Reviewer’s report

Title: Regional differences in lumbar spinal posture and the influence of low back pain

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Reviewer: Martin Descarreaux

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General comments
This paper presents new data related to the possible link between lumbar spine posture and the development of low back pain. By dividing the lumbar spine into two functional “sub region” the authors investigated the possible link between changes in the lower and upper part of the lumbar spine and low back pain in a very specific population i.e. 170 undergraduate nursing students. These new results add up to the tremendous amount of data available on the topic of spinal posture vs pain, spinal posture vs spinal degeneration and will certainly help to better understand the possible influence of spinal posture on low back conditions. My main concerns with the paper relate to the generalization of the results, the selection and the sub classification of the subjects.

*Page and line numbering would have been helpful in the revision of the manuscript.

Major Compulsory Revisions
Comment 1
In the introduction, the authors have presented a very limited overview of the current knowledge related to posture and pain. This particular topic is very controversial and data for and against such relation (between posture and pain) are abundant. Other research group have dedicated their work to this possible relationship (Harrison DD, Harrison DE) and other to the absence of a relationship.

The introduction should focus on the manuscript objectives and present data and the current body of knowledge pertaining to low back pain in nurses and the relation with posture. Otherwise it will remain a vague introduction, not serving the purpose of the article.

Comment 2
The authors have chosen to include subjects with low level of LBP ((pain less than 3 out of 10 on a VAS at the time of testing). They also state that only one subject was excluded from the study because of low back pain higher than “3/10” at the time of testing. Therefore, one could argue that the sample of subjects
chosen for this experimentation was relatively free of disabling low back pain. However the authors also performed a sub classification of their sample based on LBP intensity! On the basis of 4 criteria, one of them being “…LBP disability levels at the time of testing measured by the Oswestry Disability Index (ODI), (>20% based on mean ODI score for primary LBP of 26%”

Pain and disability are at least partially correlated and it is difficult to understand how a group of patient could score under 3/10 on the VAS and at the same time present with significant disability. The author should reconsider their sub classification and perhaps present only the data from a No LBP and LBP perspective. Sub classification of a very specific population is a major drawback to the possible generalization of the results. I think this issue has to be addressed by the authors.

Comment 3
The authors have discussed the reliability of the 3-Space Fastrak device but have not discussed its validity in the measurements of segmental spinal angles. Their measurement is not a direct measure of spinal posture and various limitations are associated with the use of external markers to calculate spinal angles. Skin movements, markers movements, vibration, interference with magnetic fields, etc… have to be discussed and taken into consideration in the both the methods and discussion section of the manuscript.

Comment 4
Many paragraphs of the discussion section are barely repetitions of the results section. The authors have only compared their results with a few studies (to often their own work). The discussion should be shortened and targeted to the main results with more explicit interpretations of the data and not only results presentation.

Minor Essential Revisions
Paragraph 1 “opinion remains divided regarding optimal LBP management” a reference should be used to support this part of the sentence.

Abstract section
Comment 1
Data should be presented in the same fashion throughout the results section of the abstract.
Changes should be done according to the different comments and changes performed throughout the manuscript.

Background section
Comment 2
I suggest the authors use more recent references regarding the two following topics:
A. Low back pain and lumbar posture for and against
B. Low back pain in nurses (here are a few examples)


Comment 3
When stating that “…the notion of the lumbar spine as a homogenous region may not provide a true reflection of pain and function in this region”… the author should be more convincing about their potentially new sub division of the lumbar spine. There are at least functional and anatomical reasons for the classification of the lumbar spine as being one of the spine main regions. If otherwise the reader as to be convinced!

Comment 4
“This may help explain why previous research has been unable to identify an optimal lifting style for reducing LBP [21], as regional lumbar posture rather than whole spine or body position (eg. stoop v squat lift technique), may be a more important factor”

This is really only an assumption and it should not be included in the background section of the manuscript.

Comment 5
“This may expose these segments to increased end range tissue stress for longer periods, and possibly increase risk of injury [23, 24]”.

The work done by Cholewicki and McGill relating to spine stability and the roentgenographic study conducted by Itoi are of completely different nature and I am not sure how these two references serve the authors comment. This whole paragraph needs to be clarified.

Comment 6
Please state a clear hypothesis based on previous work, current knowledge and publications so that it will justify the objectives of the study.

Methods
Comment 7
Defining the standing and sitting position (ex: standing posture they would usually adopt during habitual unsupported standing) must be defined as instructions to subjects. Stating that no direction of how to sit or stand was given is false as the usually adapted posture is a precise indication and might greatly
impact the subject’s posture during testing.

Comment 8
The author should comment and present data regarding the standardization and variability of the functional tasks”.

Results
Comment 9
No need to include the obvious significant difference between LLx and ULx. Not include in the initial objective of the study.

Comment 10
The sample of subjects was hardly divided into two groups, stating that 53.4% of the subjects reported that sitting was the most common source of back pain is probably an overstatement. The author might have chosen this position for subsequent analyses instead of the other causes of low back pain but they it is more of an “editorial choice” than anything. The author should better justify this choice or performed statistical analyses on other sub group of patients.

Discussion
Comment 11
Once again I am not sure how we can consider that 30% of the subjects presented with clinically significant low back pain base on the previously stated exclusion criteria.

Comment 12
Results are compared with MRI studies that can be considered a direct measure of lumbar posture or as some might say, gold standard measures. The author should acknowledge this fact and avoid simple conclusions like “Given our study found no difference in total ULx and LLx sagittal motion between LBP and control subjects, these hypotheses are not supported by our data” when in fact the two measures are very different in nature.

Comment 13
Alternatively, other factors such as spinal motor control [3, 42], habitual posturing of the spine [11, 12], patterns of spinal loading [43], neurophysiological [44], psycho-social [45, 46], and genetic factors [47] may be more important mediating factors of LBP experience than spinal range of motion.

This is a useless sentence without further explanations. Considering that the discussion needs to be shortened I would delete it.

The last paragraph of the same section is also of little help for the reader. Could be deleted.

Discretionary Revisions
Results
Please refer to table 2 in the functional tasks results (section: Regional lumbar static posture, range of movement and functional task postures)
Level of interest: An article of limited interest

Quality of written English: Acceptable

Statistical review: Yes, and I have assessed the statistics in my report.

Declaration of competing interests:

'I declare that I have no competing interests' below. If your reply is yes to any, please give details below.