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Role of Transverse Abdominis Muscle in Trunk Biomechanics: A Critical Review

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ABSTRACT

The Transverse Abdominis (TrA) is the deep abdominal muscle with a transverse fiber arrangement, known to have an anticipatory activation before any bodily movement, and has a role in the stabilisation of the lumbar and pelvic area. Although we have a general understanding of the abdominal muscle in the biomechanical component of the trunk, the role of TrA is not completely understood. This critical review thus aims to exploreand outline the role of TrA in various biomechanical functions of the trunk including trunk rotation,inter-abdominal pressure, stability, and respiration. A comprehensive literature search was conducted to identify full-text articles exploring the role of TrA in trunk biomechanics, published in English across PubMed, EMBASE, EBSCOhost, and Cochrane Library between 2014 and 2024. Keywords like 'Transverse Abdominis', 'Trunk Rotation', 'Trunk Motion', and 'Electromyography" were used as the search terms along with Boolean operators (AND, OR). Eligibility for inclusion was not restricted by any demographic or study design considerations. A total of 6 studies were identified and analysed to summarise the role of TrA. The review found that the TrA activation increases ipsilateral trunk rotation and helps in thoracolumbar and pelvic stability rather than initiation of the movement. During the perturbation and limb movement, through various reflexive mechanisms, TrA acts as a respiratory muscle and spinal stabilisation is secondary to it. The selective exercise for deep abdominal muscle and lumbar stabilisation exercise help in improving the thickness of TrA resulting in stabilisation of the lumbar region and posture. The TrA increases intra-abdominal pressure resulting in the extension of the lumbar vertebrae resulting in increased chest mobility as well. To conclude, findings suggest that TrA plays a crucial role in trunk rotation, stability, and respiration. While this review highlighted the multifaceted role of the TrA in trunk biomechanics, further research is warranted.

Keywords: Abdominal muscles, Biomechanical phenomena, Lumbosacral region, Posture, Respiratory muscles