Vertebral rotation in adolescent idiopathic scoliosis calculated by radiograph and back surface analysis-based methods: correlation between the Raimondi method and rasterstereography. *Eur Spine J*;22:2336–2337

Statistical perspectives part II

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To the Editor,

An editorial entitled ‘Concentric and Eccentric: muscle contraction or exercise’ was published in several science journals in beginning of year 2013 [1–4] as a first example of a forthcoming series of perspective articles on appropriate scientific procedure and terminology. Following a first letter on *European Spine Journal* [5] regarding “Vertebral rotation in adolescent idiopathic scoliosis calculated by radiograph and back surface analysis-based methods: correlation between the Raimondi method and rasterstereography” [6] and following a response by the authors [7] some points remain still unclear. The aim of this second letter is to point out unaddressed points and stimulate some thoughts.

We were waiting for a fulfilling response to our letter [5]. Such a response did not satisfy us. Therefore, we point out again only the main issues previously raised but still not properly addressed [6, 7].

Padulo et al.: “In particular, among the aims of the study there is the ‘correlation’ evaluation, but there is no effective comparison between the methodology object of study

and the assumed golden standard. In fact, in this case, the comparison of the signals is a standard goal to achieve proper measures reliability” [5].

- Mangone et al.: “... to our knowledge a gold standard for this kind of measurement does not exist” [7].
- About this point, to our knowledge X-ray examination is the golden standard [8–10]. Comparing two methodologies does require knowing a priori which of them is the golden standard.

The error of the new Formetric 4D method should also be investigated (Bland–Altman test) [11]. In this article, the error was assessed by means of the statistically wrong tests correlation and *t* test [12].

- ‘The “*t* test” was never used to evaluate errors. Rather, it was only deployed to show that the measurements from radiographs and rasterstereography are not the same, even though our analysis confirmed that they can be considered correlated’ [7].
- Mangone et al. in their original article: “A paired *t* test was used to determine differences between VR as calculated by Raimondi method and rasterstereography [6].” The test result has been shown in results, but the chosen test is not supported by any scientific knowledge to disclose any difference between results from two different methodologies. A good correlation score is a ‘false positive’, while in fact does hide the essence of the comparison outcome [12].

The proper sample size [13] was not calculated [14].

- No answer.
- This point remains still unclear. Particularly, *criteria* of inclusion are necessary to ensure measures reliability. In this specific case also body fat could alter the result

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by acting as a warping lens and thus biasing investigation about bodily subcutaneous structures using a visible light imaging technique such as rasterstereography is.

The experiment has not been well controlled about environmental conditions (i.e., laboratory temperature and humidity) and test re-test for measurement repeatability (intra-class correlation coefficient) [13].

- “As all procedures were carried out within a university department laboratory setting (Department of Physical Medicine and Rehabilitation, Sapienza University of Rome), standard clinical and research procedures were followed during rasterstereographic measurement” [7].
- This sentence does not address the point. In order to replicate the study, testing environmental condition and time of day should be disclosed as shown by Guidetti et al. [9].

In particular the ratio (Δ %) between the two methods is missing in Results (Raimondi/Formetric 4D mean data: Cobb -30° $9.93/4.99 = 50\%$; Thoracic $9.18/5.52 = 40\%$; Lumbar $10.18/4.82 = 53\%$; Cobb $< 30^\circ$ $8.11/5.50 = 32\%$; Cobb $\geq 30^\circ$ $15.61/8.31 = 47\%$) [5].

- “As regards the ratio, we do not believe that these measurements would help to better understand our results. We did not omit to report final measurements. Therefore, if it is of interest for readers (as seems to be the case for the authors of the letter), the ratio calculation can easily be derived from the text” [7].
- Our calculations are confirmed. Results speak by themselves: there are large result differences between the two methods [5].

In our opinion the large differences showed for all measures ($M \pm SD$ $44 \pm 4\%$) between the two methods require caution about the use of the Formetric 4D. A simple positive correlation does not disclose such huge differences in results [12].

- “It was not our aim in our article to reinforce the notion that it is possible to use rasterstereographic measurements in a clinical setting” [7].
- This sentence is inconsistent with the first sentence of the conclusions of the original article: “Rasterstereographic evaluation of VR shows a good correlation with the Raimondi method, thereby confirming the possibility to use this non-invasive method for deformity assessment in AIS patients” [7].

In conclusion, we think the attention of clinical researchers should be focused on patients needs. They

deserve both examination precision/accuracy and reduced exposure to ionizing radiation. Once there is a minimum acceptable examination precision and accuracy level established researchers should investigate alternative methodologies capable to achieve at least that specific level. That is why sound research is continuously needed on this topic.

Conflict of interest There are no conflicts of interest in this paper.

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