Reference

Kutzner I, Kuther S, Heinlein B, Dymke J, Bender A, Halder AM, Bergmann G.

Julius Wolff Institute, Charité – Universitaetsmedizin Berlin, Augustenburger Platz 1, 13353 Berlin, Germany.

The effect of valgus braces on medial compartment load of the knee joint– in vivo load measurements in three subjects

J Biomech 2011. 44: 1354–1360.

Products

Genu Arthro (Otto Bock)

MOS Genu (Bauerfeind)

Major Findings

With Genu Arthro (GA) compared to MOS Genu (MOS) and wearing no orthosis:

→ Stiffness (measured by spring constant) of MOS is 145% higher than of GA

→ Wearing GA or MOS has no significant influence on walking speed and stride length during level walking.

→ Overall: forces (Fmed & Fz) are reduced by both orthoses in 88% of 52 measurements. MOS leads for almost all conditions to lower forces than GA.

→ Level walking:

GA (8° valgus):	Fmed:	7% lower
	Fz:	2-3% lower
MOS (0°, 4°, 8° valgus):	Fmed:	9-30% lower
	Fz	2-9% lower

→ Stair ascent:

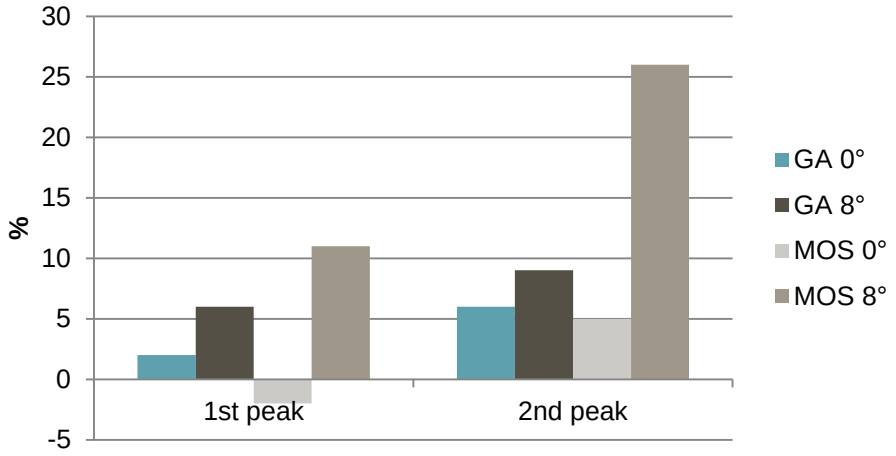
GA (0°, 8° valgus):	Fmed: 2-9% lower
MOS (0°, 8° valgus):	Fmed: -2% higher - 26% lower

→ Stair descent:

GA (0°, 8° valgus):	Fmed:	5-7% lower
	Fz:	3-7% lower
MOS (0°, 8° valgus):	Fmed:	2-24% lower
	Fz	6-16% lower

Caution: The author herself calls this study a case report with a limited number of 3 subjects, which does not allow general conclusions. Differences in 21% of 52 force measurements were significant. Moreover: the methods do not explain why an additional valgus angle of 4° was used only for MOS during level walking.

Reduction of the medial force (Fmed) during stair ascent (orthosis compared to wearing no orthosis)

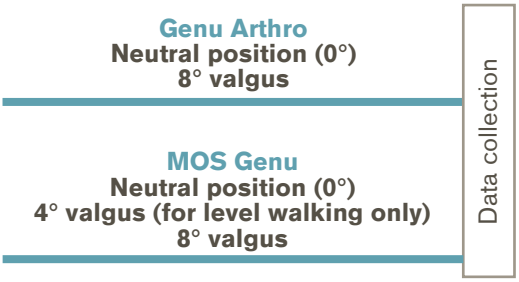


Population

Subjects:	3 male
Mean age:	65 ± 4.6 years
Mean body mass:	98.3 ± 3.3 kg
Inclusion criteria:	medial osteoarthritis Mechanical axis angle: 1.7 ± 1.25° varus

Study Design

Interventional, comparative:



The braces were first fitted to the leg in a neutral position to examine whether the brace itself already has an influence on joint loading. After performing the activities with the brace in neutral position, additional valgus angles of 4° (for MOS and level walking only) and 8° (MOS and GA) were adjusted. Three activities of daily living were investigated: walking at a self-selected speed on level ground, ascending stairs, and descending stairs. An implanted, instrumented tibial tray was developed to measure the 6 components (3 forces and 3 moments) of the knee contact loading in vivo. Additionally, the stiffness of the braces in the frontal plane was determined by a testing machine with a maximum test load of 100N.

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 (GA) & MOS Genu (MOS)	Sig.*
Biomechanics – Static measures	Stiffness	The spring constant of the **MOS** is 145% higher than that of **GA**.	n.a.

Category	Outcomes	Results for Genu Arthro (GA) & MOS Genu (MOS)				Sig.*
Biomechanics – Gait analysis	Fmed 1st peak	**GA (0°)** vs without	**GA (8°)** vs without	**MOS (0°) vs without**	**MOS (4°) vs without**	**MOS (8°) vs without**
		1% higher	7% lower	**10% lower**	**18% lower**	**23% lower**
		-	+	**++**	**++**	**++**
	Fmed 2nd peak	**GA (0°)** vs without	**GA (8°) vs without**	**MOS (0°)** vs without	**MOS (4°) vs without**	**MOS (8°) vs without**
		4% higher	**7% lower**	9% lower	**24% lower**	**30% lower**
		-	**++**	+	**++**	**++**
	Fz	With **GA (0°)** Fz increases by 2-3%.				-
		During usage of **GA (8°)**, Fz decreases by 2-3%				+
		Fz is reduced by 2-9% with the **MOS (0°, 4°, 8°)**.				+
	Walking speed	No significant differences.				0
	Stride length	No significant differences between walking with or without orthosis.				0
Functional tests	Stair ascending – Fmed 1st peak	**GA (0°)** vs without	**GA (8°)** vs without	**MOS (0°)** vs without	**MOS (8°)** vs without	
		2% lower	6% lower	2% higher	11% lower	
		+	+	-	+	
	Stair ascending – Fmed 2nd peak	**GA (0°)** vs without	**GA (8°)** vs without	**MOS (0°)** vs without	**MOS (8°) vs without**	
		6% lower	9% lower	5% lower	**26% lower**	
		+	+	+	**++**	
	Stair ascending - Fz	No significant differences for all conditions.				0
	Stair descending – Fmed 1st peak	**GA (0°)** vs without	**GA (8°)** vs without	**MOS (0°)** vs without	**MOS (8°)** vs without	
		5% lower	7% lower	12% lower	24% lower	
		+	+	+	+	
	Stair descending – Fmed 2nd peak	**GA (0°)** vs without	**GA (8°)** vs without	**MOS (0°)** vs without	**MOS (8°) vs without**	
		7% lower	6% lower	2% lower	**17% lower**	
		+	+	+	**++**	
	Stair descending - Fz	With **GA (0°, 8°)** Fz is reduced by 3-7%				+
		Fz is decreased by by 6-16% with **MOS (0°, 8°)** **2nd peak of MOS 8° (-16%) is significant**.				+

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

Author's Conclusion

"Since the patient's acceptance of the brace and the wearing comfort is of major importance, the amount of applicable external valgus moment is limited. Whereas no major discomfort was reported by the subjects when wearing the GA brace, discomfort was reported when walking with the MOS brace in 8° valgus. Since the chosen valgus settings of 8°with the MOS brace would probably not have been tolerated for a long duration by the subjects, medial load reductions of more than 25% cannot be expected permanently. …

… Due to the variability between the subjects, the authors suggest that valgus braces should only be used if a patient reports pain relief. The unloading effect of braces must furthermore be compared to other more comfortable conservative methods such as forearm crutches, laterally wedged shoes or weight reduction." (Kutzner et al. 2011)