orthosis moment during running	The orthosis valgus moment varied significantly from 0.05 Nm/kg (neutral) and 0.1 Nm/kg (8°). This was a significant change in the first peak of the stance phase but not in the second peak.					
	Net knee adduction moments during running	Neutral vs without	4° vs without	8° vs without	4° vs neutral	8° vs neutral	8° vs 4°
		9% lower +	18% lower ++	23% lower ++	9% lower +	16% lower ++	6% lower +

* no difference (0), positive trend (+), negative trend (-), significant (++/--), not applicable (n.a.)

Author's Conclusion

"In conclusion, the data of this study support the use of this orthosis model from a mechanical point of view. Significant reductions in the net knee adduction angular impulse were found during walking and running using this type of orthosis. During the walking trials, a reduction in the peak knee adduction moment was also detected; indicating effectiveness in reducing joint load. Future studies with OA patients need to be made and evaluation of joint mechanical load in combination with function and pain outcomes would complement the findings of this study." (Fantini Pagani et al. 2010)

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