**Answer to the Letter to the Editor of J. Padulo 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 Michele A, Di Renzo S, Vanadia M, Dimaggio M,
Murgia M, Santilli V (2013) Eur Spine J 22:367–371**

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Received: 3 August 2013 / Revised: 3 August 2013 / Accepted: 3 August 2013 / Published online: 21 August 2013
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We should like to respond to a recent letter to the editor that aims to demonstrate grave statistical errors in our paper published in this journal in February 2013 [1], which, if true, would invalidate some of our conclusions.

It was not the aim of our article to propose rasterstereographic technique as an alternative method that can be substituted for the calculation of vertebral rotation in scoliosis diagnosis. As indicated both by the title (*Vertebral rotation in adolescent idiopathic scoliosis calculated by radiograph and back surface analysis-based methods: correlation between the Raimondi method and rasterstereography*) and in the introduction, our aim was “to evaluate the relationship, if any, between an X-ray-based method (i.e. the Raimondi method) and rasterstereography” in the assessment of vertebral rotation in a sample of adolescent idiopathic scoliosis. Consequently, when the authors of the Letter to the Editor state that “the aim of the authors is to promote the use of the Formetric 4D for both diagnostic application”, they in fact affirm something that does not reflect our aims.

It is difficult to understand why the Authors of the Letter cite in their opening sentence the comment of Hopkins et al. [2] without specifying the similarities with our paper. According to the Letter's Authors, our paper represents a negative example, showing how statistical methods ought not to be used in a scientific article. However, the specific criticisms made do not substantiate such an affirmation.

As regards the specific comments, we would like to specify that:

Although we fully agree with the observation about the statistical requirement for a difference between the rasterstereographic method and a gold standard for the vertebral rotation measurement, to our knowledge a gold standard for this kind of measurement does not exist. We fully realize that this could be a limitation, but we used a method, which was demonstrated to be reliable and comparable to other commonly used measurements for VR [3] only to correlate its results with those of rasterstereography.

Again, please note that we do not propose rasterstereography as a diagnostic tool for scoliosis. We only specified that rasterstereography “offers the advantage of needlessly exposing the subject to ionized radiation and therefore can be performed much more frequently during both screening and follow-up”. Moreover, we do not think that the lack of ionizing radiation from rasterstereography can be refuted. 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.

We are surprised by the claim that environmental conditions were not subject to control during experimental procedures. 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. It should also be noted that we do not in fact know how the

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cited factors (laboratory temperature and humidity) may influence our measurements.

It is true that some units of measurement are missing from some figures. We hereby specify that we were obviously describing vertebral rotations in terms of degrees (°). 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.

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, it is worth repeating, is something that has already been demonstrated by a considerable body of published literature (e.g. 4, 5). In short, our message was not that rasterstereography can serve as a substitute for radiographs, when making clinical diagnosis of vertebral rotation.

Conflict of interest None.

References

1. Mangone M, Raimondi P, Paoloni M, Pellanera S, Di Michele A, Di Renzo S, Vanadia M, Dimaggio M, Murgia M, Santilli V (2013) 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* 22:367–371
2. Hopkins WG, Batterham AM, Impellizzeri FM, Pyne DB, Rowlands DS (2011) Statistical perspectives: all together NOT. *Exp Physiol* 96:1321–1323
3. Weiss HR (1995) Measurement of vertebral rotation: Perdriolle versus Raimondi. *Eur Spine J* 4:34–38
4. Schulte TL, Hierholzer E, Boerke A, Lerner T, Liljenqvist U, Bullmann V, Hackenberg L (2008) Raster stereography versus radiography in the long-term follow-up of idiopathic scoliosis. *J Spinal Disord Tech* 21:23–28
5. Hackenberg L, Hierholzer E, Potzl W, Gotze C, Liljenqvist U (2003) Rasterstereographic back shape analysis in idiopathic scoliosis after posterior correction and fusion. *Clin Biomech* 18:883–889