Core muscle activation during Swiss ball and traditional abdominal exercises.
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Comment in:

- J Orthop Sports Phys Ther. 2010 Aug;40(8):538-9; author reply 539-41.

Abstract

STUDY DESIGN: Controlled laboratory study using a repeated-measures, counterbalanced design.

OBJECTIVES: To test the ability of 8 Swiss ball exercises (roll-out, pike, knee-up, skier, hip extension right, hip extension left, decline push-up, and sitting march right) and 2 traditional abdominal exercises (crunch and bent-knee sit-up) on activating core (lumbopelvic hip complex) musculature.

BACKGROUND: Numerous Swiss ball abdominal exercises are employed for core muscle strengthening during training and rehabilitation, but there are minimal data to substantiate the ability of these exercises to recruit core muscles. It is also unknown how core muscle recruitment in many of these Swiss ball exercises compares to core muscle recruitment in traditional abdominal exercises such as the crunch and bent-knee sit-up.

METHODS: A convenience sample of 18 subjects performed 5 repetitions for each exercise. Electromyographic (EMG) data were recorded on the right side for upper and lower rectus abdominis, external and internal oblique, latissimus dorsi, lumbar paraspinals, and rectus femoris, and then normalized using maximum voluntary isometric contractions (MVICs).

RESULTS: EMG signals during the roll-out and pike exercises for the upper rectus abdominis (63% and 46% MVIC, respectively), lower rectus abdominis (53% and 55% MVIC, respectively), external oblique (46% and 84% MVIC, respectively), and internal oblique (46% and 56% MVIC, respectively) were significantly greater compared to most other exercises, where EMG signals ranged between 7% to 53% MVIC for the upper rectus abdominis, 7% to 44% MVIC for the lower rectus abdominis, 14% to 73% MVIC for the external oblique, and 16% to 47% MVIC for the internal oblique. The lowest EMG signals were consistently found in the sitting march right exercise. Latissimus dorsi EMG signals were greatest in the pike, knee-up, skier, hip extension right and left, and decline push-up (17%-25% MVIC), and least with the sitting march right, crunch, and bent-knee sit-up exercises (7%-8% MVIC). Rectus femoris EMG signal was greatest with the hip extension left exercise (35% MVIC), and least with the crunch, roll-out, hip extension right, and decline push-up exercises (6%-10% MVIC). Lumbar paraspinal EMG signal was relative low (less than 10% MVIC) for all exercises.

CONCLUSIONS: The roll-out and pike were the most effective exercises in activating upper and lower rectus abdominis, external and internal obliques, and latissimus dorsi muscles, while minimizing lumbar paraspinals and rectus femoris activity. J Orthop Sports Phys Ther 2010;40(5):265-276, Epub 22 April 2010. doi:10.2519/jospt.2010.3073.
PMID: 20436242 [PubMed - indexed for MEDLINE]

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