

Core Muscles Activity Levels During Lumbar Stabilization Exercises

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Abstract:

Purpose: This study examined the muscle activity levels of abdominal and back muscles while subjects performed specific exercises for lumbar stabilization training with abdominal bracing and drawing-in.

Relevance: Low Back pain is the most prevalent cause of absenteeism and low productivity in many European countries. To define a rehabilitation program that best meets the needs of these patients it's important to identify which exercises allow greater activation of the muscles that promote stability of the lumbo-pelvic region.

Participants: Eleven fitness instructors volunteers, 5 male and 6 female (mean age=26 years, SD=2.5, range=22-30; mean height=170 cm, SD=10, range=158-192; mean mass=66.8 kg, SD=14.6, range=48-90) participated. All subjects were healthy and had no history of low back pain.

Methods: The subjects performed nine exercises with abdominal bracing (Curl-up, SideBridge and Birdog executed bilaterally with and without progressions) and other nine exercises using the drawing-in maneuver (Hundreds, ShoulderBridge and three parts of the DoubleLegStrech, all with and without progressions). Surface electromyography was used to record the activity of selected abdominal [rectus abdominis (RA), obliquus externus abdominis (OE), obliquus internus abdominis/transversus abdominis (TrA/OI)] and back muscles [multifidus (Mu) and lumbar erector (Er)] of the right side of the trunk.

Analysis: The SPSS software was used for data analysis. Paired *t*-tests or Wilcoxon tests were performed to find significant differences in the levels of muscle activation between exercises. Statistical significance was accepted at the 0.05 level of confidence.

Results: The activity levels of the muscles were analyzed as a percentage of maximal voluntary isometric contraction. The RA muscle was mostly recruited in the exercises Curl-

Up and DoubleLegStretch5 with no significant differences between these two exercises. The exercises that produce greater activity levels of OE muscle were right SideBridge with progression, DoubleLegStretch5 and Curl-up. For this muscle were found significant differences between SideBridge with and without progression. The TrA/OI muscles showed a higher activity level for the Curl-up and SideBridge exercises, but no differences were significant. Both back muscles, Mu and Er, were higher recruited on right SideBridge without progression, but with no significant differences between this exercise and right SideBridge with progression or right Birdog with progression exercises. In relation to the simultaneous activation of muscles TrA/OI and MU there was greater co-activation in the exercise SideBridge with and without progression.

Conclusion: Our results suggest that, of all exercises, SideBridge appear to constitute the most complete and appropriate for lumbo-pelvic stabilization training, although shoulder complex must be assessed. All the exercises produced activity levels less than 25% of CVM, so they may be beneficial in the initial phase of a core rehabilitation program.

Implications: Our results suggest that these exercises could be used for a core rehabilitation or endurance program. Depending on the individual needs, some of these exercises may be more beneficial than others for achieving lumbo-pelvic stabilization.

KeyWords: lumbo-pelvic stabilization, bracing, drawing-in

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