Reviewer's report

Title: Segmental lumbar mobility in individuals with low back pain: In vivo assessment during passive and active motion using dynamic MRI.

Version: 2 Date: 17 July 2006

Reviewer: Jim Dickey

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General

This is an interesting paper describing the segmental lumbar spine extension angles which accompany passive and active motion. The authors apply dynamic MRI to study two groups: young individuals with non-specific central low back pain and asymptomatic subjects. They applied PA forces to spinous processes of each lumbar level starting caudally at L5 and moving cranially to L1. They limited their analysis to the one spinal motion segment caudal to the level where the PA force was applied. Similar analysis was performed for a press-up maneuver. They performed two-way ANOVA tests assessing differences in degree of spinal extension at the different lumbar levels between symptomatic and asymptomatic subjects (for the PA and PU maneuver separately). They failed to observe any statistically significant differences in their analyses. In the discussion, they go on to evaluate the proportion of subjects which were hypo-mobile and hyper-mobile in the symptomatic and asymptomatic groups.

Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

1) the authors specifically assess young individuals; however, they do not provide a clear justification of whether this is a strength or limitation of their study. If it is a strength, then the authors must provide a more clear rationale for exclusively studying this group (they do acknowledge that younger subjects typically have a shorter duration of symptoms in low back pain, and that low back pain can begin its manifestations in the younger individuals, but this is not a compelling rationale for exclusively studying this group). If it is a limitation, then many of the references to age should be removed and there should be a paragraph within the discussion section where they acknowledge the limitation that their results are only applicable to young individuals.

2) the philosophy and analysis seem fundamentally flawed. The authors study segmental lumbar spine motion (angulation) between two groups at five spinal levels using two-way ANOVAs and determined that there is no statistically significant difference between the symptomatic or asymptomatic individuals, there is no significant difference between spinal levels, and that there is no interaction between these two variables for both the PA and PU conditions. This analysis precludes further investigation of differences at individual spinal levels; there is no statistical basis for further analysis of hyper- or hypo-mobile subjects. Accordingly, this aspect of the manuscript must be entirely removed. Alternatively, the authors could reframe their entire study to analyze hyper- and hypo-mobile subjects based around the chi-square analysis; however, this would clearly be a case for cherry picking the favorable results post hoc, which should be discouraged. Additionally, does the hyper/hypo distinction that you make in Tables 2 and 3 reflect the data was not normally distributed and that you should have used non-parametric statistics?

3) there are number of issues regarding how spinal mobility was assessed which need to be clarified. They applied PA forces to spinous processes of each lumbar level starting caudally at L5 and moving cranially to L1; the order was not randomized and therefore represents a systematic bias in the experiment. This needs to be identified as a limitation of this study. The authors base all their measurements on two images: baseline, and maximum. However, it is unclear how the authors know that the frame they pick as maximum is really the true maximum since they do not analyze other frames. Similarly, the authors identified that the maximum amount of motion was always between the target vertebrae and the vertebrate caudal to it; however, it is impossible to evaluate this statement since they only quantify the segmental motion at this one level. The authors must provide data to substantiate these choices OR include a clear description of their qualitative procedures used to make these determinations.

4) organization of the paper: there are results in the methods section, and the discussion contains both
methods and results. For example, they describe the Visual Analog Scale results (first paragraph), and the averaged angular position measurements (third paragraph on page 7) in the methods section. The discussion contains the methods and results regarding the chi-square analysis of the clinically most involved lumbar segments.

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

It appears that the surface coil was repositioned between the two tests. If so, then this should be explicitly stated and the implications of this move should be discussed.

The caption for Figure 2 states that the figure contains measurements of intravertebral motion when in fact it contains static images from dynamic MRI.

Subject confidentiality should be maintained in Figure 1 by placing a bar over the subject's face.

Tables 2 and 3 require additional detail in the table caption specifically describing the point made with the footnotes (specific subjects were hypermobile or hypomobile at more than one spinal level and accordingly the tally in the right hand column is not merely the sum of the individual values within the table).

Discretionary Revisions (which the author can choose to ignore)

On page 7, second paragraph: the author should include the manufacturer and model for the inclinometer.

Page 9: the first and second paragraph should be joined together.

Page 9, 4th line before "data analysis" section: you state that the subjects placed their arms in front of them. Were their arms supported by the chair as shown in Figure? If so, then it should be mentioned in the text.

What next?: Unable to decide on acceptance or rejection until the authors have responded to the major compulsory revisions

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Needs some language corrections before being published

Statistical review: Yes

Declaration of competing interests:

I declare that I have no competing interests