Answer to the second letter to the Editor of J. Padulo et al. concerning: “vertebral rotation in adolescent idiopathic scoliosis calculated by radiograph and back surface analysis-based methods: correlation between the Raimondi method and rasterstereography” by Mangone M, Raimondi P, Paoloni M, Pellanera S, Di MA, Di RS, Vanadia M, Dimaggio M, Murgia M, Santilli V (2013) Eur Spine J 22:367–371

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Dear Editor,

We think that we have already answered most of Dr. Padulo's questions in our first answer; therefore, we have answered only to new questions.

We hope that Dr. Padulo will be definitely satisfied by this second answer.

- 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” [1].
- Mangone et al.: “... to our knowledge a gold standard for this kind of measurement does not exist” [2].
- About this point, to our knowledge X-ray examination is the golden standard. Comparing two methodologies does require knowing a priori which of them is the golden standard.

Response: As already written in the original article and in the answer to the first letter, the aim of our study was not to compare the two methods, but to evaluate the correlation between two methods. We believe that the references of the author's letter are not appropriate. According to cited articles we did not find confirm about his comments [3, 4].

Moreover, there is no gold standard for the evaluation of vertebral rotation. Recently, Vrtovec et al. [5] in a systematic review observed that does not exist a standardized method to quantify the axial vertebral rotation. Indeed, they identified the torsionmeter proposed by Perdriolle and Vidalas the most accurate and simple for use in coronal radiographs; the Ho et al. method (proved to be the most reliable and clinically useful) for 3D image is applied with successful in CT and MR spine images. Moreover, in order to develop an effective image-based yet clinically relevant measure of axial vertebral rotation in 3D, a strong coupling of the clinical knowledge in anatomy and engineering expertise in computerized image analysis may result in a successful combination.

- The error of the new Formetric 4D method should also be investigated (Bland–Altman test). In this article the error was assessed by means of the statistically wrong tests correlation and *t* test.
- 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.
- Mangone et al. in original article: “A paired *t* test was used to determine differences between VR as calculated by Raimondi method and rasterstereography.” 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.

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Response: The paired samples *t* test assesses whether the mean of two groups are statistically different from each other [6].

- The proper sample size was not calculated.
- 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 by acting as a warping lens and thus biasing investigation about bodily subcutaneous structures using a visible light imaging technique such as rasterstereography is.

Response: We did not make the sample size calculation and this is a limit in our study. We would like to enlighten that the sample size calculation have to be made on vertebral number. According to influence of the body fat on our results, we included patients with a BMI value less than of 30.

- The experiment has not been well controlled about environmental conditions (i.e., laboratory temperature and humidity) and test re-tests for measurement repeatability (Intra-class Correlation Coefficient).
- “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”.
- This sentence does not address the point. In order to replicate the study, it is necessary to know testing environmental condition and time of the day as Guidetti et al. have shown.

Response: The author of the letter points out the necessity to know exactly the time of the day of the examination. According to Guidetti et al., there is any correlation between VR calculation and time of day [7]. **Once again, the author of the letter does not seem to have understood the contents of the articles cited by himself.**

- 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° $8.11/5.50 = 32$ %; Cobb $\geq 30^\circ$ $15.61/8.31 = 47$ %).
- “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.”

- Our calculations are confirmed. Results speak by themselves: there are large result differences between the two methods.

Response: We want to clarify again that sample paired *t* test was used to verify the difference of the values calculated with the two methods, and we reported exactly it in the original article.

- In our opinion the large differences showed for all measures ($M \pm SD$: 44 ± 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.
- “It was not our aim in our article to reinforce the notion that it is possible to use rasterstereographic measurements in a clinical setting”.
- 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”.

Response: According to Schulte et al., we use the rotation values at follow-up because we found high correlation values [8].

Conflict of interest None.

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