

ADVANCE COPY OF THE STUDY WITH SELECTED RESULTS

# EVALUATION OF THE BIOMECHANICAL MODE OF ACTION OF THE GenuTrain® – KNEE SUPPORT

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## BACKGROUND

Osteoarthritis of the knee is a degenerative disease of the knee that becomes increasingly prevalent with age. The disease has an adverse effect on patients' quality of life and ability to cope on an everyday basis, as well as creating high costs for the healthcare system.

Knee supports are a common part of therapy and are used, for example, to relieve pain in cases of osteoarthritis. However, only a limited amount of research has so far been carried out into the effect of supports on the complex biomechanics of walking.

The aim of this study was thus to investigate the biomechanical mode of action of knee supports in patients suffering from osteoarthritis of the knee when walking. The study focused particularly on the adduction of the knee and the associated joint torque, because these aspects are considered to be connected to the development of osteoarthritis of the knee.

The study is presented below in the form of extracts only.

## STUDY DESIGN

prospective, cross-sectional study;  
randomized, controlled, cross over

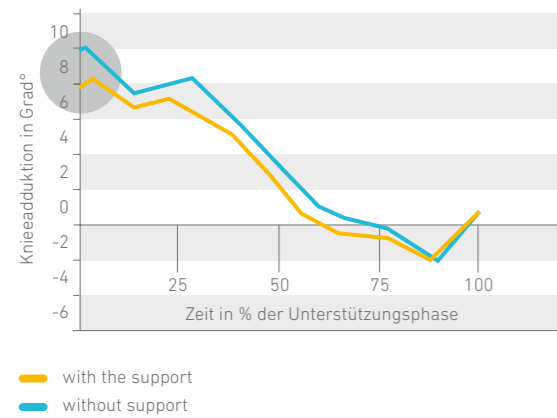
## METHODOLOGY

Sample: n = 31 (16 w, 15 m),  
Age: 51 ± 9 years for females  
54 ± 6 years for males  
Test support: Kniegelenkbandage (GenuTrain, Bauerfeind)  
Test method: 3D kinematics and kinetics (Vicon®)  
Data analysis: Variance analysis with significance level of 5 percent  
Inclusion criteria:  
· Age: 25-65 years  
· Unilateral or unilaterally pronounced bilateral osteoarthritis of the knee  
Exclusion criteria:  
· Neurological impairments  
· Endoprostheses for the knee, hip and ankle  
· A definite intolerance for the physiological stresses occurring during the study

## RESULTS (SELECTION)

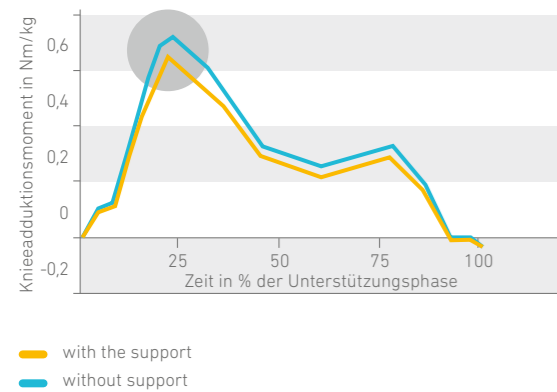
The knee adduction in the affected (= diseased or seriously diseased leg) was significantly reduced by the knee support at the beginning and at the peak of the floor contact phase (by an average of approx. 2°).

### Knee adduction



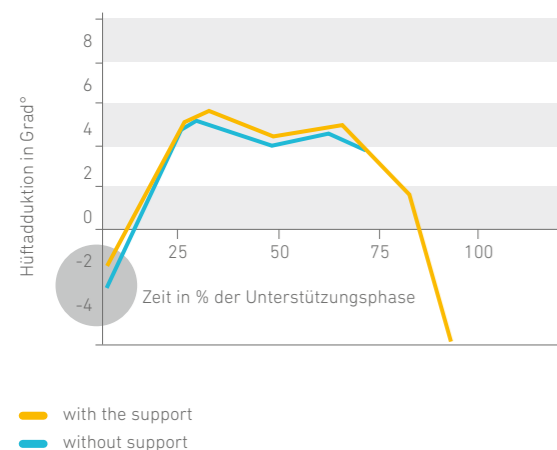
The maximum knee adduction torque in the affected leg was significantly reduced when wearing the knee support (by an average of approx. 9 percent).

### Knee adduction torque

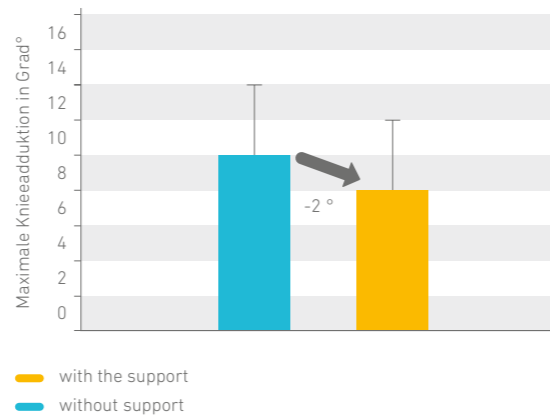


With GenuTrain, the hip adduction was increased when placing the foot on the floor. This is consistent with the reduced knee adduction. The results were confirmed for the gait cycle on the treadmill!

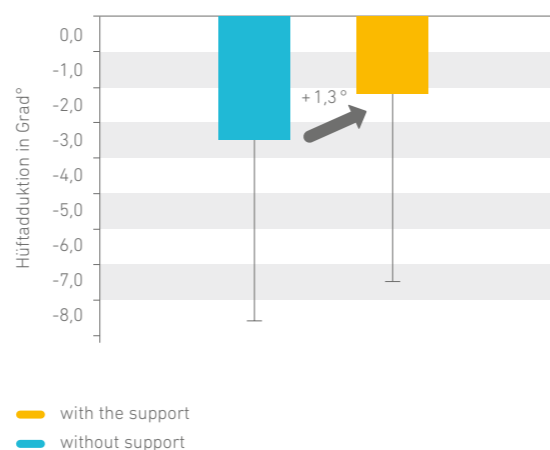
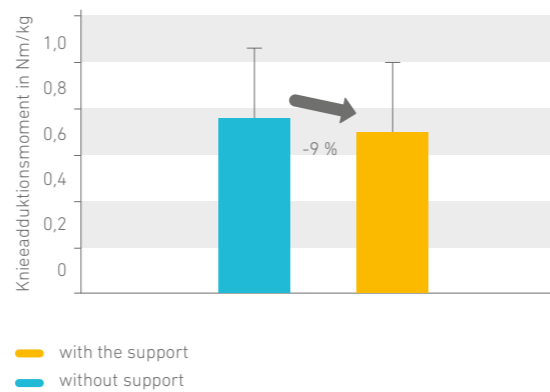
### Hip adduction



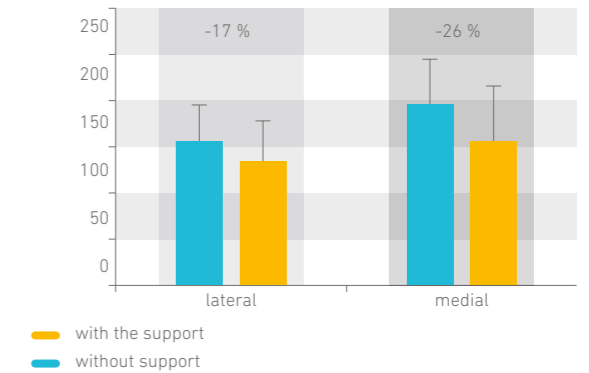
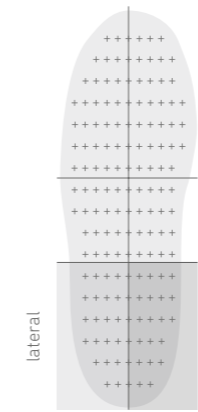
### Maximum knee adduction



### Maximum knee adduction torque



With GenuTrain®, a significant reduction of the maximum pressure value in the hindfoot area was measured



## DISCUSSION

The study compared the kinematics and kinetics of walking with and without a knee support. The maximum knee adduction angle and the knee adduction torque were significantly reduced when wearing the knee support. Since evidence has been produced to show that an increased knee adduction torque, for example, is a predictor of greater disease progression (Miyazaki et al., 2002), the change observed when wearing the knee support can be regarded as positive.

There is a functional interrelation between the increase of the hip adduction angle and the reduction of the knee adduction angle. There is a relatively high peak of force when the heel touches the ground. The resulting translational moments of force have a compressive effect on the knee joint. A lower impact on the heel results in reduced peak pressure on the hindfoot, thus lowering the pressure on the knee joint.

It is likely that the changes observed when wearing the knee support are the result of improved proprioception, alongside the mechanical-elastic effects.

63% of the test subjects reported after the conclusion of the measurements that pain had diminished while wearing the support ( $p=0.001$ ; median: -1 point on the visual analog scale from -5 to +5 [VAS]). 89% of the test subjects felt that wearing the support had increased joint stability ( $p<0.001$ ; median +2.5 points on the VAS).

## SOURCE

Schween R, Gehring D, Gollhofer A (2015) Immediate Effects of an Elastic Knee Sleeve on Frontal Plane Gait Biomechanics in Knee Osteoarthritis. PLOS one 10(1): e0115782. doi:10.1371/journal.pone.0115782