

## CROSSTALK

**Last Word from R. Matthew Brothers and Rong Zhang****R. Matthew Brothers<sup>1</sup> and Rong Zhang<sup>2</sup>**<sup>1</sup>*Department of Kinesiology, University of Texas at Arlington, Arlington, TX, USA*<sup>2</sup>*Institute for Exercise and Environmental Medicine, Texas Health Presbyterian Hospital Dallas, TX and Department of Internal Medicine, University of Texas Southwestern Medical Center, Dallas, TX, USA*

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We thank all the authors who provided comments on this CrossTalk. No single methodology exists for assessment of cerebral blood flow (CBF) and cerebrovascular function without inherent limitations; however, the extent to which these limitations influence data collection and interpretation and thus are acceptable

varies depending on study conditions. The points raised by the contributing authors highlight key considerations and offer insight for study design and data interpretation.

It is clear that more research is needed to compare CBF measurements using various approaches, including transcranial Doppler (TCD) ultrasound, near infrared spectroscopy, duplex Doppler ultrasound, and magnetic resonance imaging to address the questions raised in this debate. Particularly, the extent to which methodological limitations compromise the accuracy and precision of CBF measurements under study conditions, such as alterations in blood pressure and blood gases, exposure to altitude, exercise, changes in body posture, etc., should be better elucidated. That being the case, evidence from many studies over three decades supports our contention that TCD assessment of changes in CBF velocity

can reflect changes in volumetric CBF in the middle cerebral artery under moderate changes in arterial blood gases and blood pressure. However, as cautioned in this debate, the research community should pay special attention to the fact that TCD measures blood velocity not volumetric CBF, and this should be considered when designing studies to assess cerebrovascular function. Most importantly, this CrossTalk provided an opportunity for discussion and hopefully will stimulate more innovative research to better clarify this issue and improve our knowledge of CBF regulation.

**Additional information****Competing interests**

None declared.

**Ryan L. Hoiland and Philip N. Ainslie chose not to submit a Last Word.**