KINEMATICAL ANALYSIS OF THE LOWER EXTREMITY'S BEHAVIOR IN SQUATS WITH THREE DIFFERENT LEVELS OF DECLINATION

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INTRODUCTION: The squat is an exercise helpful in the sport's environment (Escamilla, 2001). The use of a skid under the heels during its execution has become common. Many studies have approached biomechanics analyses from the squat's movement (Kongsgaard et al, 2006). However, we didn't find studies that analysis the use of a skid in the training. Thus, the aim of this initial study was to analyse the kinematic behavior of the lower extremity during the bilateral squat with a straight bar in three different levels of declination.

METHODS: Ten volunteers were oriented to execute 3 squat repetitions until 90º of knees's flexion on a flat surface (0), with 1 skid (1) and with 2 skids (2) under the heels. The plantar flexion degrees were calculated using the law of the sines considering the angle formed by the participants foot and the floor. The inclination was approximately from 10º to 15º for situation 1 and from 20º to 25º for the 2. The videogrametry method with a camera in the sagittal view was used to determine data. Seven markers were fixed on temporomandibular joint, acromion, hip (H), knee (K) ankle (A), heel and fifth metatarsal to determine the angular and linear position of the lower extremity from the beginning of the movement to the end of the eccentric phase (ROM). The images were analyzed using the software Dgeeme, version 1.0 (www.geeware.com). The software package GraphPad Prim® (Version 4.01) was used for the statistical analysis (ANOVA one-Way and post hoc Tukey's test [α=0,05.]).

RESULTS: The qualitative analysis showed that by increasing the declivity, more individuals (i) exceeded the foot tip limit by projecting the knees joint in each situation: 0 (3i); 1 (5i) and 2 (7i).The quantitative analysis didn't show any significant difference ($p>0,05$) for the angular ROM of the lower extremity's joints H 0 (84,37º), 1 (85,79º), 2 (89,31º); K 0 (66,90º); 1 (73,74º), 2 (78,60º) and A 0 (18,20º), 1 (15,51º), 2 (15,58º). There were also no statistical differences ($p>0,05$) in the linear displacement among H 0 (0,20m), 1 (0,22m), 2 (0,22m); K 0 (0,16m), 1 (0,18m), 2 (0,17m) and A 0 (0,01m), 1 (0,01m), 2 (0,01m). Nevertheless, the lienar displacement of the knee, having as reference the foots tip, was statisticaly significant ($p<0,05$) between situation 0 (- 0,023m) and 2 (0,038m).

DISCUSSION: The angular data of K and A in all situations was similar to Kongsgaard's study (2006). However, the H joint data disagree of the results found by this author. The greatest forward knees motion could suggest an increase in the shear forces, favoring the appearance of some injuries, as patello-femoral pain syndrome (Escamilla, 2001).

CONCLUSION: Kinematic alterations are few by using skids. So, if well executed, it should not cause a negative interference in the training. We still need to compare this data with the trunk inclination to confirm if an increase of the knee torque exist.

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