following conditions: 1) three sets of four non-ballistic repetitions (30N-B), 2) three sets of four non-ballistic repetitions with a 3-second pause between the eccentric and concentric phases (30PN-B), 3) three sets of four ballistic repetitions (30B), 4) three sets of four ballistic repetitions with a 3-second pause between the eccentric and concentric phases (30PB). Force plates and a 3-D motion analysis system were used to determine the total mechanical work performed during each session while a portable gas analysis system was used to collect expired gases.
RESULTS: Total mechanical work performed during each set was significantly greater during 30B compared to 30N-B (mean difference [MD]: 7,792 J, p<0.001, effect size [ES]: 1.88) and 30PN-B (MD: 7,749 J, p<0.001, ES: 1.89), while that during 30PB was significantly greater than that during both 30N-B (MD: 7,488 J, p<0.001, ES: 1.89) and 30PN-B (MD: 7,445 J, p<0.001, ES: 1.90). Energy expenditure during each set was significantly greater during the 30B condition compared to the 30N-B (MD: 13,983 J, p<0.001, ES: 1.08) and the 30PN-B (MD: 11,326 J, p=0.001, ES: 0.92). Energy expenditure during 30PB was also significantly greater than that during 30N-B (MD: 12,615 J, p=0.001, ES: 1.04) and 30PN-B (MD: 9,958 J, p=0.006, ES: 0.86). Furthermore, energy expenditure during set 1 was significantly greater than that during set 2 (MD: 6,840 J, p<0.001, ES: 0.64) and set 3 (MD: 8,070 J, p<0.001, ES: 0.75).
CONCLUSION: Ballistic resistance training exercises may represent a more effective metabolic stimulus compared to traditional resistance training exercises and a pause inserted between the eccentric and concentric phases has little effect.

1420 Board #95 June 1 9:00 AM - 10:30 AM

Electromyographic Analysis Of The Two Parts Of The Gluteus Maximus During Squat Exercises

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(No relationships reported)

PURPOSE: Many lower extremity strengthening programs prescribed after injury include the squat as an integral part of rehabilitation. Little attention has been paid, however, in either research or clinical settings, to the impact of the functional differentiation on segmentation of the gluteus maximus (GM) muscle on the prescription of therapeutic exercise. The purpose of this study was to describe the activation of the two parts of the gluteus maximus muscle during a single and double leg squat.
METHODS: Ten subjects (7 females, 3 males, mean age 23.6 years) without current neuromuscular or orthopedic ailments participated in the study. Electromyographic (EMG) activity was assessed with surface electrodes, (Model EMG-55, Therapeutics Unlimited). Electrodes were placed on the right side, lateral and inferior to PSIS for upper part of GM and inferior to the greater trochanter for the lower part of GM. EMG electrodes were also placed on the gluteus medius (GMED) and adductor magnus (ADM). Subjects performed 5 trials for each bilateral and single leg squats with a maximum knee flexion angle of 100 degrees. Squat activity was time normalized and EMG amplitudes normalized to %Maximal Voluntary Contraction (MVIC). Paired t-test and pearson correlations (p-value <0.05) were performed between the levels of muscle activation for two types of squat.
RESULTS: Mean activation was greater for the UGM (0.38 ± 0.04) compared to the LGM (0.25 ± 0.04) for the single leg squat ($p < 0.01$) demonstrating different recruitment. UGM activation was greater than LGM ($p < 0.01$) during abduction MVIC testing. A stronger correlation was observed between LGM-ADM (0.76) compared to UGM-ADM (0.55) for single leg squat. LGM was highly correlated to ADM during the bilateral squat (0.95). A strong correlation was also observed between UGM-GMED (0.74) during single leg squat.
CONCLUSIONS: Differences are seen in the activation levels and patterns for the upper and lower GM. LGM compliments the role of ADM during both bilateral and single leg squats. Upper part of GM were strongly correlated with the GMED, suggesting the GM has an abductor function during a single leg squat.The results suggest that segmentation of muscles based on moment arms should be taken into consideration for muscle modeling and in developing more specific therapeutic exercises.

1421 Board #96 June 1 9:00 AM - 10:30 AM

A Consecutive Loop Elastic Band Placed Around the Distal End of the Thighs During an Overhead Barbell Squat Increases Medial Knee Collapse

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The use of a resistant band wrapped around the distal end of the thighs may act as a proprioceptive aid to reduce medial collapse of the knee during squats. No studies have examined this corrective technique on mechanically advanced exercises, such as the overhead barbell squat.
PURPOSE: The purpose of this study was to examine the influence of a high resistance consecutive loop elastic band on lower body kinematics during an overhead barbell squat.
METHODS: 8, resistant-trained males participated in the study. 3D kinematics were assessed using motion capture and sampled at 50 Hz. Kinematics were captured using rigid bodies consisting of active, infrared markers placed bilaterally on the mid-segmental areas of the foot, shank, thigh and thorax. Participants warmed up with a single set of bodyweight squats for a self-selected number of repetitions, followed by two sets of overhead barbell squats with a load of 25% of their bodyweight with and without a consecutive loop elastic band (resistance of 6.5 KG at 100% elongation) wrapped around the distal end of the thighs. Sets were performed for 12 repetitions, or to voluntary failure, at a controlled tempo. The order with which the band was used was randomized. Medial knee collapse was calculated using a knee width index (KWI) as a ratio of the distance between the distal thigh segments and the distal shank segments. KWI was evaluated for both concentric and eccentric phases.
RESULTS: The maximum knee flexion angle across the 12 repetitions was not different between the band and no band conditions ($P = 0.18$). However, the average KWI was smaller with the band condition for the concentric phase (band: 0.96 ± 0.6; no band: 1.0 ± 0.06, $P < 0.05$) and eccentric phase (band: 0.97 ± 0.06; no band: 1.0 ± 0.05, $P < 0.05$). Maximum KWI was also smaller for the band condition for the concentric phase (band: 1.0 ± 0.06; no band: 1.04 ± 0.05, $P < 0.06$) and eccentric phase (band: 1.0 ± 0.05; no band: 1.04 ± 0.06, $P < 0.05$).
DISCUSSION: KWI during the overhead barbell squat was significantly smaller with the use of the band. Familiarity may have played a role in this finding as none of the participants had any prior experience with band-assisted work. Because the band provides a high amount of resistance, the use of the band may have actually enhanced medial collapse rather than improve it.
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1422 Board #97 June 1 9:00 AM - 10:30 AM

Internal and External Focus of Attention During Bench Press Results in Increased EMG Amplitudes

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It is generally acknowledged that performance in various motor skills can be significantly affected by the participant's focus of attention, induced by instructions for instance. However, the effect of focus of attention in relation to strength training exercises remains to be investigated.
PURPOSE: To address the effect of internal and external focus of attention on the surface electromyography (EMG) amplitude during bench press.