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Response to Letter to the Editor Regarding: Characteristics of Spinal Morphology According to the "Current" and "Theoretical" Roussouly Classification Systems in a Diverse, Asymptomatic Cohort: Multi-Ethnic Alignment Normative Study

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To Whom It May Concern

We are grateful for your letter and thoughtful engagement with our manuscript. In this response, we will address your concerns.

In our manuscript, we acknowledged and referenced the original and updated Roussouly classification systems as the gold standards of the definition and applicability of the classification system.[1,2] However, our research builds on previously published literature regarding the "current" and "theoretical" Roussouly classification systems. For instance, Passias et al.[3] stated the following:

> "…included patients were grouped by both "theoretical" and "current" Roussouly sagittal shape types. Briefly, "theoretical" Roussouly type was evaluated using PI and LL to stratify patients into four groups: Type 1 (PI <45° and LL apex below L4), Type 2 (PI <45° and LL apex at or above the L4–L5 interspace), Type 3 (45° ≤PI <60°) and Type 4 (PI ≥60°). This represents a patient's ideal physiological sagittal type. "Current" Roussouly type was evaluated according to sacral slope (SS): Type 1 (SS <35° and LL apex below L4), Type 2 (SS <35° and LL apex above L4–L5 interspace), Type 3 (35° ≤SS <45°), and Type 4 (SS ≥45°). The "current" type provides the Roussouly type at a particular instance (baseline or follow up time point). We used mismatch between "theoretical" and "current" Roussouly types to assess modification of the patient's normal sagittal morphology due to deformity."

Additionally, Passias et al. referenced previously published literature by Pizones et al.[4] wherein they stated the below definition of "theoretical" and "current" Roussouly types:

> "…The first step was to classify the physiological sagittal type according to PI; this was called "theoretical type." As published, type 1 and 2 corresponded to PI <45°, type 3 to PI between 45° and 60°, and type 4 to PI >60°…Next, the "current type" of every patient with AS was evaluated looking at the other proposed published criteria, apart from the PI: the inflexion point, the apical lumbar level, the number of levels included in the lordosis, and the sagittal shape with the original images drawn by Roussouly."

In our work, we followed the definitions proposed by Passias et al. for the "theoretical" and "current" Roussouly types. We acknowledge that the original and updated Roussouly system is based on SS. However, our manuscript does not evaluate the original and update Roussouly system, rather, our manuscript evaluates the "current" and "theoretical" Roussouly system as described by Passias et al and Pizones et al. Passias et al and Pizones et al determined the "theoretical" type based on pelvic incidence. The existence of this fruitful discussion highlights the need for the spine deformity community to reach a consensus and codify the definition and use of the Roussouly classification, both original and updated, "theoretical" and "current." We hope that we can be collaborators in such an endeavor.

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