

# Effects of Lace-Up Ankle Bracing on Isokinetic Muscle Function and Joint Range of Motion

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## CONTEXT

The primary purpose of ankle bracing is to maintain normal joint mechanics and permit normal muscular responses. Athletic tape and lace-up bracing have been shown to restrict sagittal plane motion and may not be appropriate for activities that require full dorsiflexion and plantar flexion range of motion. When sagittal plane motion is restricted, then the performance of a functional task could be negatively affected. No comprehensive analysis of the differences in muscle function and joint ROM between the ASO™ lace-up ankle brace and no-brace has been reported.

## OBJECTIVE

To examine the effects of the ASO™ lace-up brace support on ankle plantar flexion and dorsiflexion (PF-DF) Isokinetic measures of muscle function and joint ROM.

## PARTICIPANTS

Dominant ankle of 12 male athletes (21.5 ± 1.1 years, 82.9 ± 6.5 kg, 175.8 ± 7.8 cm).

## INTERVENTIONS

Subjects were randomly assigned to two Isokinetic testing sessions consisting of wearing an ASO™ lace-up ankle brace and no ankle brace while wearing their own low-top athletic shoe. PF-DF strength was assessed isokinetically for 5 maximal contractions performed at 30°/sec, 120°/sec and 180°/sec. Following the strength tests, a maximal work performance test consisting of 15 PF-DF repetitions at 180°/sec was performed.



Plantar Flexion



Dorsiflexion

## RESULTS

The results of this study indicate the ASO™ lace-up ankle brace significantly decreased ankle joint ROM and Isokinetic measures of muscle torque, total work, and power (Tables 1 and 2).

## CONCLUSIONS

Wearing the ASO™ lace-up ankle brace negatively affected ankle joint motion and muscle function by significantly decreasing plantar flexion-dorsiflexion ROM across the velocity spectrum and by significantly decreasing muscle torque, work, and power. Objective information on how lace-up bracing affects muscle performance and joint range of motion should assist the sports medicine professional when recommending ankle bracing to patients.

Table 1. Summary (Mean ± SD) of Statistically Significant Findings from Isokinetic Measures of Strength and ROM

ANKLE JOINT RANGE OF MOTION (ROM)	NO BRACE	ASO BRACE	SIGNIFICANCE (P ≤ .05)
Plantar Flexion-Dorsiflexion at 30°/sec	57.53° ± 10.2°	44.54° ± 6.8°	P < .001
Plantar Flexion-Dorsiflexion at 120°/sec	62.56° ± 9.2°	46.96° ± 8.4°	P < .001
Plantar Flexion-Dorsiflexion at 180°/sec	61.97° ± 9.4°	46.98° ± 8.8°	P < .001
MUSCLE TORQUE (FT-LBS)	NO BRACE	ASO BRACE	SIGNIFICANCE (P ≤ .05)
Plantar Flexion AVG PT 30°/sec	63.71 ± 11.7	55.68 ± 12.0	P = .05
Plantar Flexion PT/BW at 180°/sec	14.92 ± 4.7	13.13 ± 3.9	P = .04

Table 2. Summary (Mean ± SD) of Statistically Significant Findings from Isokinetic Work Test at 180°/sec

	NO BRACE	ASO BRACE	SIGNIFICANCE (P ≤ .05)
Total Work – Plantar Flexion	224.29 ± 88.6 FT-lbs	146.35 ± 70.3 FT-lbs	P < .001
Total Work - Dorsiflexion	44.68 ± 12.1 FT-lbs	35.24 ± 11.0 FT-lbs	P = .003
Total Work – PF-DF ROM	62.58° ± 9.5°	45.31° ± 7.8°	P < .001
AVG Peak Torque - PF	23.17 ± 6.7 watts	18.34 ± 6.9 watts	P = .001
AVG Peak Torque - DF	8.60 ± 3.5 watts	7.00 ± 2.6 watts	P = .022
AVG Power - PF	47.42 ± 15.2 watts	33.81 ± 15.7 watts	P < .001