

Comparison of Abdominal Muscle Activity During a Single-Legged Hold in the Hook-Lying Position on the Floor and on a Round Foam Roll

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Context: To improve trunk stability or trunk muscle strength, many athletic trainers and physiotherapists use various types of unstable equipment for training. The round foam roll is one of those unstable pieces of equipment and may be useful for improving trunk stability.

Objective: To assess the effect of the supporting surface (floor versus round foam roll) on the activity of abdominal muscles during a single-legged hold exercise performed in the hook-lying position on the floor and on a round foam roll.

Design: Crossover study.

Setting: University research laboratory.

Patients or Other Participants: Nineteen healthy volunteers (11 men, 8 women) from a university population.

Intervention(s): The participants were instructed to perform a single-legged hold exercise while in the hook-lying position on the floor (stable surface) and on a round foam roll (unstable surface).

Main Outcome Measure(s): Surface electromyography (EMG) signals were recorded from the bilateral rectus abdominis, internal oblique, and external oblique muscles. Dependent variables were examined with a paired *t* test.

Results: The EMG activities in all abdominal muscles were greater during the single-legged hold exercise performed on the round foam roll than on the stable surface.

Conclusions: The single-legged hold exercise in the hook-lying position on an unstable supporting surface induced greater abdominal muscle EMG amplitude than the same exercise performed on a stable supporting surface. These results suggest that performing the single-legged hold exercise while in the hook-lying position on a round foam roll is useful for activating the abdominal muscles.

Key Words: trunk stability, low back pain, electromyography, injury prevention

Key Points

- The unilateral single-legged hold exercise performed on a round foam roll resulted in greater abdominal muscle activation than did the same exercise performed on a stable surface.
- During this exercise on a round foam roll, activation of the transversus abdominis/internal oblique muscles was greater on the contralateral side, but activation of the rectus abdominis and external oblique muscles was greater on the ipsilateral side.

Trunk stability is essential to prevent lumbar compensatory motion^{1,2} and to reduce the intensity^{3–5} and recurrence rate⁶ of low back pain. Trunk stability is maintained by passive, active, and neural control subsystems.⁷ The trunk muscles are coactivated through integrated active and neural control subsystems to stabilize the trunk and spinal segment.^{7–9}

Unlike the cervical spine, the lumbar spine lacks flexor muscles just anterior to the vertebral body; thus, to achieve trunk stability, it is essential to improve abdominal muscle activity and coordination.^{8,9} Previous authors have suggested that trunk stability can be improved with pelvic tilt,¹⁰ abdominal hollowing,¹⁰ abdominal bracing,¹⁰ curl-up,¹¹ bridging,¹² and “dead-bug” exercises.¹¹ Unstable surfaces, such as a gym ball or wobble board, have been

used to increase the difficulty level of trunk stability exercises.¹³ Previous researchers^{13–15} compared the activity of the trunk and abdominal muscles on unstable and stable surfaces and demonstrated that abdominal muscle activity was greater on the unstable surface. Rectus abdominis (RA) and external oblique (EO) activity was greater when curl-up exercises were performed on unstable surfaces compared with stable surfaces,¹³ and Marshall and Murphy¹⁴ reported that activity of the RA muscle was greater during exercise on the Swiss ball than on a stable surface. Similarly, Behm et al¹⁵ found that activity of the upper lumbar erector spinae, lumbosacral erector spinae, transversus abdominis (TrA), and internal oblique (IO) muscles during the chest press exercise was greater on an unstable surface than on a stable surface.