

Effects of Wearing an ACL Brace on Hamstring and Quadriceps Muscle Activity When Performing a Body Weight Squat

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ABSTRACT

After surgical repair of the anterior cruciate ligament (ACL) a functional knee brace is used to support the injured knee. Of importance, would be the reduction of actions that would promote anterior tibial translation relative to the femur. **PURPOSE:** The purpose of this study was to determine if the use of a functional ACL brace proportionally reduces quadriceps relative to hamstring muscle activity during a body weight squat. **METHODS:** Seven collegiate athletes (20.5±1.0 yrs, 183.9±9.58 cm and 91.77±11.95 kg) provided informed consent and participated in this study. Two gel bipolar surface Ag-AgCl electrodes were placed on each of the muscle bellies of the vastus lateralis (VL) and the biceps femoris (BF) of the dominant leg. Participants performed eight repetitions of a two-legged bodyweight squat with and without a functional knee brace at a cadence of 54 bpm. RMS EMG was computed across a 200 ms window and analyzed for the middle six repetitions at 45° and 60° of knee flexion during the movement. EMG data were collected at 1000Hz and normalized to the respective maximum voluntary isometric contraction (MVIC) for each muscle. Hamstrings and quadriceps activity for the upward phase of movement were evaluated separately, with two 2x2 (Muscle x Brace Condition) repeated measures ANOVAs. **RESULTS:** No interaction between muscle and brace condition was observed at 45° ($F(1,6) = 5.369, p = 0.06$) or 60° ($F(1,6) = 5.241, p = 0.062$). At 45° and 60° quadriceps activity tended to increase and hamstrings activity tended to decrease when wearing the brace (Table 1) but these differences were not significant ($F(1,6)=2.54, p=0.16$; $F(1,6)=2.90, p=0.14$, respectively). **CONCLUSION:** The trend in muscle activity surprisingly suggests that the movement was more quadriceps dominant while wearing the brace. The quadriceps group had 4.6x and 1.7x more muscle activity than the hamstring during the braced squat and non-braced squat respectively. This data suggests that after the initial healing period, when rehabilitating an ACL injury the functional brace should be used sparingly so the hamstrings may be adequately strengthened.

Table 1. EMG Activity (%MVIC) During Upward Movement of a Body Weight Squat.

Joint Position	Quadriceps		Hamstrings	
	Brace	No Brace	Brace	No Brace
45 degrees	47.0±28.4	33.0±26.9	10.2±5.7	18.8±22.6
60 degrees	50.8±29.1	36.0±30.5	11.1±5.9	21.9±22.6