

## The Effects of Playing Surface on Plant Leg Knee Kinematics of Men and Women Collegiate Soccer Players

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### ABSTRACT

The majority of anterior cruciate ligament (ACL) injuries for soccer players are non-contact. Women have a higher incidence of non-contact ACL injury than men. One of the five most important factors associated with these non-contact injuries is when the plant leg knee flexes to less than 30°. Women soccer players have also been reported to flex the knee less than men when planting to take a shot. While soccer is mainly played on natural grass (NG) fields, playing on artificial turf (AT) surfaces is becoming increasingly popular because of the many benefits including low maintenance. Recently some data has suggested that knee injury incidence rates are higher on artificial turf than natural grass. PURPOSE: To determine if playing surface has an effect on men and women soccer players' plant leg knee angle when performing maximal effort power (PS) and finesse (FS) shots. METHODS: Sixteen collegiate soccer players (8 female, 8 male, age = 20.17± yrs, mass = 73.67± kg, height = 162.41± cm) performed four different shooting conditions (3 PS on artificial turf, 3 PS on natural grass, 3 FS on artificial turf, 3 FS natural grass). Participants performed a 15 yd maximal effort dribble into a 5yd x 5yd cone box to complete the shot. A wireless electrogoniometer and accelerometer were attached to each participant in order to collect plant leg knee angle kinematics as well as tibial acceleration at 200 Hz. Separate 2x2 (field surface x gender) Repeated Measures ANOVAs were used to analyze data collected from each shot type. RESULTS: The mean (sd) knee angle (degrees) for men, on grass and turf fields during the power shot were 29.3°(11.4°) and, 28.6°(8.1°), respectively. The knee angle for women on grass and turf fields for the power shot were 26.8°(3.8°), and 31.9° (18.7°), respectively. The mean (sd) knee angle (degrees) for men on grass and turf fields during the finesse shot were 30.8° (13.1°) and 28.7° (8.6°), respectively. The knee angle for women on grass and turf fields for the finesse shot were 24.0° (6.5°), and 24.3° (6.3°), respectively. Field surface had no significant effect on knee angle of the plant leg during the power ( $F_{(1,14)} = 0.251$ ,  $p = 0.624$ ) or finesse ( $F_{(1,14)} = 0.082$ ,  $p = 0.779$ ) shots. Furthermore, plant leg knee angle were similar between genders during the power ( $F_{(1,14)} = 0.012$ ,  $p = 0.913$ ) and finesse ( $F_{(1,14)} = 3.128$ ,  $p = 0.099$ ) shots. Lastly, there was no significant interaction between field condition and sex on the plant leg knee angle during the power ( $F_{(1,14)} = 0.431$ ,  $p = 0.522$ ) and finesse ( $F_{(1,14)} = 0.141$ ,  $p = 0.713$ ) shots. CONCLUSION: A more extended knee on the plant leg has been shown to be one factor that is associated with knee injuries in soccer. Data from this study suggests that playing surface had no effect on plant leg knee kinematics for either men or women suggesting that either surface is acceptable for play with respect to plant leg knee kinematics.