

LETTERS TO THE EDITOR-IN-CHIEF

Does Evidence Support the Existence of Lumbar Spine Coupled Motion? A Critical Review of the Literature

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We were very pleased to see the publication of the literature review by Legaspi and Edmond.⁶ As academic instructors, educators, and clinicians, we have encountered directional coupling concepts as requisite knowledge for use of manipulation, muscle energy techniques, and as a method of diagnosis. Summary evidence has existed for 4 years that lumbar spine coupling has questionable directional predictability,^{1,5} yet this concept continues to be advocated by textbooks and manual therapy education groups. Isn't it time for professionals to accept the evidence and redefine the role of biomechanics in manual therapy?

Our group has been active in analyzing and reviewing many dogmatic concepts of the spine and, like Legaspi and Edmond, has observed inconsistencies in the coupling behaviors of the lumbar spine,^{1,4,5} upper cervical spine,^{2,3} and, recently, the thoracic spine.⁷ We have questioned the continued importance placed upon this concept and have suggested that these findings provide an opportunity for beneficial change in treatment practice. We hope that articles such as Legaspi and Edmond's, as well as our portfolio of work, will foster continued changes in the concepts and approaches associated with manual therapy practice.

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AUTHORS' RESPONSE

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Thank you for your comments regarding our paper entitled "Does the evidence support the existence of lumbar spine coupled motion? A critical review of the literature."² We especially applaud

your reference to the need to analyze and review concepts and approaches commonly associated with manual physical therapy practice, and to implement changes in practice patterns based on these reviews.

Our conclusions regarding lumbar spine coupled motion were rendered relatively easy by the large number of published articles addressing this concept and the inconsistency in conclusions across these studies. Decisions regarding the validity of many other concepts involving manual therapy are less easily determined, owing to the paucity of related published studies. Perhaps as a result, many concepts that lack sufficient scientific evidence to justify their implementation are commonly used in clinical physical therapy practice. Examples abound, and include those suggested by Cook et al involving cervical and thoracic spinal coupled motion, as well as the far more sacrosanct concept of joint concave-convex rules.¹ We believe that the practice of implementing examination and intervention techniques that lack scientific merit have an overall negative impact on treatment outcomes.

Current research principles support the use of probability statistics to validate the implementation of new concepts and approaches. As such, the preponderance of the evidence must support the implementation of the new concept or approach under study for it to be justifiably incorporated into clinical practice. We believe that the same burden of proof should be placed on concepts and approaches that have already become part of the lexicon of physical therapy practice—that the burden should be placed on the justification, and not on the refutation of the concept being addressed. In our paper, we were able to demonstrate that there is a lack of evidence to support the premise that a specific pattern of coupled motion exists for the lumbar spine. Under this proposed schema, we would only support the use of coupled motion patterns in the clinical setting if we could

demonstrate with a high degree of probability that such a pattern exists.

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The Effect of Anterior Versus Posterior Glide Joint Mobilization on External Rotation Range of Motion in Patients With Shoulder Adhesive Capsulitis

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Congratulations to Johnson and her colleagues³ for their interesting and well done work! I would like to emphasize the positional fault of the humeral head mentioned by the authors as a likely explanation for the improvement of external rotation by posterior mobilization of the glenohumeral joint, which might seem contradictory to the convex-concave rule, but is not.

In the description of the techniques the authors do not mention any fixation of the scapula as described by Kaltenborn.⁴ Without this fixation, the humerus and scapula are moving together, producing angular movements rather than translatory ones. The anterior glide technique of the authors is therefore likely to stretch the anterior part of the joint capsule (by horizontal abduction)

and the posterior glide might stretch the posterior capsule (by horizontal adduction). Now, the posterior mobilization group improved in external rotation, but probably not because of stretching the posterior capsule, which limits internal rotation and not external rotation. There must be another explanation for the gain in external rotation.

The position of the humeral head in the glenoid fossa is mentioned by the authors: "It is common with these patients (with adhesive capsulitis) to palpate the humeral head displaced in an anterior position, with respect to the uninvolved shoulder."³ The posterior glide technique used in this study is likely to improve this positional fault, even without stretching the capsule. The authors do not describe the end feel and, therefore, it remains unclear if the restriction of external rotation is due to shortened connective tissue or, for example, pain. This hypothesis is supported by the authors' observation that in 4 subjects a sudden giving-way occurred, accompanied by an audible pop, followed by an immediate increase in external rotation range of motion, as well as more shoulder comfort reported by the subject. Therefore it is likely that it was a correction of this "positional fault," rather than a stretching of the joint capsule, that improved the external rotation. The authors suggest this possibility: "If a component of the improvement in external rotation ROM is associated with normalizing the humeral head position in the glenoid fossa, then it may be that stretch mobilizations of shorter duration are adequate to produce similar results."³

Probably, this anterior position of the humeral head changes the tension (not shortening) of the capsule and the rotator cuff which is responsible for the restricted external rotation movement. The authors suppose that the "capsule plays an important role in dictating the humeral head translation...,"³ and even state that "The results of this study are not at odds with the concave-convex

rule."³ The convex-concave rule, according to Kaltenborn,⁴ is the application of the mechanical principle of the lever law to joints. It explains the gliding movements between the joint surfaces that are caused by their form. Tightening the capsule and the rotator cuff increases joint compression forces leading to diminished gliding and increased rolling of the joint surfaces. Rolling changes the translation of the center of the head of humerus,¹ but not the gliding direction of the joint surfaces. Gliding is simply restricted and rolling predominates. As the palpation of the anterior position of humeral head is reliable,² it should be included in further research on limited shoulder movements.

Finally, it is an interesting fact, that both groups—anterior and posterior mobilization—had lesser pain after treatment without significant differences between groups. The posterior mobilization group, however, improved significantly more in external rotation range of motion, which led to better overall daily function. We should, therefore, differentiate between treatment of pain and treatment of function (range of motion, daily function, etc), although they are often related.

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AUTHORS' RESPONSE

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We wish to thank Dr Jochen Schomacher for the thoughtful comments in response to our study and appreciate the perspective presented. Because of its unique anatomical architecture, the shoulder joint is intrinsically unstable and relies on the static (capsule and ligaments) and dynamic (muscles) structures enveloping the glenohumeral joint for stability. Therefore, the joint mechanics involved are complex, with multiple possibilities for dysfunction and multiple treatment methods required to correct these dysfunctions. Our study focused on the capsuloligamentous structures. The mobilization procedures used were intended to stretch the capsule, with the anterior glide mobilization technique presumed to target the anterior capsule and the posterior glide mobilization the posterior capsule.

Dr Schomacher stresses the importance of fixation of the scapula during the posterior mobilization procedures. While performing the posterior mobilization in our study, the humerus was beyond the edge of the treatment table and the investigator felt that she was able to take up the slack of the soft tissues of the joint to the point where the scapula was stabilized by the treatment table. A firm end feel was reached during the mobilization, and the feedback provided by the patient, reporting a "deep stretching sensation," indicated that a consistent level of force was being produced, presumably at the glenohumeral joint. The mobilizations were only superimposed after the joint was taken to full available abduction and external rotation (or flexion and external rotation in the posterior progression technique). As pain reduced with the mobilizations, a firmer end feel, or tissue resistance, was able to be reached in all subjects. This end feel was subjected to a sustained stretch for a total of 15 minutes at each treatment session. We agree that use of a wedge

probably would have given better stabilization of the scapula during the posterior mobilizations, which could have stretched the posterior capsule more directly.

Schomacher suggests that because of the lack of fixation of the scapula in this study, the significant gain in glenohumeral joint external rotation range of motion that resulted from the posterior mobilization is likely to be a result of correcting the "positional fault" of the humeral head in the glenoid cavity and "probably not because of stretching the posterior capsule, which limits internal rotation and not external rotation."

Schomacher's explanation for the gain in external rotation is interesting and thought provoking. However, it seems contrary to the findings reported by Harryman et al,⁵ who showed that tightening the posterior capsule of cadaver models translated the head of the humerus anteriorly. Thus, it seems reasonable to hypothesize that the common finding in adhesive capsulitis of an anteriorly displaced humeral head in the glenoid cavity is due to a tight posterior capsule. On the other hand, Uittvugt et al⁷ documented arthroscopic findings of 21 patients with adhesive capsulitis before and after manipulation under anesthesia. They found that the posterior capsule was affected in only 24% of these patients, whereas the anterior capsule was affected in 90% of their patients.

In our study, we used the inclusion criteria of an increasingly greater limitation of external rotation with increasing shoulder abduction, which provides a plausible rationale for the capsular tightness hypothesis. Did our study select patients with posterior capsular involvement and were we indeed stretching the posterior capsule without the need for additional fixation of the scapula? Or, was the technique used in our study unable to stretch the posterior capsule, but instead was actually correcting a positional fault, as suggested by Dr Schomacher? Dr Schomacher proposes that the anterior position of the humeral head changes the tension

of the capsule—which restricts the range of motion in external rotation—rather than the capsule becoming shortened. This is a plausible hypothesis and we recommend that further research should include palpation of the humeral head position as described by Bryde et al.² Maybe Dr Schomacher's viewpoint has opened up a new insight into the development of adhesive capsulitis.

In summary, we do not disagree with the hypothesis that positional symmetry may be a contributing component of shoulder mobility impairments and associated pain. However, could it be that this anterior displacement of the humeral head initiates an inflammatory process in the anterior capsule, which is the most common⁷ site for capsular involvement in adhesive capsulitis? If so, then the posterior mobilization could possibly take the humeral head away from the inflamed anterior capsule, and maybe decrease the capsular inflammatory reaction. This may be why fewer sessions were needed to gain results in these patients than would usually be expected for remodeling of a tight capsule. The impact of a positional fault of the humeral head in patients with adhesive capsulitis may be an important factor that should be researched further.

The motivation for our research was to find a more effective physical therapy treatment for our patients who become impatient with long-term treatment affecting their work schedule and lifestyle, together with the financial impact of long-term physical therapy. At the same time, previous research indicates that physical therapy has been of little benefit in the treatment of adhesive capsulitis.^{1,3,4} If effective physical therapy treatment could not be performed, our patients would have been offered manipulation under anesthesia as the best treatment for adhesive capsulitis. The work of Roubal et al⁶ with manipulation under anesthetic, where extremely large changes in external as well as internal rotation ranges were noted following inferior and posterior gliding manipulations, stimulated our interest in

the possibility of a posterior glide mobilization technique without anesthesia and how this would compare with the traditional technique of anterior glide mobilizations for improving external rotation range (the most limited range) in patients with adhesive capsulitis. Our subjects with identifiable impairments (glenohumeral external rotation that is progressively further limited as the shoulder is abducted) responded to the posterior mobilization procedures that were applied, in a comparably short period of time.

As with most clinical situations in physical therapy, there is likely a combination of multiple contributing factors to adhesive capsulitis and the related loss of range of motion. Until studies focusing on the mechanism of the glenohumeral accessory motion limitations have been performed, the actual anatomical reason for the observed changes will remain a conjecture. We appreciate Dr Schom-

acher's comments for highlighting the positional-asymmetry factor and look forward to future discussions, refinement of evaluation and technique, as well as biomechanical research on this issue.

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