

**Reply to the Letters to the Editor**

**The Effect of Postural Pelvic Dynamics on the Three-dimensional Orientation of the Acetabular Cup in THA Is Patient Specific**

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Letter to the Editor

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## Reply to the Letters to the Editor: The Effect of Postural Pelvic Dynamics on the Three-dimensional Orientation of the Acetabular Cup in THA Is Patient Specific

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### To the Editor,

We have read the letters to the editor by Zhao et al. [7] and Darrith et al. [1] with great interest. We would like to compliment both research groups for

(RE: Zhao J-X, Su X-Y, Zhao Z, Zhang L-C, Tang P-F. Letter to the editor: The effect of postural pelvic Dynamics on the three-dimensional orientation of the acetabular cup in THA is patient specific. *Clin Orthop Relat Res*. Published online. DOI: [10.1097/CORR.0000000000001870](https://doi.org/10.1097/CORR.0000000000001870). and Darrith B, Nelson FR, Davis JJ, Silverton CD. Letter to the editor: The effect of postural pelvic dynamics on the three-dimensional orientation of the acetabular cup in THA is patient specific. *Clin Orthop Relat Res*. Published online. DOI: [10.1097/CORR.0000000000001871](https://doi.org/10.1097/CORR.0000000000001871).)

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their meticulous reading of our study [5].

First, we would like to address the concerns of Zhao et al. [7] regarding the use of the intraclass correlation coefficient (ICC). Before any measurement instrument can be used for research or clinical applications, their reliability must be established. “Reliability” is defined as the extent to which measurements can be replicated. In other words, it reflects not only degree of correlation but also agreement between measurements, and ICC does this [3]. Our proposed trigonometric mathematical model, based on elementary goniometric formulas, and the CT measurements both determine the same spatial

coronal and transverse cup orientation angles. Therefore, the “nature” (a term used by Zhao et al. [7] in their letter) of the data is equal and this allows for the use of the ICC to establish whether the measurements can be replicated [4].

Second, we appreciate Zhao et al. [7] highlighting the similarities of our research findings with their earlier work on pelvic tilt and radiographic offset. It is clear that with specific radiographic inclination angles, the effect of pelvic tilt is more profound in cups with larger radiographic anteversion angles than in cups with smaller ones [6]. However, our study differs considerably in terms of its potential practical applications. We chose an established clinical standard for assessing the acetabular component orientation in the anatomical planes, namely the coronal and sagittal plane. The third dimension, the transverse version, can then be calculated. To avoid relying only on the theoretical derivation of the mathematical formulae [6], a clinical dataset was used to validate the tool, and based on that, we created a freely available tool that surgeons can use in practice ([www.3d-hip.com](http://www.3d-hip.com)). By visiting that website, any surgeon can simulate the reorientation of the acetabular cup as pelvic tilt is varied in three dimensions. This practical tool can be used by any surgeon, for any individual patient’s pelvic parameters, in advance of surgery. The practical usability of this

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## Letter to the Editor

basic tool was recently confirmed by the evaluation of the effect of functional pelvic tilt on the three-dimensional acetabular cup orientation in THA dislocations [5].

Finally, we agree that there is a problem with inconsistent and non-explicit definitions for the historically ambiguous terminology. We thank Darrith et al. [1] for their comments and appreciate their accurate explanation of the problems associated with different definitions. We feel that the consensus review from the Hip-Spine Workgroup simplifies the spinopelvic relationship, offers hip surgeons a concise summary of the available evidence, and selects common terminology approved by both hip and spine surgeons for future research [2]. In line with the comments by Darrith et al. [1], however, a structured

approach with addition of the associated sagittal pelvic orientation to the various definitions of acetabular component orientation angles might allow for more reliable communication.

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