The immediate effect of a soft knee brace on dynamic knee instability in persons with knee osteoarthritis.

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INTRODUCTION

It has been shown that a soft knee brace reduces self-reported knee instability, in persons with knee osteoarthritis (OA) [1]. To our knowledge, no evidence exists to show that a soft knee brace decreases objectively evaluated dynamic knee instability. Tightness of a soft brace may influence its effects [2]. Previously, we showed that there was no difference between a non-tight and a tight soft brace in self-reported knee instability [3], but dynamic knee instability can be a more sensitive measure to detect differences. Thus, the aims of the study were to (i) evaluate the immediate effect of a soft brace on dynamic knee instability, and to (ii) assess the difference in effect between a non-tight and a tight soft brace in persons with knee OA.

METHODS

A within-subject design was used, comparing a brace with no brace, and comparing a non-tight with a tight(standard fit) brace (Figure 1). Participants of the study attended a single testing session during which they were subjected to walking on an instrumented treadmill in two testing conditions: level walk and perturbed walk (Figure 2). 3D movement of the lower legs, pelvis and trunk were captured via markers on anatomical landmarks at 100 Hz using a motion-capture system (Vicon, Oxford, United Kingdom). Dynamic knee instability was expressed by the Perturbation Response (PR), i.e. a biomechanics based measure reflecting deviation in the mean knee varus-valgus angle after a controlled mechanical perturbation, in respect to level walking [4]. Higher PR value reflects greater deviation in varus/valgus angle in relation to level walking. Linear mixed-effect model analysis was used to evaluate the effect of a brace on dynamic knee instability.

Figure 1. The soft brace used in the study

Figure 2. Virtual Reality Gait Laboratory, VU Medical Center Amsterdam

RESULTS

Thirty-eight persons with knee OA and self-reported knee instability participated in the study (Table 1). Wearing a brace significantly reduced the PR, compared to not wearing a brace (B -0.16, P=0.01). There was no difference between a non-tight and a tight brace (B -0.03, P=0.6) (Table 2). The PR value reduced from 0.48 when not wearing a brace to 0.32 when wearing a brace. To better understand changes in kinematics, evaluation of averaged kinematics stratified for baseline dynamic knee alignment, is presented in Figure 3.

Table 1. Descriptive statistics of the study participants (*n*=38)

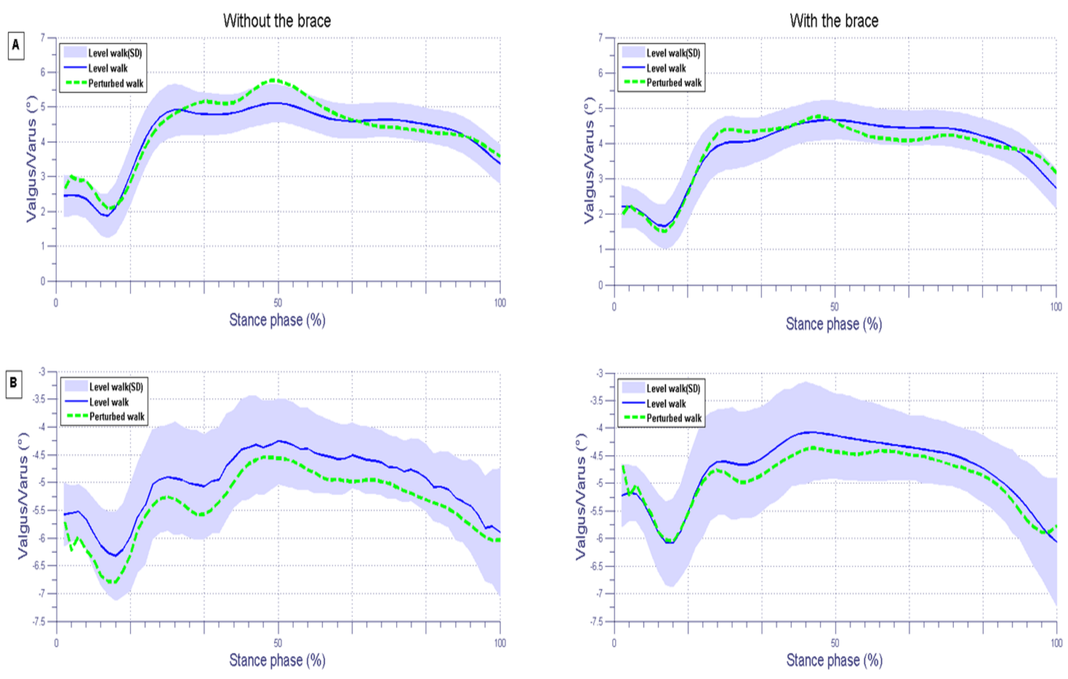
Variable	Value
Age (years)	66.4 (9.3)
Female, number (%)	24 (62.3)
Body Mass index (kg/m²)	29.1 (5.0)
Duration of symptoms (years)	12.7 (10.4)
Pain last week (NRS, range, 0 – 10)	4.5 (2.0)
WOMAC, pain (range, 0 – 20)	8.3 (3.8)
WOMAC, stiffness (range, 0 – 8)	4.4 (1.5)
WOMAC, physical Function (range, 0 – 68)	31.3(12.3)
WOMAC, total score (range, 0 – 96)	44.1 (16.7)
Muscle strength, (Nm/kg)	0.91 (0.32)
Walking speed on the treadmill, (m/s)	0.76 (0.25)
K&L grade, number (%)	
0 (none)	4 (10.8)
1 (doubtful)	14 (37.8)
2 (mild)	8 (21.6)
3 (moderate)	8 (21.6)
4 (severe)	3 (8.1)
Self-reported left knee instability <3 months; number (%)	
Rarely (1-2 times)	14 (36.8)
Regularly (3-4 times)	16 (42.1)
Very often (>4 times)	8 (21.1)

Table 2. Dynamic knee instability (PR) by the comparisons

	Brace vs. no brace		Tight brace vs. no brace		Non-tight brace vs. no brace		Non-tight vs. Tight brace	
Outcome	B (95% CI)	*P*	B (95% CI)	*P*	B (95% CI)	*P*	B (95% CI)	*P*
PR	-.16 (-.25 -.05)	0.010*	-.10 (-.26 .05)	0.35	-.21 (-.32 -.07)	0.003*	-.04 (-.14 .07)	0.60

*Significant at p value <0.05;

Figure 3. Mean waveforms of the knee varus/valgus angles in persons with: A. varus dynamic alignment (varus is in the positive direction); B. valgus dynamic alignment (valgus is in the negative direction)



DISCUSSION

These results may have important implications. Measures of varus/valgus movement have been associated with knee pain and stiffness [5], lack of knee confidence [6] and the knee adduction moment, a surrogate measure of knee joint loading [7]. Thus, wearing a soft brace can potentially reduce symptoms and load in the knee joint, by limiting the frontal plane movement of the knee in the presence of external perturbations during daily life of persons with knee OA. Results of the study might encourage physiotherapists to consider soft knee braces as a treatment option in persons with knee OA.

In conclusion, this study is the first to report that wearing a soft knee brace reduces dynamic knee instability, expressed by the PR, in persons with knee OA. The implications of wearing a soft with regard to targeting knee instability in persons with knee OA need further evaluation in clinical longitudinal studies.

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