Research Paper Review

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The use of "stabilization exercises" to affect neuromuscular control in the lumbopelvic region: a narrative review

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ABSTRACT

It is well-established that the coordination of muscular activity in the lumbopelvic region is vital to the generation of mechanical spinal stability. Several models illustrating mechanisms by which dysfunctional neuromuscular control strategies may serve as a cause and/or effect of low back pain have been described in the literature. The term "core stability" is variously used by clinicians and researchers, and this variety has led to several rehabilitative approaches suggested to affect the neuromuscular control strategies of the lumbopelvic region (e.g. "stabilization exercise", "motor control exercise"). This narrative review will highlight: 1) the ongoing debate in the clinical and research communities regarding the terms "core stability" and "stabilization exercise", 2) the importance of sub-grouping in identifying those patients most likely to benefit from such therapeutic interventions, and 3) two protocols that can assist clinicians in this process.

BACKGROUND INFORMATION.

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It is well accepted that the neuromuscular control of the lumbopelvic region is an important factor in generating and maintaining spinal stability, and models have been proposed that describe mechanisms by which altered neuromuscular control strategies can lead to impaired spinal stability during functional activities. Over the years, several "stabilization exercise" programs have been proposed as being potentially useful in restoring optimal neuromuscular control. In general, these programs focus on having a patient perform functional movements whilst selectively targeting the transversus abdominis and multifidus muscles ("abdominal hollow") (1), or whilst attempting to contract all abdominal and lumbopelvic musculature ("abdominal brace") (2).

Current evidence generally suggests that exercise programs incorporating the "abdominal hollow" are more effective in reducing pain and disability than no treatment, regular medical treatment, and general

exercise (3-9). However, there are currently no published trials that have directly compared the effects of exercise programs incorporating the "abdominal hollow" with those incorporating the "abdominal brace".

One important consideration that is currently the focus of much attention in the literature is the need to develop clinical tools that can identify sub-groups of patients with low back pain who are more likely to respond to specific treatments. To date, there have only been a handful of published studies investigating the effects of stabilization exercise programs in sub-groups of patients deemed to be more likely to respond to such programs (10-12). One of the primary hindrances in conducting such studies is the current lack of reliable and valid clinical protocols to identify such sub-groups. Two protocols that have been described in the literature, and which have some degree of evidential support for their clinical use, are presented and discussed in this narrative review.

SUMMARY

Protocol 1: Treatment-Based Classification System (13)

Proposed criteria to identify patients more likely to respond to stabilization exercise (Note: the number of criteria that must be present to determine inclusion in this sub-group is not specified):

- History of frequent recurrent episodes of LBP precipitated by minimal perturbations
- History of alternating sides of a lateral shift deformity (i.e. antalgic posture)
- History of frequent spinal manipulation with short-term relief
- History of trauma, pregnancy, or use of oral contraceptives
- Pain relief with immobilization (e.g. external support, abdominal bracing)
- Clinical signs of generalized ligamentous laxity
- Clinical signs of "segmental instability" (e.g. presence of aberrant movement during lumbar range of motion testing, positive posterior shear test)

Evidential support for the system:

- Two studies have demonstrated moderate inter-rater reliability of classification assignment (14-15).
- One study provides preliminary evidence regarding the construct validity of the classification system (16).
- Two studies have demonstrated that patients who receive treatment matched to sub-group classification (i.e. spinal manipulation, stabilization exercise, directional preference exercise) had a significantly greater improvement in clinical outcomes post-intervention and at a 1-year follow-up compared to patients who did not receive matched treatment (17-18).

Current limitations of the system:

- The literature regarding this system is generally restricted to its use with acute low back pain patients.
- The type of stabilization exercise to prescribe to identified patients is not specified.

Protocol 2: Clinical Prediction Rule (19)

Proposed criteria to identify patients more likely to respond to stabilization exercise:

- Age < 40 years
- Average straight leg raise > 91°
- Presence of aberrant movement during lumbar range of motion testing
- Positive prone instability test

Evidential support for the system:

- The best rule for predicting treatment success (i.e. ≥ 50% reduction in disability score) following a stabilization exercise program ("abdominal brace") is the presence of ≥ 3/4 of the criteria (+LR: 4.0) (19).
- One study provides limited preliminary evidence regarding the construct validity of the prediction rule (20).
- One study demonstrated that patients identified using the rule who performed a stabilization exercise program ("abdominal brace" and "abdominal hollow") had a significantly greater improvement in clinical outcomes post-intervention and at a 3-month follow-up compared to identified patients who performed routine exercise (12).

Current limitations of the system:

- Has not undergone full validation or impact analysis testing.

CLINICAL APPLICATION & CONCLUSIONS

This narrative review highlights the ongoing debate in the literature regarding the use of "stabilization exercise" as a treatment for low back pain. The two clinical protocols described in the review have some degree of evidential support for their use in clinical practice. However, clinicians need to be aware of the limitations in the current evidence base for each protocol in order to apply them more appropriately and judiciously with their patients.

STUDY METHODS

This is a narrative (non-systematic) review of the published peer-reviewed literature.

STUDY STRENGTHS / WEAKNESSES

A relatively thorough literature search was performed to form the basis for this review. However, as with all narrative reviews, there may have been selection bias regarding the literature included and described in the review. Another limitation of this review is that a formal assessment of the quality and risk of bias for the included studies was not performed.

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