

Subtalar Joint Movement During Running On Camber: Comparison Between Prophylactic Devices

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Abstract: The primary purpose of this study was to compare ankle joint (subtalar) inversion motion among four different types of ankle joint protective devices. The two semirigid braces studied were the Active Ankle (AA) and the Aircast (AC) support devices. The two soft supports studied were the Swed-O Universal (SW) device and protective tape wrap (TP). The angle of the subtalar joint was determined while the subject ran at 6mph on a camber surface set at 10 degrees. The subjects were ten male volunteer undergraduate and graduate students with a mean age of 23.5 years. Two Locam 16mm cameras were employed to photograph the subject's sagittal and frontal plane ankle joint movements. The subjects were photographed while running (6mph) on a treadmill, which had a lateral tilt (camber) of 10 degrees. This study was limited to movements of the left leg, which was the lower leg on the camber surface. It was assumed that the camber surface would cause the left foot to invert 10 degrees when placed on the treadmill. A sonic digitizer interfaced to a VAX computer was used to digitize the film data. Each subject reported to the laboratory five times, at 48 hour intervals at approximately the same time of the day. The order in which the subject wore the experimental supportive devices was systematically rotated (counter-balance treatment design). Following the application of the protective device, each subject jogged (6mph) for approximately 2 minutes, completed an ankle joint plantar and dorsiflexion isokinetic strength and fatigue test (approximately 5 minutes) and finally repeated the treadmill jogging tests. Pre and post exercise film data was analyzed for subtalar joint maximum angle of displacement during support. ANOVA indicated a significant difference between experimental treatments; however, Scheffe F-test failed to identify a significance between individual treatments.

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Conclusion: The treatment which allowed the least angular displacement during the stance phase of running was the Active Ankle, and the treatment which allowed the most movement was tape. The maximum range of motion data presented here agrees with the results of several other studies which found that semirigid devices are equal or superior to traditional tape support. Our data suggest that the superiority of one device over another appears to be related to the structure of ankle stabilizing device. Devices which wrap around the ankle joint appear to provide less support than semirigid devices attached to the side of the ankle.

TABLE 1. PRE AND POST TEST MAXIMUM RANGE OF MOTION

	PRE (degrees)	POST	PRE-POST DIFFERENCE
NOS	16.56	17.23	0.67
AC	3.61a	16.22	2.61c
AA	12.02ab	14.28	2.26
SW	13.54a	15.88	2.34c
TP	15.33	17.23	1.80c

- a. significantly different from NOS
- b. significantly different from TP
- c. pre-post significantly difference

TABLE 2. AVERAGE RANGE OF MOTION DURING MIDSTANCE

	MEAN (degrees)	S.D.	PRE-POST DIFFERENCE
PRE NOS	1.24bde	1.89	
POST NOS	1.24cbd	1.37	0.01
PRE AC	1.94ace	0.62	
POST AC	3.67ac	0.74	1.73*
PRE AA	0.92bde	0.39	
POST AA	1.76ebd	0.75	0.84*
PRE SW	1.93ace	0.68	
POST SW	2.95ac	0.83	1.02*
PRE TP	3.55acbd	0.58	
POST TP	3.67ac	0.78	0.12

*significant difference ($p < 0.05$) between pre-post test

- a. when compared to NOS
- b. when compared to AC
- c. when compared to AA
- d. when compared to SW
- e. when compared to TP