Author's response to reviews

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

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Author's response to reviews: see over
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: 5 July 2006
Reviewer: Alison Hazel McGregor
Reviewer's report: General

The Authors thank Dr. McGregor for her insightful comments. To improve readability, we copied Dr. McGregor’s comments into this document, and will keep them in ‘regular’ font. We will reply to her queries in ‘italics’ and the paragraph will be indented. The new text, will be presented in “bold”. Page and paragraph will indicate location of the new text within the revised version of the manuscript.

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

This paper looks at motion patterns in response to a PA mobilisation or press-up extension procedure using intersegmental angle as the principal measure in a group of subjects with sub-acute low back pain and controls. Although interesting the themes and focus of this paper change throughout.

Specific points:

The paper starts with stating the impact of low back pain to the individual and society although it does not refer specifically to the sub population investigated.

*We added a citation [McBride et al 2004] to the last sentence the first paragraph and a statement at the end of the first paragraph: “Even though the resolution of acute symptoms seems faster in younger person, one of four may continue having symptoms 12 weeks after the onset of symptoms resulting in pain and cost to economy (McBride et al 2004, Grotel at al 2005).*

Paragraph 2 goes on to discuss mobility, I just feel this section lack robustness and would benefit from referencing to back up these statements.

*We agree with Dr. McGregor’s recommendation and have added citations to these statements.*

You discuss PA mobilisations briefly but do not let the reader in on what is known about PA mobs scientifically particularly what they achieve and how repeatable this technique is etc and on the clinical side how often it is used. This would help show how important studies are in this area. Also should you define what clinicians mean by the grading hypomobile normal etc.
We have modified the third paragraph to address your recommendations.

I think you need to justify why pain will affect spinal mobility.

We are thinking of pain and motion patterns as coexisting. We are not comfortable arguing a causative relationship.

Paragraph 5 first sentence, I am not sure how you are eliminating gravity. My concern here also with this statement is you are not looking at an active and then passive movement that are the same you are looking at 2 very different movements so not sure how relevant this all is.

We have altered the terminology to ‘manual test’ and ‘self-initiated test’.

I disagree with the statement that segmental motion of the spine during PA has been scarcely investigated this is misleading. It has been investigated a lot by Lee et al, McGregor et al, in vivo plus others albeit in cadavers. The problem is despite these studies we still do not fully understand what the manoeuvre is achieving.

We have made appropriate modification to the text of the manuscript.

I am confused as to how you are linking the PU and PA mobilisation and I think this need clarifying to me they are very separate movements/techniques.

We are thinking of these two clinical procedures as separate movements that may produce intervertebral motions, similar in direction, but perhaps different in quantity and pattern of intervertebral motion? We have modified the second paragraph on page 2. The test now reads: Quantity and pattern of segmental mobility may certainly vary with the type of movement tested, instructions to the subjects and their willingness to participate. For example, a self initiated test, such as a press-up (PU) maneuver may be influenced by the subject’s symptoms, thereby limiting spinal segmental motion. In contrast, application of a manual PA force to a lumbar spinous process sufficient in amount to reach end-range may produce more motion since it’s not self-limited by pain. Therefore, quantifying motion under these two conditions may provide a more comprehensive assessment of segmental mobility in persons with low back pain.

Study population/Methods
Can you explain why there were 45 patients and only 20 controls?

The data interpreted in this manuscript are from a larger intervention study. The patient group was randomly assigned to one of three groups (15 per group). The power analyses were performed on the patient groups. We feel that the uneven distribution of subjects in this analysis does not compromise our conclusions.
What were your power calculations for this study?

*The power calculations were based of the 3 intervention groups mentioned above.*

Also where and how were patient recruited.

*The patients were recruited from a university campus with the use of flyers. The student and faculty*

How much disability did the patient group have and was their global motion restricted?

*We used the self-administered Oswestry disability questionnaire. The scores ranged between minimal and moderate disability.*

Were these people at work or off work as a result of their back pain. Their VAS are low so I assume they were not too disabled.

*No, the subjects were not off work.*

When you performed your localisers scan did you screen for pathology such as disc prolapse or degeneration?

*Yes, we did pay attention to the morphological appearance of the lumbar spine when performing the localizer. One subject was excluded from the study based on the appearance of the fifth lumbar vertebra suggesting an anatomical variance in its osseous development.*

One concern is whether the force applied to each spinous level was the same how did you control for this other than subjective feel?

*We relied only on the subjective feel of an experienced operator (therapist). Which make the data clinically relevant, but less exciting and convincing biomechanically. We acknowledge that as a limitation of this study.*

How often did errors occur in terms of mobilising correct level page 8 paragraph 2.

*There were three occurrences, among all 65 subjects tested, where the tester missed the L5 spinous process and moved from the sacrum to L4. The investigator, who viewed the data online, immediately prompt the operator (therapist) to repeat the test.*

Not sure how you used a hand held dynamometer to measure the force of the mobilisation. Are these levels of force in accordance with the published literature? It might be worth adding that studies have attempted to measure force in the scanner,
with non-electronic devices but these were unable to record the high magnitudes of force generated by the PA mob (Lee et al)

*We decided to exclude this statement from the manuscript. Since the dynamometry experiment was not done in the magnet, this information does not seem to inform the reader what happened during our experiment. We have performed the experiment as a pilot experimentation, in preparation for this study.*

Finally how did you decide which images were obtained at the end range?

*During data collection, motion was performed slowly “on a count of 1001 to 1002”. We held the terminal position for a count of “1003 to 1008”. This gave us several images that were clear and easy to digitize. From our experience, motion produces artifact that become quite obvious in clarity of the image. Therefore, choosing an image at the end of the motion with the best clarity, gave us an assurance that this was the final position. To assure ourselves that this assumption was correct, we have randomly selected 5 studies and have digitized three consecutive images deemed to be at the end of the range. This experiment assured us that our prior choice of the final image was correct.*

Results/Discussion
One concern is greater range of intersegmental motion appear to be achieve by the PU rather than the PA mob which is supposed to be the passive mobilisation to end of range.
Can you explain this?

*Yes, that is a good observation. Even thought the differences in intervertebral motion were small, they were consistent in 4 out of 5 motion segments in the asymptomatic subjects. We can only speculate … that the PU provides more force (self-imposed and gravity assisted) in the direction of increased lordosis.*

Much of the discussion focuses on hypermobility at one level, do you think the calculations etc in relation to this should be in results?

*Upon reflection, on the reviewers’ comments, we have reviewed our data and decided to focus on the non-parametric analyses. Consequently, we moved the calculations to results.*

Also how do this range of motion compare with other studies on intersegmental motion (so all of the videofluoroscopy work etc).

*Considering the range and direction of motion, the quantities are similar.*
You discuss age could you not investigate the correlation of age with motion directly using your data set.

*The subjects recruited for this study, represent a narrow age group. Therefore, we would not be able to look at our data from that perspective.*

Also from the images taken could you make some assessment on the degenerative status of the discs?

*We screened for signs of pathology during the physical exam. We also screened for disc pathology during the online image analysis.*

I also have concerns that the conclusion of this study hangs on the higher percentage of hypermobility when this is not presented or justified as clearly as it could be.

*We have focused the analyses on hypermobility.*

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

**Discretionary Revisions (which the author can choose to ignore)**

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

**Level of interest:** An article of limited interest

**Quality of written English:** Acceptable

**Statistical review:** No

**Declaration of competing interests:** I declare that I have no competing interests