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## The Effect of Chronic Ankle Instability (CAI) on Y-Balance Scores in Soccer Athletes

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**Objective:** Chronic ankle instability (CAI) is a common problem among athletes and active persons. CAI is an issue that can result from an acute ankle sprain. Individuals are described as having chronic ankle instability if they have had at least one ankle sprain along and suffer residual symptoms for a minimum of one year following the initial ankle sprain and have feelings of instability or “giving way” as well as recurrent ankle sprain incidents.<sup>1</sup> Chronic ankle instability has been associated with decreased proprioception and balance sense. Increasingly, the Lower Extremity Y-Balance Test is being used to assess dynamic balance within the athletic population. Maintenance of dynamic balance is very important in athletics due to the amount of movement and coordination that is required. Recent authors have indicated that the Y-balance test may “estimate lower extremity injury risk, differentiate between lower extremity musculoskeletal pathologies, and measure improvements in postural control after training programs.”<sup>2, p.772</sup> Ankle sprains are common in soccer athletes. In order to treat soccer athletes that may be suffering from CAI, it is necessary to identify a functional test that would not only be useful as a means of screening these athletes, but to also serve as a way to demonstrate improvement in dynamic balance of these athletes after intervention. Therefore, the purpose of this study was determine if there was a significant difference in Lower Extremity Y-Balance Test scores in soccer athletes with and without CAI.

**Design and setting:** This was a controlled, laboratory experimental design. All testing was performed in the athletic training room of a Division III institution.

**Participants:** Intercollegiate soccer athletes from a Division III institution were recruited via email to determine interest in participating in this study. Those that were willing to participate were assigned a testing time. This study was approved by the Institutional Review Board at the University. Upon arrival at the assigned testing period, the researchers reviewed the informed consent documents and those willing to participate signed the informed consent form.

**Intervention:** During testing, the subjects were given an initial demographic questionnaire and the Ankle Instability Instrument (AII) which was used to determine the presence of chronic ankle instability. Subjects completed the AII for each ankle. Subjects were not included in this study if they had history of fracture or surgery on the involved ankle or if they self-reported to have any lower extremity injury within the past six weeks. Subjects were placed into the CAI group according based upon the results of their AII survey. Answering “yes” to five or more of the nine questions, placed the subjects in the CAI group. Group assignment served as the independent variable for this study.

**Main Outcome Measurement:** Scores on the Lower Extremity Y-Balance test served as the levels of the independent variable (anterior, posteromedial, posterolateral, and composite). The subjects’ leg length from ASIS to lateral

malleolus were measured and recorded in order to normalize the reach distance for each limb. A Y-balance test kit was used for all trial and formal testing. Leg lengths and Y-balance scores were always measured by the same researchers to minimize inter-rater reliability for any portion of the study. Subjects were given 3 test trials and then complete the testing rounds. A one minute rest break followed each trial and testing round. In order for a test round to be recorded, subjects had to: 1) remain standing on one foot, 2) not lift the heel of the standing foot off the platform, 3) return the reach foot to the starting position before moving on to the next direction. Three rounds per leg were completed and scored and the mean values were carried forward for data analysis.

**Results:** Subjects included 21 male athletes and 16 female athletes for a total of 74 limbs. The 15 limbs were in the CAI group (9 male, 6 female) and 59 limbs were in the non-CAI group (33 male, 26 female). Data analysis included the normalized mean values for each reach distance and the normalized composite reach score for each group (CAI and non-CAI). An independent

t-test was used to examine the data for significant differences between the two groups for the normalized reach distances (anterior, posteromedial, posterolateral, and composite). The results of the independent t-tests indicated a significant difference ( $p=.003$ ) between the normalized anterior reach for CAI vs. non-CAI ankles. No significant difference was found between the CAI and non-CAI subjects for any other reach direction or for the composite reach distance.

**Conclusion:** The only reach direction with a statistically significant difference between CA and non-CAI individuals was the anterior direction. This result differs slightly from previous research that found CAI subjects to have significant reach difference in the posteromedial direction as well.<sup>4</sup> The loss of reach distance in the anterior direction does support the literature that has determined the primary reason participants with CAI achieve lower scores during the various reach tasks is reduced sagittal plane hip and knee flexion of the stance limb.<sup>3</sup>

**Key Words:** dynamic balance, chronic ankle instability, neuromuscular control, reach distance, sport-specific performance

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