

## GENDER DIFFERENCES IN THE RELATIONSHIP BETWEEN QUADRICEPS MVIC AND HAMSTRING TO QUADRICEPS RATIO

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**KEY WORDS:** ACL, injury prevention, gender

**INTRODUCTION:** No previous research has evaluated the relationship between degree of Q activation and its' effect on H:Q ratio, despite the fact that Q dominance and low H:Q ratios are thought to increase the risk of H and ACL injury (Baratta et al., 1988; Hewitt et al., 2001). Compared to males, females may be at greater risk, due to higher Q co-activation (Colliander and Tesch, 1989; White et al., 2003). The purpose of this study was to evaluate gender differences in the relationship between Q activation and it's effect on H:Q ratios.

**METHODS:** A repeated measures design was used to compare H and Q EMG during six resistance training exercises believed to elicit H activity. Twenty-three males and 13 females ( $20.38 \pm 1.77$  years) performed a maximum voluntary isometric contraction (MVIC) for the H and Q as well as 2 repetitions (6 RM loads) for each of the randomly ordered test exercises including the squat, Russian curl, seated leg curl, stiff leg dead lift, single leg deadlift and good morning. Data were acquired for the second repetition of each exercise and normalized to each muscle groups' MVIC. Data were analyzed using Pearson's Correlation.

**RESULTS:** Analysis of data from female subjects demonstrated no correlation between Q MVIC, and the H:Q activation ratio for any of the exercises assessed (Table 1). These findings did not change when the strongest 50% of the female subjects were analyzed separately. Conversely, analysis of male subjects resulted in moderate to strong correlations between Q MVIC and H:Q activation ratio for all exercises (Table 1), as well as between squat strength and the H:Q ratio during the performance of the squat ( $r^2=.58$ ,  $p<0.01$ ).

Table1. Pearson Correlation for quadriceps MVIC and Hamstring to Quadriceps ratio during lower body resistance training exercise

	Russian Curl	Seated Leg Curl	Stiff Leg Deadlift	Single Leg Deadlift	Good Morning
$r^2$ for female subjects (n=13)	0.08	0.47	0.21	0.24	0.13
$r^2$ for male subjects (n=21)	0.71 <sup>a</sup>	0.66 <sup>a</sup>	0.81 <sup>a</sup>	0.52 <sup>b</sup>	0.49 <sup>b</sup>

<sup>a</sup>Correlation is significant at  $p<0.01$  level; <sup>b</sup>Correlation is significant at  $p<0.05$  level

**DISCUSSION/ CONCLUSIONS:** This study demonstrates that strong Q MVIC appears to be related to strong H activation relative to the Q, for male subjects. Strong Q MVIC does not appear to be associated with strong H activation relative to the Q for female subjects.

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