Letter to the editor: Applying the blood flow restriction pressure: the elephant in the room

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TO THE EDITOR: We read with interest the article by Spranger et al. (7) in which the authors discussed the exercise pressor reflex in response to blood flow restriction (BFR) exercise. Within, the authors cite an impracticality of standardizing cuff pressure due to differences in cuff width, cuff type, and individual differences between participants. They recommend the effects of a BFR stimulus be balanced with safety measures to avoid increasing the risk of any adverse events. We agree and wish to extend their discussion by addressing specific methodological concerns related to BFR that could potentially reduce these risks.

First, to ensure all participants receive a similar stimulus, it is recommended that cuff inflation pressure be made relative to the individual and the cuff being used. For example, the amount of pressure needed to occlude blood flow is dependent on the size of the limb [larger limbs require greater pressures (3, 4)]. Therefore, applying the same pressure to every individual could inadvertently lead to the complete occlusion of blood flow for some participants. Illustrated in Fig. 1, applying an absolute pressure of 160 mmHg would result in arterial occlusion at rest for many participants in the upper body [also true in lower body (5)]. To control for this, the pressure could be made relative to an individual’s arterial occlusion pressure (AOP), which is the minimum pressure required to completely occlude blood flow. Other efforts to make BFR relative are made by applying a pressure 20 mmHg less than brachial systolic blood pressure. Although this makes it relative, the resulting pressure may vary as a percentage of arterial occlusion (51-88% arterial occlusion, Fig. 1) due to differences in cuff width/type. Thus pressure should also be made relative to the cuff being used during the actual BFR session, as AOP changes depending on the width of the cuff (4). In other words, setting the pressure at a percentage of the pressure required to completely occlude blood flow with a specific cuff should allow a stimulus that accounts for differences in cuff type and limb size.

Currently, no standards exist for the application of BFR, yet the stimulus has been shown effective across a wide range of pressures in the upper and lower body (1, 2). However, the risk of an adverse cardiovascular event may be increased at higher cuff pressures. Acute (6) and chronic (1) studies suggest that higher relative pressures do not appear to be more effective than lower relative pressures. In fact, a recent study compared BFR training at both 40 and 90% of AOP and found no differences in skeletal muscle size and strength (1). Thus applying a low relative pressure instead of a high relative pressure could lessen the risk of adverse events and still elicit beneficial adaptation to skeletal muscle.

We suggest that making pressure relative to the cuff and individual will not only work toward a standardized BFR application but may also help reduce the risk of any adverse cardiovascular events associated with the exercise pressor reflex.

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AUTHOR CONTRIBUTIONS

REFERENCES