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Influence of attentional focus in a weighted barbell back squat among experience performers

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METHODS: 7 physically active adults (4 male, 3 female; ages 25 +/- 4 years) performed front squats under two conditions: baseline and after instruction in a specific front squat technique emphasizing foot alignment and using EMG biofeedback to help engage the glutes. All squats were performed at 70% of a tested 1 rep max. Whole-body kinematics were recorded with a 12-camera motion capture system while ground reaction forces were measured using two force plates. Peak hip extensor moments, pelvic tilt, and forward torso lean were calculated on each repetition. Activity of the erector spinae (ES) and gluteus maximus (GM) muscles was analyzed by calculating average root mean square (RMS) amplitude across the squat. Differences from pre to post intervention were evaluated using paired *t*-tests and effect sizes.
RESULTS: Peak pelvic tilt, forward trunk lean, and hip extensor moments were all not statistically different after the intervention and all showed small effect sizes (Table 1). While mean ES activity decreased after the intervention the effect size was small (Table 1). In contrast, while mean GM activity was not significantly different post-intervention, there was a moderate effect size (Table 1).

Table 1. Means (± standard deviations) pre and post intervention.

	Pre	Post	*p*	*d*
Peak pelvic tilt (°)	30.4 ± 10.5	28.7 ± 14.2	.341	0.134
Forward trunk lean (°)	28.9 ± 5.6	29.9 ± 6.9	.521	0.157
Peak hip extensor moment (Nm)	89.6 ± 66.9	85.8 ± 68.3	.313	0.057
Mean erector spinae RMS (mV)	6.0 ± 3.2	5.5 ± 3.0	.034	0.148
Mean gluteus maximus RMS (mV)	1.1 ± 0.7	1.5 ± 1.0	.069	0.472

CONCLUSION: The intervention technique changed activation of some posterior muscle groups, but not kinematics or kinetics. Whether this was due to the intervention itself or participants requiring more training time requires further investigation.

1824 Board #85 May 31 3:30 PM - 5:00 PM

Effects of Squat Depth and Stance Width on Lower Extremity Frontal Plane Kinetics

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(No relevant relationships reported)

The squat is an exercise commonly used to improve lower-extremity (LE) strength and performance. Repeated frontal plane movement in the LE could have detrimental effects by contributing to certain joint pathologies. Therefore, investigating squat technique on LE kinetics is warranted.
PURPOSE: This study compared hip and knee frontal plane kinetics during body-weight squats with varying depths and stance widths.
METHODS: 11 healthy, college-aged participants (6 female, 5 male, height = 1.68 ± 0.08 m, mass = 67.4 ± 10.7 kg) performed 5 body squats at 100%, 150% and 200% of shoulder width for each of the following knee flexion angles: 55º, 90º and 125º. Trials were randomized and data were collected using Vicon Nexus and AMTI force plates. Frontal plane kinetics were processed using Visual 3D.
RESULTS: At the hip, adduction moments showed significant increases as the width (100% = 0.301 ± 0.02, 150% = 0.539 ±0.04 and 200% = 0.736 ± 0.04; $p < 0.001$) and depth (55º = 0.306 ± 0.03 Nm/kg, 90º= 0.545 ± 0.04 Nm/kg and 125º = 0.725 ± 0.05 Nm/kg, $p < 0.001$) increased. At the knee, adduction moments significantly increased with wider stances (100% = 0.116 ± 0.02 Nm/kg, 150% = 0.178 ± 0.01 Nm/kg and 200% = 0.221 ± 0.01 Nm/kg; $p < 0.001$) while greater knee abduction moments were observed as depth of the squat increased (55º = 0.006 ± 0.02 Nm/kg, 90º = 0.147 ± 0.04 Nm/kg and 125º = 0.465 ± 0.05 Nm/kg; $p < 0.001$).
CONCLUSION: Deep squats and larger stance widths may place greater demand on the hip and knee joints as evidenced by increased frontal plane moments. These data may benefit rehabilitation and strength training programs. For example, clinicians using squats as a rehabilitative exercise might decrease stance width when aiming to avoid LE frontal plane joint loading. Further, athletes who repeatedly stress the frontal plane stabilizing structures of the LE during dynamic movements may benefit from deeper and wider squats in training that would prepare these structures for their sport specific movements. Further research is needed to investigate other means of altering joint loading in the LE during exercise.

1825 Board #86 May 31 3:30 PM - 5:00 PM

Influence of Attentional Focus in a Weighted Barbell Back Squat Among Experienced Performers

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(No relevant relationships reported)

Previous research suggests that adopting an external attentional focus (i.e. an object) rather than an internal focus (i.e. a body part) improves motor skill performance such as jump height, and increases peak force during isokinetic elbow flexion. However, little is known about the impact of attentional focus during a barbell back squat (BBS).
PURPOSE: To determine the influence of attentional focus on ground reaction force (GRF), peak power (PP), and peak moment (PM) in the sagittal, frontal, and transverse planes at the knee, hip, and ankle joints in weight-lifters performing a BBS.
METHODS: Male weight-lifters (age 23.1 ±2.4; >3 years strength training experience) performed 8 BBS repetitions at 50% of their 1RM. Repetitions were performed under 3 conditions: Control (CON) followed by counterbalanced internal (INT; putting pressure on the heels and lateral aspect of the feet) and external (EXT; pushing the ground away from the body) focus conditions. PP (W) and PM (Nm) were measured using the software Motion Monitor; GRF (N) was measured using Bertec force plates. Participants also completed an attentional focus adherence questionnaire.
RESULTS: For inversion PP at the ankle (i.e., negative power in the frontal plane), the absolute value for EXT (-59.5 W ±6.6; 0.021, 0.016) was significantly greater than CON (-42.3 W ±4.1) and INT (-42.2 W ±4.8). For valgus PP at the knee (i.e. negative power in the frontal plane), the absolute values for EXT (-231.8 W ±18.8; 0.016) and INT (-227.3 W ±23; 0.033) were significantly greater than CON (-187.4 W ±15.9). For abduction ankle PM (i.e. positive moment in the transverse plane), the EXT (39.4 Nm ±4.6; 0.016) was significantly greater than INT (30.7 Nm ±3.7). With an EXT focus, participants focused on pushing the ground away in significantly more repetitions (6.3 ±0.72; 0.03) than the INT focus (5.2 ±1.9). Focus conditions elicited no significant differences in the other variables.
CONCLUSION: Results indicate attentional focus has little influence on hip, knee, and ankle joint kinetics during a BBS among experienced weightlifters. Instructing experienced weightlifters to shift their attentional focus may have little effect on BBS performance. Future studies should investigate the impact of attentional focus on novice weightlifters performing lower body multi-joint movements.

1826 Board #87 May 31 3:30 PM - 5:00 PM

Load-dependent Relative Muscular Effort of the Knee Extensor Muscles During Back and Front Squats

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(No relevant relationships reported)

INTRODUCTION: The back squat (BS) and the front squat (FS) are mainstay exercises of strength training programs. However, not much is known about joint-specific kinematic and kinetic changes during the execution these two exercises as the external load is varied. In addition, the Relative Muscular Effort (RME), which quantifies a muscle groups operating level with respect to its maximum capacity, of the knee extensor muscle group during both exercises is not well characterized.
PURPOSE: To investigate load-dependent RME of the knee extensor muscles during the BS and FS.
METHODS: Seven collegiate athletes (4 male, 3 female) participate in this study. Each athlete completed motion analysis and isometric muscle strength testing. During motion analysis testing each athlete performed, in counterbalanced order, both the BS and FS at loads of 40, 60, and 80% of their FS one-repetition maximum (1-RM). Kinematic and kinetic data were captured from markers placed on anatomical landmarks (Plug-in Gait marker set) and from two force plates underneath the athletes' feet. These data were used to calculate the net joint moments (NJM) during each exercise and at each load. During the isometric strength testing sessions each athlete performed maximal voluntary isometric contractions (MVIC) at 30, 60,