MUSCLE ACTIVATION LEVELS DURING STANDING HIP JOINT STRENGTHENING EXERCISES USING ELASTIC TUBING RESISTANCE: COMPARISON OF TRADITIONAL CARDINAL PLANE MOVEMENTS VERSUS PROPRIOCEPTIVE NEUROMUSCULAR FACILITATION (PNF) SPIRAL-DIAGONAL PATTERNS

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Abstract (Limited to 300 Words):

PURPOSE: Quantify activation levels bilaterally of hip muscles during resisted lower extremity (LE) standing exercises using elastic tubing: (1) front pull; (2) back pull; (3) crossover; (4) reverse crossover; (5) PNF diagonal 1 flexion (D1F); (6) PNF diagonal 1 extension (D1E); (7) PNF diagonal 2 flexion (D2F); and (8) PNF diagonal 2 extension (D2E).

SUBJECTS: Thirteen men (25 ± 3 years),13 women (24 ±1) participated.

METHODS AND MATERIALS: Electromyographic (EMG) signals for moving and stance side hip muscles were collected using DE-3.1 double differential surface electrodes at a sampling frequency of 1000 Hz. EMG signals were normalized to peak activity in the maximum voluntary isometric contraction (MVIC) trial and expressed as a percentage. Subjects completed 3 - consecutive repetitions of LE exercises in random order.

ANALYSES: Descriptive statistics-including means and standard deviations (SDs)- for EMG recruitment (% MVIC) in the gluteus medius, hip adductors, hamstrings, and rectus femoris were calculated for both the stance and moving sides. The magnitudes of the EMG recruitment were analyzed with a 2 x 8 repeated-measures ANOVA for each muscle ($\alpha = .05$).

RESULTS: Adductor average EMG activation was greatest during crossover (moving limb 69 ± 5% MVIC; stance limb 52 ± 4% MVIC). Rectus femoris average EMG activation was greatest bilaterally during reverse crossover (moving limb 51 ± 6% MVIC; stance limb 57 ± 7% MVIC). Hamstring average EMG activation was greatest for the moving limb during back pull (57 ± 7% MVIC), and for the stance limb during D1F (51 ± 6% MVIC). Gluteus medius average EMG activation was greatest during reverse crossover (moving limb 72 ± 5% MVIC; stance limb 67 ± 7% MVIC).

CONCLUSIONS: Hip muscles were activated above a 50% MVIC threshold necessary for strengthening using one of the eight exercises.
IMPLICATIONS: The stance limb generated muscle activation levels (> 50% MVIC) consistent with LE strengthening during resisted exercises using elastic tubing.