Reviewer’s report

Title: Study of trunk asymmetry in normal children and adolescent

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Reviewer: Martha Hawes

Reviewer’s report:

General

This paper documents that the relative proportion of a spinal curvature that is caused by a leg length inequality (LLI) can be detected by a simple method that easily can be incorporated into screening protocols: angle of trunk rotation (ATR) at forward bending is measured with the subject in a seated position, and the values are compared with those obtained while the subject is seated. The change in ATR (CATR) was highly correlated with LLI (ranging from 0.5 to 3.2 cm) among patients screened. Even though the dynamics of torso deformity have been measured and plotted in a variety of approaches, this particular observation, to my knowledge, has not been documented among detailed biomechanical analysis (e.g. Jaremko et al. 2002; Schultz & co-authors 1970s, 1980s; Stokes et al 1988, etc) or the limited information on LLI and scoliosis in the peer reviewed literature (e.g. Fontanesi et al 1987; Gibson et al 1983; Gurney 2002; Jones et al 2002; Steen et al. 1997; Timgren et al 2006). The work has implications not only for diagnosis and for understanding etiology and prognosis, as the authors have inferred, but also as an avenue to help make targeted decisions regarding referral of patients screened. The report also provides a starting point, potentially, for a new avenue for diagnostic screening, evaluation, and treatment based on simple analysis of the positional dynamics of torso deformity. Therefore I strongly feel the data should be published, but that there are several ways the presentation can be improved.


The authors report the use of scoliometer measurements to survey torso asymmetry among 2071 individuals, aged 5.5 to 18 years. These were recorded, by one individual, with the subject in a seated and a standing position, within a context of demographics, body morphology, handedness, as well as appearance of a leg length inequality (LLI). The majority of screened children exhibited no torso asymmetry in seated (76.5%, 75.1% for boys vs girls, respectively) and standing (67% vs 65%) assays. The presence of scoliosis, based on a standard of >7 degrees ATR in the standing position was 3.23 vs 3.92% for boys and girls, respectively, and was 0.62 and 2.21% in the sitting position; every child with ATR >7 degrees was
found by radiography to have a scoliotic curve with Cobb angle >10 degrees. Correction of the ATR by assumption of the standing position was strongly correlated with the presence of a leg length discrepancy.

Methods and Results:

The methods for surveying the children are described in sufficient detail to allow independent replication. However, there are some confusing issues with regard to analysis and presentation of the data.

Range of leg length inequality was reported to be 0.5 to 3.2 cm. Is this the 50 children referred for LLI, or the total sample? The sample of 50 children was referred to as a 'random sample.' It is not clear how this sample was randomized.

What happened to the demographic and body morphology data?

All of the data should be presented comprehensively, for example as scatter plots, with the statistical renderings provided as an adjunct. We need to know what the data are, not just their statistical significance.

The results section is much too succinct, and needs to be written in a more comprehensive manner, with a paragraph to explain what each data set show. To some extent this can be dealt with by bringing more of the 'discussion' into the 'results' section.

Some of the writing needs to be worked over a bit, as well. For example, the sentence 'However, the level of the spine where this rotation mainly occurs and the mechanism by which this is done; it is hitherto a question to be answered,' could be made simpler and more direct. As it is, the meaning is obscure.

Table 2 provides error ratings--I assume these values reflect error for individual patient readings? The 'Methods' do not explain how many scoliometer measurement replications were used to obtain these values--how many reps, taken at what intervals, with reassumption of the positions after return to neutrality, or while the child remains in the forward bending position? 'Methods' also indicate that a single recorder took the measurements, so it is not clear how inter-observer values were obtained.

Information about radiological measurements is needed. The authors indicate that a separate paper will be published on the radiological information, but some data are needed in order to judge the correlation between the 7 degree ATR and the presence of a spinal curvature with Cobb angle of >10 degrees.

RE: Discussion. I think it is reasonable to conclude that these observations warrant additional research to explore the hypothesis that a sitting position for screening protocols is a good idea. I don't think it is reasonable to propose changes to existing protocols, based on a small sample size. I also agree that these data support the hypothesis that spinal curvatures occur secondary to other clinical problems, but if the statement regarding compatibility with the Nottingham theory for pathogenesis of scoliosis is to be used, the authors need to fill out what they mean by this.

References need to be proofed, as there are some spelling and format errors.

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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)
see above
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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 importance in its field

Quality of written English: Needs some language corrections before being published
**Statistical review:** No, the manuscript does not need to be seen by a statistician.