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

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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

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

Keywords	Publications		
	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

^aDuplicate 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 al¹⁹ reported significant within- and between-group differences favoring the MCE treatment group

for pain reduction and improvement in disability. Moseley¹⁶ 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 Caulfield²² 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 al¹⁸ 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 al³ 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 al⁶ 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 Matthews¹⁸ 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

REFERENCES

- Brumitt J. A return to running program for the postpartum client: a case report. *Physiother Theory Pract.* 2009;25:310-325.
- Brumitt J. Successful rehabilitation of a recreational endurance runner: initial validation for the Bunkie test. *J Bodyw Mov Ther.* 2011;15:384-390.
- Cairns MC, Foster NE, Wright C. Randomized controlled trial of specific spinal stabilization exercises and conventional physiotherapy for recurrent low back pain. *Spine (Phila Pa 1976).* 2006;31:E670-E681.
- Chou R, Huffman LH. Nonpharmacologic therapies for acute and chronic low back pain: a review of the evidence for an American Pain Society/ American College of Physicians clinical practice guideline [erratum 2008;148:247-248]. *Ann Intern Med.* 2007;147:492-504.
- Costa LO, Maher CG, Latimer J, et al. Motor control exercise for chronic low back pain: a randomized placebo-controlled trial. *Phys Ther.* 2009;89:1275-1286.
- Critchley DJ, Ratcliffe J, Noonan S, Jones RH, Hurley MV. Effectiveness and cost-effectiveness of three types of physiotherapy used to reduce chronic low back pain disability: a pragmatic randomized trial with economic evaluation. *Spine (Phila Pa 1976).* 2007;32:1474-1481.
- Ferreira ML, Ferreira PH, Latimer J, et al. Comparison of general exercise, motor control exercise and spinal manipulative therapy for chronic low back pain: a randomized trial. *Pain.* 2007;131:31-37.
- Goldby LJ, Moore AP, Doust J, Trew ME. A randomized controlled trial investigating the efficiency of musculoskeletal physiotherapy on chronic low back disorder. *Spine (Phila Pa 1976).* 2006;31:1083-1093.
- Haynes RB, McKibbin KA, Wilczynski NL, Walter SD, Were SR. Optimal search strategies for retrieving scientifically strong studies of treatment from Medline: analytical survey. *BMJ.* 2005;330:1179.
- Hicks GE, Fritz JM, Delitto A, McGill SM. Preliminary development of a clinical prediction rule for determining which patients with low back pain will respond to a stabilization exercise program. *Arch Phys Med Rehabil.* 2005;86:1753-1762.
- Koumantakis GA, Watson PJ, Oldham JA. Trunk muscle stabilization training plus general exercise versus general exercise only: randomized controlled trial of patients with recurrent low back pain. *Phys Ther.* 2005;85:209-225.
- Macedo LG, Latimer J, Maher CG, et al. Effect of motor control exercises versus graded activity in patients with chronic nonspecific low back pain: a randomized controlled trial [erratum 2012;92:631]. *Phys Ther.* 2012;92:363-377.
- McGill S. *Low Back Disorders: Evidence-Based Prevention and Rehabilitation.* 2nd ed. Champaign, IL: Human Kinetics; 2007.
- Meira EP, Brumitt J. Minimizing injuries and enhancing performance in golf through training programs. *Sports Health.* 2010;2:337-344.
- Miller ER, Schenk RJ, Karnes JL, Rousselle JG. A comparison of the McKenzie approach to a specific spine stabilization program for chronic low back pain. *J Man Manip Ther.* 2005;13:103-112.
- Moseley L. Combined physiotherapy and education is efficacious for chronic low back pain. *Aust J Physiother.* 2002;48:297-302.
- Niemistö L, Lahtinen-Suopanki T, Rissanen P, Lindgren KA, Sarna S, Hurri H. A randomized trial of combined manipulation, stabilizing exercises, and physician consultation compared to physician consultation alone for chronic low back pain. *Spine (Phila Pa 1976).* 2003;28:2185-2191.
- Norris C, Matthews M. The role of an integrated back stability program in patients with chronic low back pain. *Complement Ther Clin Pract.* 2008;14:255-263.
- O'Sullivan PB, Phytty GD, Twomey LT, Allison GT. Evaluation of specific stabilizing exercise in the treatment of chronic low back pain with radiologic diagnosis of spondylolysis or spondylolisthesis. *Spine (Phila Pa 1976).* 1997;22:2959-2967.
- Rasmussen-Barr E, Nilsson-Wikmar L, Arvidsson I. Stabilizing training compared with manual treatment in sub-acute and chronic low-back pain. *Man Ther.* 2003;8:233-241.
- Richardson C, Hodges PW, Hides J, Richardson C. *Therapeutic Exercise for Lumbopelvic Stabilization: A Motor Control Approach for the Treatment and Prevention of Low Back Pain.* 2nd ed. New York, NY: Churchill Livingstone; 2004.
- Shaughnessy M, Caulfield B. A pilot study to investigate the effect of lumbar stabilization exercise training on functional ability and quality of life in patients with chronic low back pain. *Int J Rehabil Res.* 2004;27:297-301.
- Unsgaard-Tondel M, Fladmark AM, Salvesen O, Vasseljen O. Motor control exercises, sling exercises, and general exercises for patients with chronic low back pain: a randomized controlled trial with 1-year follow-up. *Phys Ther.* 2010;90:1426-1440.
- van Tulder MW, Koes B, Malmivaara A. Outcome of non-invasive treatment modalities on back pain: an evidence-based review. *Eur Spine J.* 2006;15(suppl 1):S64-S81.
- Waddell G. *The Back Pain Revolution.* 2nd ed. London, England: Churchill Livingstone; 2004.
- Waddell G. A new clinical model for the treatment of low back pain. *Spine (Phila Pa 1976).* 1987;12:632-644.