

DIFFERENCES IN MEN'S AND WOMEN'S MEAN ANKLE LIGAMENTOUS LAXITY

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ABSTRACT

The incidence of ligamentous ankle injuries is known to be one of the most common athletic injuries that exists. Recently, there has been a great deal of interest regarding the increased risk of female ligamentous injury, such as the anterior cruciate ligament, lateral ankle sprains and others. The purpose of this study is to evaluate whether or not normal lateral ankle ligamentous laxity is similar in male and female athletes. This study selects 22 male and 27 female college athletes who have had no significant ligamentous ankle injuries requiring medical treatment. They were placed on a Telos ligamentous stress device and stressed to a level of 15 daN. Radiographs were then obtained to determine talar tilt at this level of ankle stress. Results were compared between men and women showing that there was a statistically significant difference. Women had a much greater ligamentous laxity of the lateral ankle than men.

INTRODUCTION

The degree of ankle ligamentous laxity is important in determining treatment of the injured ankle, and measuring talar tilt angle is one way to determine this laxity. In order to determine whether or not laxity is excessive, it is necessary to establish normal talar tilt. Attempts to determine normalcy have been made, but these attempts have failed to examine possible differences in talar tilt between men and women.

Recent literature has begun to look at differences between injury patterns in men and women. In a study by Arendt, Agel, and Dick, collegiate women basketball and soccer players were shown to tear their anterior cruciate ligaments at a significantly higher rate than college-aged men participating in the same sports.² A study by Gray and colleagues examined 76 female and 151 male basketball players over a 30-month period. They found that 19 female basketball players ruptured their ACL's, while only 4 male basketball players did the same.⁴ Zelisko, Noble, and Porter looked at all of

the injuries sustained by one men's professional basketball team and one women's professional basketball team over two consecutive seasons. They found that the frequency of all of the women's injuries was 1.6 times that of men. They also found that the most frequently injured body part in the athlete was the ankle for both the men and women.⁶

Research on ankle talar tilt has established norms for men and women as a combined group. Cox and Hewes examined the talar tilt of 202 midshipmen's ankles (404 ankles) at the U.S. Naval Academy. All subjects had no previous ankle injuries in order to establish a normal tilt range. One hundred ninety-one males and 11 females made up this subject group, but they were not put into separate categories. Results of this grouped study revealed that 365 ankles had 0 degrees of tilt, 32 ankles had 1-5 degrees of tilt, and 7 ankles had greater than 5 degrees of tilt.³

Ahovuo, Kaartinen, and Slatis looked at 63 patients' ankles (30 men, 33 women) in which the men and women were again put into the same group. Results showed that of the uninjured ankles, 43 had a talar tilt of less than 5 degrees, 11 had tilts of 5-10 degrees, and 2 had tilts of greater than 10 degrees. These results established a normal talar tilt of 5 degrees or less.¹

Research by Rubin and Witten examined talar tilt of the ankles categorizing patients as having normal ankles, ankles with old or recent sprains, and ankles with other abnormalities. They found that among the normal ankles 56% had tilts of 3 to 23 degrees. Again there was no comparison of the differences in the talar tilts of normal ankles of men and women.⁵

The purpose of this article is to present new information on the normal talar tilt differences between male and female athletes who have had no history of ankle sprains serious enough to warrant missing a practice or game, or causing need for any medical treatment.

MATERIALS AND METHODS

Twenty-two male and twenty-seven female athletes from a NCAA Division III University, with no previous history of significant ankle ligamentous injury requiring medical care, were used in this study. The Telos stress device was used to stress the lateral ligament of the ankles. The subjects' were sitting on the ground while their ankles (one at time) were placed in the Telos

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	Right Foot		Left Foot		Combined	
	Males	Females	Males	Females	Males	Females
Mean	1.18	2.96	0.95	3.44	1.07	3.20
Standard Deviation	1.53	3.37	1.46	3.17	1.48	3.25
Sample Size	22	27	22	27	44	54
Degrees of Freedom	21		21		43	
Test Statistic Value	-245		-3.64		-4.3	
p-Value	0.023		0.0015		0.0001	
90% Confidence	Means Are Not Equal		Means Are Not Equal		Means Are Not Equal	
95% Confidence	Means Are Not Equal		Means Are Not Equal		Means Are Not Equal	
99% Confidence	Means Are Equal - -		Means Are Not Equal		Means Are Not Equal	
	Means may be equal— (Hypothesis that Means are Equal not rejected)					

Table 1.

machine. The involved knee was at approximately a 20 degree flexed angle, the heel was placed firmly against the middle part of the foot holding device, the involved ankle was at 15 degrees of inversion in the Telos machine, and the cushion of the pressure device was placed at a distance of five centimeters above the medial malleolus. The pressure device was set at 15 daN. X-rays were taken of the anterior ankle joint in AP position and the talar tilt angle was measured.

RESULTS

Means and standard deviations were figured for both males' and females' right feet, left feet, and the combined totals. A two-tailed hypothesis test was used with the null hypothesis H_0 : Mean of males (Mm) is equal to the Mean of females (Mf). The second hypothesis is H_a : Mm not equal to Mf. When H_0 is true, we treat the hypothesis test statistic as having a student's t distribution, but with degrees of freedom given by the minimum of Number of males less one (Nm-1) and Number of females less one (Nf-1) This approach biases the results towards rejecting the latter hypothesis (rejecting that the male and female means are unequal). This makes us even more confident that the significance decision is correct. The results are shown in table 1. The right foot statistics revealed that the means (Mm and Mf) were not equal with a confidence level of 95% (p-value=0.05), left foot means were not equal with a confidence level of 99% (p-value=0.01), and the combined means were not equal with a confidence level of 99%

(p-value=0.01). The normal talar tilt mean for the right foot was 1.18 degrees for males and 2.96 for females. The left foot means for males was .95 degrees and for females 3.44 degrees. The combined means totaled 1.07 degrees for males and 3.20 degrees for females.

DISCUSSION

This study was conducted to examine the difference in normal ankle ligamentous laxity between men and women. Previous studies have not focused on gender differences. With recent focus on the significant differences in ACL ruptures between men and women, this study on ankle ligamentous laxity differences was necessary. Results revealed that women's ankles are normally more lax than men's. This finding of normalcy is important in determining abnormal laxity after injury and in determining the need for surgery due to this abnormal laxity. Since women's lateral ankle ligaments are normally more lax than men's, the abnormal range may need to be set at a higher talar tilt than men's abnormal range when considering surgical intervention. Further study as to whether increased normal lateral ankle laxity affects incidence of ankle injury is necessary. A study to evaluate the effect that the level of relaxin at certain times during the menstrual cycle has on ligamentous laxity in female athletes would be of value.

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