

Diaphragm, core stability & low back pain: a rehabilitative-preventive perspective

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Introduction

Core muscles exercises has gained popularity among physical therapists or fitness professionals and they are used for both rehabilitation and injury prevention purposes. In the available literature core training is also performed for people with Low Back Pain (LBP). One of the origins of LBP could be attributed to a motor control dysfunction in abdominals and paraspinals muscles¹ However, the breathing pattern is involved in core stabilization and motor function;² in fact the diaphragm, in synergy with other muscles, forms the “core region”.³ The aim of this brief review is to provide a concise summary on the role of breathing and core stability exercises in the prevention of LBP.

Diaphragm and low back pain

Many studies investigated the connection between respiratory muscles and LBP. Kolar et al. showed that people with LBP have an abnormal diaphragm position.⁴ Individuals with LBP exhibit major diaphragm fatigue compared to healthy one.⁵ Moreover, it is important to highlight that the whole breathing pattern is affected by LBP in terms of dyspnea, allergies and *Chronic Obstructive Pulmonary Disease*.⁶

Abdominal hollowing

One modality to train the core is the Hollowing technique. This approach was used to train the core not only for healthy subjects, but also in treating LBP.⁷ The Hollowing Technique consists on a local contraction of transversus abdominis (TrA) and multifidus by drawing the belly button toward the spine. Many studies found that this maneuver permits an anticipatory TrA activation.⁸ The purpose is to recruit the deep core muscles, avoiding superficial abdominal motion. Hides et al. demonstrated that a specific training program significantly decreased LBP episodes compared with control group.⁹

Abdominal bracing

This technique is another possibility to recruit abdominal muscles using a simultaneous contraction of global core muscles, locking the rib cage to the pelvis and tightening the core muscles at 360°, breathing normally, in order to be stiff and to protect the spine.¹⁰ Abdominal Bracing, thanks to TrA, external/internal obliques, rectus abdominis and quadratum lumborum co-contraction, increases spine stability limiting lumbar motions.¹¹

Traditional abdominal exercises

Generally, the most common progression model to train the core muscles consists in performing static or dynamic contractions³ like

crunches or sits-up. As a matter of fact, this type of exercises are associated to spine flexion which induces high lumbar compressions that could be injurious;¹² in addition, the flexed spine position is rarely used during daily life activities.¹³

Discussion

Some of the studies published on this issue have underlined the associations between breathing pattern, core stability and LBP. Vera-Garcia et al. demonstrated that the core stability provided by the Hollowing technique was less effective in terms of spine protection against perturbations compared to Bracing. In fact, Abdominal Bracing has been found to guarantee better trunk stability.¹¹ On the other hand, also the diaphragm has fundamental role in core stability, as suggested by the Dynamic Neuromuscular Stabilization technique,¹⁴ by promoting bracing thanks to a lower abdomen region-ribcage expansion. From a LBP rehabilitative viewpoint, it could be useful to follow these points: performing a proper diaphragmatic breath with a parallel whole body segments alignment;¹⁵ restoring the basic motor function with patterns like crawling, rocking, rolling.¹⁴ Finally, because of muscular spasms induced by LBP, it could be necessary to decrease the muscle tone, for example with global postural stretching.¹⁶ In conclusion, there is not an exclusive single exercise to stimulate the core structure, but all of the above-mentioned techniques are effective. For a major daily life transfer, it is important to train core muscles respecting the body postures which are more frequently used.

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None.

Conflicts of interest

None.

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