Letter to the Editor

Blood Flow Restricted Training in Older Adults: Consider Standardized Methodology for Future Investigations?

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We read with interest the article by Yasuda and colleagues (1) on muscle morphological and functional adaptations following low-load elastic band resistance training combined with blood flow restriction (BFR) in older adults. The authors described that the mean restrictive cuff pressure throughout the training period was ~200 mmHg and that pressure was taken to 270 mmHg if each participant could perform the exercise under such pressure. To our knowledge, 270 mmHg is the highest pressure ever used for a training study in the upper body (2).

Since the first appearance of a BFR training study in the literature (3), ~150 articles have been published. Early studies focused on the efficacy, mechanisms, and safety of BFR training, but did not necessarily consider the methodological standardization of this technique. Many studies did not report cuff width which has a pronounced effect on pressure and most studies applied the same pressure to every participant, regardless of their size. Recently, research has been published investigating the standardization of this method (4,5). Furthermore, data from our laboratory suggests that arm circumference and brachial systolic blood pressure should be taken into account when determining the BFR pressure in the upper body (4). When looking at the systolic blood pressures reported by Yasuda and colleagues (1) (~135 mmHg), it is likely that several participants were under arterial occlusion prior to exercise with pressures of 200–270 mmHg. This observation is interpreted in context with the finding that arterial occlusion pressure is heavily determined by cuff width (5). If the goal is to restrict (not occlude) arterial inflow into the muscle (6), then determining the arterial occlusion prior to training may be an important measurement to include in order to better standardize the pressure in the upper body. This method allows the investigator to take a percentage of arterial occlusion, which may provide a better standardization of pressure over simply relying on the individual’s perception; given that the perceptual response does not appear to change a large degree across pressures (6).

Finally, Yasuda and colleagues (1) reported marked increases in biceps muscle size (17.6%) and relatively small gains in elbow flexor strength (7.8%) following training, while increases in elbow extensor muscle size and strength were identical (17.4% and 16.1%, respectively). In contrast to pennate muscles such as triceps brachii, the fusiform muscles (biceps brachii) increase muscle volume during contraction, especially the proximal region of the muscle. Given the participants wore a cuff around the proximal region of the arm, it’s possible that this may have had a negative chronic effect on the biceps brachii. Although the authors failed to observe changes in creatine kinase in the blood (3–7 days postfinal training session), this may be explained by the time course of measurement. It is true that previous studies have failed to produce measurable muscle damage following BFR exercise (7), however, very high pressures may increase this risk.

We feel that the standardization of pressure to the individual will increase the safety and possibly effectiveness of this training method. At pressures between 200 and 270 mmHg, it is possible that many participants were under arterial occlusion. We wish to suggest that if the goal of BFR is to restrict (not occlude) arterial inflow, then taking a percentage of arterial occlusion may allow for a more uniform application of this stimulus. Future studies could investigate this further.

References