ANALYSES ON THE EFFECT OF BICYCLE SEAT HEIGHT ON THE ELECTROMYOGRAPHIC ACTIVITY OF THE QUADRICEPS AND THE HAMSTRINGS

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**CONTEXT:** Cycle ergometers are often used in rehabilitation for injuries to the knee. Cycling can help maintain cardiovascular fitness and increase the strength in the athlete’s legs. The optimal seat height, which will produce the greatest muscular activity, however, is unclear. **Objective:** To analyze the electromyographic activity of the quadriceps and the hamstrings while cycling at 5 different seat heights, hence 5 different knee angles. **Design:** Repeated Measures Design. **Setting:** Biomechanics Laboratory. **Subjects:** Ten healthy college age adults, five females (age = 22.7 ± 2.0 years, mean height = 161.1 ± 6.6 cm, mean weight = 63.5 ± 5.8 kg) and five males (age = 21.8 ± 1.5 years, mean height = 172.1 ± 5.6 cm, mean weight = 74.2 ± 3.1 kg) with no known knee pathologies. **Interventions:** Subjects performed five 3-minute bouts on a cycle ergometer at a resistance that allowed them to pedal continuously at 90 revolutions per minute. After three-minutes the seat height was changed to either increase or decrease the knee angle. The seat height was adjusted to achieve maximal knee angles of 53°, 44°, 35°, 26°, and 17° of knee flexion. All knee angles are relative to the anatomic zero position and were quantified using an electrogoniometer attached to the lateral portion of the leg. The seat height order was randomized. **Main Outcome Measure:** The Root mean Square (RMS) of the EMG was used as a measure of overall muscle activity and is reported as a percentage of the maximal voluntary contraction. **Results:** The RMS for hamstring activity showed significant differences (F= 12.68, P<0.05) between females and males with the females exhibiting greater hamstring activity (19.02 ± 1.17 vs. 9.6 ± .61). No gender difference was observed for the quadriceps though the quadriceps had a higher level of activation when compared with the hamstrings (F= 11.70 P<0.001) (37.21 ± 2.08 vs. 14.33 ± 1.18). There was no effect of knee angle on quadriceps activity however there was a general trend toward hamstring activity increasing as the knee angle decreased and seat height increased (13.1 ± 1.8 at 53°, 12.9 ± 1.5 at 44°, 13.8 ± 1.7 at 35°, 14.9 ± 2.6 at 26° and 18.3 ± 2.1 at 17°) with significant differences noted when comparing the smallest knee angle to the other four angles (F= 5.40, P<0.01). **Conclusions:** Within the limitations of the study design these results suggest that females utilize their hamstrings more during cycling exercises than males. In addition these results suggest that cycling with a higher seat height, therefore a decreased knee angle, will produce greater hamstring activity however it is apparent that the level of quadriceps activity is much greater than hamstring activity regardless of the knee angle.