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Lifting Out of Pain

Dan Williams presents a case for complex weightlifting movements as a safe, efficient and effective method for rehabilitation and prevention of lower-back pain: a proposed treatment methodology and review of the literature.

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I propose that the rehabilitation and prevention of non-specific lower-back pain is dependent on the mechanically correct patterning of fundamental human movement. Though not immediately apparent, elements of Olympic weightlifting and powerlifting neatly fulfill this required motor patterning.

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Controversial? Perhaps, but there is no place for contrived and invented movements in creating a buffer from injury. Fundamental movements are natural and are “no more contrived than a sneeze,” to quote Greg Glassman.

Let me first outline my empirically based philosophies on the matter, then review the literature supporting these concepts.

Activating the Right Muscles

Let us not think of exercises in terms of their anatomical recruitments but in terms of their movements. A deadlift becomes a lift to the waist. A clean becomes a lift to shoulder height. A press becomes a lift to overhead. A squat becomes a stand from a chair.

To detractors of the squat, the question must be posed as to how a patient is to stand from a chair. Detractors of the deadlift should consider the best method of picking up an object from the floor. The answers, respectively, are squat and deadlift. It is guaranteed that a patient will at some stage perform these movements as part of activities of daily living. Surely it is a professional obligation to teach them how to execute these movements correctly in a clinical setting so they may move safely when these movements inevitably rear themselves in life.

The common thread between the proposed movements is the ability to maintain neutral spine with the addition of external perturbations and complex motor patterning. Here lies the immediate red flag. Should neutral spine be lost, the body is prone to damage and deformity. As with any exercise with the potential to elicit any degree of favorable response from the body, risk is present. The key lies in minimizing this risk through gradual and progressive repetition of the basics of movement without load.

The role of the prime movers is just that: movement. Similarly, the role of the stabilizers is stability, or the resistance of movement. The loads and body positions experienced during complex movement add perturbations, and the act of resisting these perturbations (deviations from neutral spine) trains the stabilizers according to their role.

With mastery of the mechanics comes a development of healthy motor patterning, paving the way for future increases in intensity. Should musculoskeletal factors prevent the correct development of movement, the movement should not occur in its suboptimal state until these factors are addressed.



R. Lucas/CrossFit

Being able to stabilize the spine is important in lifting, but it's also important in daily life.

For example, it can be observed that movements between the ground and chin have a propensity to reduce lumbar lordosis and create dangerous spinal loading. Fundamentally, this is a result of a tightness through musculature causing a posterior pelvic tilt, and a weakness (or inhibition) of musculature causing an anterior pelvic tilt.

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Conversely, movements overhead can be observed to have the opposite effect: increasing the level of lordosis due to any combination of a tight thoracic spine, impaired shoulder flexion, tight hip flexors, weak gluteals and weak abdominals.

By definition, the conscious effort to maintain lumbar curve with weight both below the chin (by resisting lumbar flexion and a posterior pelvic tilt) and above the chin (by resisting lumbar extension and an anterior pelvic tilt) is correcting the very imbalances causing these problems. Should neutral spine be unattainable, even with strict technique development, the underlying imbalances must first be corrected.

A common concern regarding the deadlift as a safe exercise (not to mention an effective rehabilitator) is the perceived tendency to utilize superficial prime movers (erector spinae, latissimus dorsi) in the role of stabilizers (a role that should be occupied by deeper segmental musculature, including multifidus). Incorrect patterning



T. Campitelli/CrossFit

***Weight held below the chin has a tendency to eliminate the lumbar curve.
With proper training, athletes can develop the core strength needed to maintain that curve.***



T. Campitelli/CrossFit

Carey Kepler addresses the bar before setting her lumbar curve at the 2010 CrossFit Games.

in this respect can increase compression at the facet and sacroiliac joints. This is not to say that the more superficial structures of the thoraco-lumbar fascia, hip, back and abdominal musculature do not have a role. The concern, however, is that they occur in isolation, without the anticipatory activation of the deeper musculature.

Review of Literature

The concept to explore then, is how best to train the deep segmental musculature? In addition, is it possible to train these stabilizers using “real” movements (read: deadlifts, squats, etc.)?

The need for real movements stems from the concept that activation created in a vacuum (e.g., lying prone) is only useable in a vacuum. Segmented practice leads to segmented capacity. Research has already shown that free weights elicit a greater increase in strength (115 percent versus 57 percent for fixed range-of-motion exercise) and balance (245 percent versus 49 percent for fixed range-of-motion exercise), and that they result in lower overall pain levels (1). If it can be shown in the literature that these complex movements are proficient in creating the desired activation patterns, surely these same movements can be accepted as safe, effective and efficient tools.

Nuzzo et. al. compared isometric trunk-muscle activation during stability and free-weight exercises (squats and deadlifts) (2). Activation levels (measured via IEMG) of the multifidus and longissimus muscles were found to be significantly greater during the squats and deadlifts than the isometric contractions. Assuming a link between cross-sectional area and strength, the study questioned the effectiveness of stability exercises and recommended squats and deadlifts to activate and thus strengthen these muscle groups.

A similar conclusion was drawn by Hamlyn et. al. in the article “Trunk muscle activation during dynamic weight-training exercises and isometric instability activities,” in which it was stated, “Individuals performing upright, resisted, dynamic exercises can achieve high trunk muscle activation and thus may not need to add instability device exercises to augment core stability training” (3). The movements we are discussing herein are indeed upright, resisted and dynamic.

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The harder an athlete works to maintain core stability, the less chance of injury.

Again regarding levels of core activation, Behm et. al. stated that Olympic lifts, squats and deadlifts "have been shown to activate the core musculature to a greater extent than callisthenic-type exercises." (4).

The effect of stabilization training versus dynamic resistance training on the cross-sectional area of the paravertebral muscles was examined in patients with chronic lower-back pain by Daneels et. al. (5). Stabilization exercises were found to have no effect on the cross-sectional area of the musculature, leading the authors to conclude that, "Intensive lumbar resistance training seems to be necessary to restore the size of the paravertebrals in chronic lower back pain patients with atrophied back muscles".

Though more specific to the cross-sectional area of the multifidus, a similar concept was studied by many of the same researchers (Daneels et. al.), also in 2001 (6). Stabilization training on its own was found to elicit "no significant differences" in lower-back pain. Multifidus cross-sectional area was, however, found to have increased when this stabilization training was combined with "intensive lumbar dynamic-static strengthening."

Maier et. al. explored the effects of Motor Control Exercise (sometimes called "specific spinal stabilization exercise") (7). They indicated, "The key feature of the motor control exercise approach is the training of the deep trunk muscles in isolation before progressing to demanding tasks that train coordination of the deep and the superficial trunk muscles." Specific to this review, Olympic lifts and powerlifts fit the category of "demanding tasks." The authors further define these tasks as "functional tasks and exercises targeting coordination of trunk and limb movement and maintenance of trunk stability." This fits our requirement to maintain neutral spine with the addition of external perturbations and complex motor patterning. The study goes on to state, "There is no evidence for the efficacy of motor control exercise in the treatment of chronic low back pain." An argument for complex resistance-based exercises is supported by the lack of a quantifiable benefit of motor control or specific spinal stabilization exercise and the difficulty of retraining specific muscles.

Koumantakis et. al. came to a similar conclusion regarding non-specific lower-back pain, stating, "Stabilisation exercises do not appear to provide additional benefit," and "Patient engagement in activity through safe exercising and not particular types of exercises may be the key component for successful lower back pain management" (8).

Macedo et. al. (2009) supported the findings of the previous two studies, stating that:

We did not find convincing evidence that motor control exercise was superior to manual therapy, other forms of exercise, or surgery. An intriguing finding of this review was that motor control exercise was as effective in reducing pain and increasing quality of life as a less-complex form of exercise therapy that did not incorporate the retraining of specific muscles that often is time consuming to therapists and patients. (9)

Complex and Effective?

If complex resistance-based exercises are just as effective, easier to teach, easier to complete correctly (without biofeedback) and offer the added benefits of global muscle strengthening, increased strength, increased functional capacity and functional movement pattern training, then surely they have a place in the prevention and treatment of lower-back pain.

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