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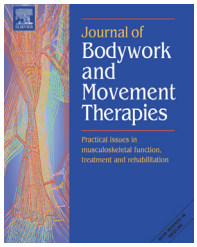



# 'The core': Understanding it, and retraining its dysfunction

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**Summary** "Core stability training" is popular in both the therapeutic and fitness industries but what is actually meant and understood by this concept? And does everyone need the same training approach?

This paper examines the landscape of 'the core' and its control from both a clinical and research perspective. It attempts a comprehensive review of its healthy functional role and how this is commonly changed in people with spinal and pelvic girdle pain syndromes.

The common clinically observable and palpable patterns of functional and structural change associated with 'problems with the core' have been relatively little described.

This paper endeavors to do so, introducing a variant paradigm aimed at promoting the understanding and management of these altered patterns of 'core control'.

Clinically, two basic subgroups emerge. In light of these, the predictable difficulties that each group finds in establishing the important fundamental elements of spino-pelvic 'core control' and how to best retrain these, are highlighted.

The integrated model presented is applicable for practitioners re-educating movement in physiotherapy, rehabilitation, Pilates, Yoga or injury prevention within the fitness industry in general.
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## Introduction

Despite a lot of research around the subject, there is apparent confusion in understanding what goes wrong with 'the core' and how to properly retrain it. The noted researcher, McGill (2009) opines: "There's so much mythology out there about the core. The idea has reached trainers and through them the public that the core means only the abs. There's no science behind that".

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'Core confusion' and/or reductionism of 'core' as synonymous with the abdominals and by association, the 'need to strengthen them' utilizing 'high load' (strength/effort) training starts to permeate research design and outcomes (George et al., 2011; Escamilla et al., 2010). The misunderstanding becomes further entrenched.

Most people with spino-pelvic pain syndromes generally have relatively low level function and *cannot organize the basic elements of 'core control'*. Subjecting them to individual muscle group and 'high load' training strategies is likely to further imprint perturbed motor patterns and in many, symptom development or exacerbation.

Debate around 'core stability' has begun to surface (McNeill, 2010), questioning the concept and the real value of 'training the core' (Allison and Morris, 2008; Allison et al., 2008; Lederman, 2010).

## A historical perspective on 'core'

In spite of all the interest in 'the core' it is difficult to find a succinct definition of it.

Long before 'the core' became fashionable, Ida Rolf conceptualized the myofascial system as 'intrinsic' and 'extrinsic'. The intrinsic are the 'core', inner 'being' muscles. The extrinsic are the 'sleeve' — the large/superficial 'doing' muscles (Linn, 2004). She saw that inappropriate substitution by the 'extrinsics' for the 'intrinsics' — "living in their extrinsics", was a sign of somatic immaturity or dysfunction (Smith, 2008). These are useful concepts to keep in mind.

The concept of 'core stability' probably emanated from Australian research into postural control in both healthy and chronic low back pain (CLBP) populations. They were interested in the role of the motor system — how the nervous system organizes the appropriate responses to support the spine, give us the postural control to counteract gravity and balance while at the same time, also co-coordinating important functions such as breathing and continence. The evidence suggests that when spinal pain is present, the strategies used by the central nervous system may be altered (Hodges, 1999, 2000, 2001). Much of their research involved studying the feedforward anticipatory role played by the intra-abdominal pressure (IAP) *mechanism*, an important aspect of the antigravity postural control and spinal stabilization system. They studied the roles of various muscles contributing to a ***synergy of muscles*** responsible for generating intra-abdominal pressure (IAP) — transversus abdominis, the diaphragm, the pelvic floor muscles (PFM) and lumbar multifidus.

Hence it is appropriate to adopt the term '**stabilization synergy**'. This affords 'intrinsic' *control from the inside* — the 'core' of our being.

These researchers found that in healthy populations the individual elements of the 'stabilization synergy' *spontaneously* ***co-activate*** *in advance* of limb movement: — transversus abdominis (Hodges and Richardson, 1996, 1997); the diaphragm (Hodges et al., 1997a; Hodges and Gandevia, 2000a,b); the pelvic floor (Hodges et al., 2007; Smith et al., 2007a); deep fibres of lumbar multifidus (Moseley et al., 2002). Yet, in CLBP and chronic pelvic girdle pain (CPGP), the pre-activation response of ***all*** these muscles was variably ***delayed and/or diminished*** during movement (Hodges and Richardson, 1998, 1999a; Hungerford et al., 2003; O'Sullivan et al., 2002).

However, their findings have been somewhat misinterpreted, such that transversus abdominis has been singled out as '*the* core muscle' — transversus and 'core' have become inextricably linked. This myth-conception is propagated as the panacea for just about everything from helping back pain, enhancing performance, to improving your shape. Transversus abdominis dysfunction is only a part of the problem.

Joseph Pilates work has become linked with 'the core' although he didn't use the term. His interest was "physical fitness and the complete coordination of body mind and spirit — good posture, flexibility and vitality" (Pilates and Miller, 1945). He worked with the physically elite — gymnasts, dancers and circus performers, and many of his exercises are 'high load' strengthening with a strong focus on activating the abdominals (into lumbar flexion) and gluteals with the breath.

Many of the moves are difficult to perform properly and also risk provoking lumbo-pelvic pain symptoms e.g. 'The Roll up', 'The Teaser'.

Later disciples of his method use the term 'the powerhouse' "*... to describe the collective muscles of your abdominals, gluteals (buttock muscles) and lower back musculature. We define the powerhouse as the centre of strength and control for the rest of your body. Pilates practitioners also refer to this region as your 'girdle of strength' or your 'core muscles'*" (Ungaro, 2002).

One starts to understand how the confusion begins to occur — the shift in seeing 'the girdle' and the 'abdominals' in becoming synonymous' with 'core'. Note also that this notion of the 'powerhouse' alludes to a more '***extrinsic***' locus of control.

The risk is that the 'inner locus of control' gets bypassed.

## Examining the healthy 'core'

### 'Core' structure

'Core' is often simply construed as the muscles that wrap around and 'pull in the midriff' — the transversus trap. 'Core' is more complex.

The pelvis is the main centre of weight shift and 'load transfer' in the body. The body's centre of gravity is anterior to the second sacral segment (S2) in the standing anatomical position (Neumann, 2002) hence our mechanical 'core' is principally around the front of the sacrum. Yet, as the diaphragm and anterolateral abdomen are critical in 'core support' and movement control, structurally, 'the core' reaches from the ischial tuberosities up to the mid thorax where the diaphragm and transversus abdominis attach superiorly.

Energy expenditure is minimized when the head, thorax and pelvis are aligned in relation to the line of gravity — known as the 'neutral' spinal posture. The rib cage, anterolateral abdominal wall (ALAW) and the pelvic ring form a framework of 'hoop bracing' to the spinal column and enclose an internal body chamber capable of volume change through expansion

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