[ Sports Physical Therapy ]

# Core Stabilization Exercise Prescription, Part 2: A Systematic Review of Motor Control and General (Global) Exercise Rehabilitation Approaches for Patients With Low Back Pain

Jason Brumitt, PT, PhD, SCS, ATC, CSCS,*† J. W. Matheson, PT, DPT, MS, OCS, SCS, CSCS,‡ and Erik P. Meira, PT, SCS, CSCS§

**Context:** Therapeutic exercises are frequently prescribed to patients with low back pain. Numerous exercise programs for patients with low back pain have been described. Many of these treatment programs are based on 1 of 2 popular rehabilitation strategies: a motor control exercise approach or a general exercise approach.

**Data Sources:** PubMed clinical queries from 1966 to March 2013 for keyword combinations including *motor control exercise, core stability exercise, therapeutic exercise, general exercise, global exercise, local exercise, transversus abdominis, segmental stabilization*, and *low back pain*.

**Study Selection:** Randomized controlled trials that assessed the effects of a motor control exercise approach, a general exercise approach, or both for patients with low back pain that were published in scientific peer-reviewed journals.

**Data Extraction:** Included studies underwent appraisal for exercise intervention and outcomes.

**Results:** Fifteen studies were identified (8, motor control exercise approach without general exercise comparison; 7, general exercise approach with or without motor control exercise approach comparison). Current evidence suggests that exercise interventions may be effective at reducing pain or disability in patients with low back pain.

**Conclusion:** Stabilization exercises for patients with low back pain may help to decrease pain and disability. It may not be necessary to prescribe exercises purported to restore motor control of specific muscles.

**Keywords:** core stabilization; low back pain; motor control exercise; multifidi; transversus abdominis

Injuries to the low back are common, with a prevalence as high as 80%.[25,26] Athletes also risk injury to the low back. Untimely episodes of acute low back pain (LBP) may impair an athlete's performance and affect his or her team's success. Chronic LBP may significantly impair performance for prolonged periods and in many cases require an athlete to retire from sport or participate in other forms of exercise or sport. Exercise prescription is recognized as 1 treatment that may benefit patients with LBP.[4,24]

Exercise can target the muscles and joints of the low back to rehabilitate the injured athlete.[1,2,13,14] Therapeutic exercises, specifically core stabilization exercises, decrease pain, reduce disability, improve quality of life, increase muscular endurance and strength, improve segmental stability, and reduce risk of injury.[10,13,21]

Part 1 of this article presented 2 clinically popular core stabilization rehabilitation strategies for individuals with LBP: a motor control exercise (MCE) approach and a general exercise (GE) approach. It is not currently known if one approach is

From the †School of Physical Therapy, Pacific University (Oregon), Hillsboro, Oregon, ‡Catalyst Sports Medicine, Hudson, Wisconsin, and §Black Diamond Physical Therapy, Portland, Oregon

*Address correspondence to Jason Brumitt, PT, PhD, SCS, ATC, CSCS, Assistant Professor, School of Physical Therapy, Pacific University (Oregon), 222 SE 8th Avenue, Hillsboro, OR 97089 (e-mail: brum4084@pacificu.edu).

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Table 1. Search strategy by keyword and number of identified and relevant articles

| | Publications | | |
|---|---|---|---|
| Keywords | Identified | Potentially Relevant | In Critical Appraisal |
| Motor control exercise | 1729 | — | — |
| Therapeutic exercise AND low back pain | 837 | — | — |
| General exercise AND low back pain | 188 | 17 | 8 |
| Segmental stabilization | 139 | 4 | 0 |
| Stabilizing AND exercise | 122 | 7 | 3 (2)[a] |
| Global exercise AND low back pain | 70 | 5 | 1 (2)[a] |
| Motor control exercise AND low back pain | 33 | 9 | 0 (4)[a] |
| Transversus abdominis AND exercise | 27 | 7 | 0 |
| Core stability exercises | 37 | 2 | 1 |
| Segmental stabilization exercises | 11 | 3 | 0 |
| Local muscle exercise AND low back pain | 10 | 0 | 1 |
| Core stability exercise AND low back pain | 6 | 2 | 0 (2)[a] |

[a]Duplicate results.

superior to the other in reducing pain and disability in patients with LBP. The purpose of this article is to review the efficacy of the 2 rehabilitation strategies.

## METHODS

### Data Sources

MEDLINE, CINAHL, and SPORTDiscus were initially searched to identify research relevant to the clinical question. However, thousands of articles were revealed per search term. For example, combining *low back* and *exercise* revealed over 4100 articles using the aforementioned search databases (March 2013).

An alternate search strategy was deemed necessary to reduce the high number of published nonexperimental studies that were revealed when using the aforementioned search engines. A PubMed clinical queries search was conducted to identify randomized controlled trials that included the MCE treatment approach, the GE approach, or both, while minimizing the number of studies not based on the randomized controlled trial.[9] The clinical queries search has been validated as a search strategy "to optimize retrieval from Medline (PubMed) of articles reporting high-quality clinical studies on prevention or treatment of health disorders."[9]

### Selection of Articles

A literature search was performed with a single subject (eg, segmental stabilization) or in combination with multiple subjects (eg, general exercise AND low back pain) (Table 1). When a search strategy presented fewer than 200 articles, the identified abstracts were reviewed for potential relevance to the clinical question. The inclusion criteria for this review consisted of studies published in English that contained a randomized controlled trial with 1 intervention group including either the MCE approach or a GE approach for patients with LBP. Fifteen articles were identified (Table 1). The reference lists of selected articles were also reviewed for studies relevant to the clinical question.

## RESULTS

### MCE Approach

Core stabilization exercises that are reported to train the "local" muscles of the trunk (eg, transversus abdominis and multifidi) are frequently referred to as MCEs for the low back.[21] Eight studies have been published assessing the effects of an MCE approach compared with general practitioner care (eg, treatments prescribed or performed by general practitioner: exercise prescription, medication prescription, manipulation, analgesic injection, education), a nonexercise intervention, or a control (nonintervention) group (see Appendix 1, available at http://sph.sagepub.com/content/suppl).[5,8,15-17,19,20,22] An MCE treatment program was superior in reducing pain or disability when compared with a general practitioner care program in 2 studies.[16,19] O'Sullivan et al[19] reported significant within- and between-group differences favoring the MCE treatment group

for pain reduction and improvement in disability. Moseley[16] also reported superior treatment effects for pain and disability for patients who completed an 8-session treatment program consisting of MCE, manual therapy, and educational sessions (neurophysiology of pain) than did those who continued care with a general practitioner. Shaughnessy and Caulfield[22] reported that a 10-week program targeting local muscles led to significant reductions in disability (as measured by the Oswestry Disability Questionnaire and the Roland Morris Disability Questionnaire) and significant improvement in health status (as measured by the SF-36, except for the general health subscale) and was significantly superior to a nonintervention group for the aforementioned outcome measures. The remaining 5 studies compared outcomes between an experimental group (spine stabilization treatment group) and (1) a manual therapy treatment program,[8,20] (2) an education intervention,[8,17] (3) the McKenzie-based treatment approach,[15] or (4) placebo.[5] The MCE treatment programs were superior to manual therapy interventions,[20] education,[17] and placebo modalities for selected outcome measures (see Appendix 1). However, the MCE program was statistically similar in the present pain index measure (subscale of the short-form McGill Pain Questionnaire) to a McKenzie-based treatment approach for patients with LBP of duration greater than 7 weeks.[15] Participants who completed a 6-week MCE program experienced significant improvements in pain descriptors ($P = 0.001$) and present pain index ($P = 0.002$), whereas those in the McKenzie group improved on only the present pain index ($P = 0.05$).[15] Finally, Goldby et al[8] found that both the manual therapy and MCE treatment programs led to significant decreases in pain and disability (outcomes assessed at 3, 6, and 12 months). The between-group effect favoring the MCE group was superior at only the 6-month assessment period.[8]

### GE Approach: With or Without MCE Comparison Group

A GE approach to core stabilization consists of strengthening exercises for the back; however, the approach does not include exercises that target local muscles in isolation. Seven studies assessed the effects of a GE treatment approach for patients with LBP, with 6 studies comparing outcomes against an MCE group.[3,6,7,11,12,18,23]

When a GE approach was compared with MCE, most studies reported no difference in outcomes between groups (see Appendix 2).[3,6,7,11,12,18,23] For example, Cairns et al[3] compared stabilization exercises for the local muscles against a program of active treatment without low-load, high-repetition muscle activity. At the end of 1 year, there were no differences between groups for disability, pain, psychological distress, or general health.[3] Critchley et al[6] also reported no differences in outcome measures among a treatment of specific trunk muscle retraining, an exercise program addressing local muscles, and an education group.[6] At 18 months, all 3 groups improved from baseline in disability and health quality-of-life measures.[6]

Two studies reported significant between-group differences favoring the GE approach.[11,17] Koumantakis et al showed that a GE approach was superior at reducing disability ($P = 0.027$) at the 2-month follow-up.[11] Both groups, however, realized significant improvements in pain reduction ($P < 0.001$). A week-by-week description of each exercise intervention was included. In addition, parity was created by manipulating the total time spent performing the exercises.[11] Total time spent exercising was based on estimation of total force output of the trunk muscles targeted by the exercises.[11] Norris and Matthews[18] suggested that a 6-week 3-stage exercise program was superior to an educational leaflet (back care advice) at reducing pain (short-form McGill Pain Questionnaire), disability (Roland Morris Disability Questionnaire), and fear of movement (Tampa Scale of Kinesiophobia) in patients with chronic LBP. The 3-stage program consisted of postural exercises (stage 1), back fitness exercises (stage 2), and functional strengthening (stage 3). Progression from stage 1 to stage 2 occurred when modalities were not necessary to reduce pain and patients could perform an abdominal hollowing contraction with their spine in neutral. Interestingly, the abdominal hollowing contraction is traditionally performed to activate the local muscles in isolation; however, GEs were performed for global musculature activation. Progression from stage 2 to stage 3 occurred when a participant could complete 5 single-leg lifts supine.

## CONCLUSION

Therapeutic exercises, either an MCE approach or a GE approach, appear to reduce pain and disability in patients with subacute or chronic LBP. In most cases, when an MCE approach was compared with a GE approach, there were no between-group differences for pain or disability. However, superior outcomes were reported in 2 studies with GE.[11,17] Based on the current evidence it may be unnecessary to prescribe therapeutic exercises that are purported to selectively activate the local muscles.

# Clinical Recommendations

**SORT: Strength of Recommendation Taxonomy**
**A:** consistent, good-quality patient-oriented evidence
**B:** inconsistent or limited-quality patient-oriented evidence
**C:** consensus, disease-oriented evidence, usual practice, expert opinion, or case series

| Clinical Recommendation | SORT Evidence Rating |
|---|---|
| A therapeutic exercise program consisting of motor control exercises may help reduce pain and disability in patients with low back pain lasting longer than 6 weeks.[3,5-8,15-20,22] | B |
| Patients with low back pain lasting longer than 6 weeks may benefit from a therapeutic exercise program consisting of general back-strengthening exercises. [3,6,7,11,12,18,23] | B |

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