Blood Flow Restriction Training: What is it and does it work?

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Key Points:

- **Blood Flow Restriction (BFR) exercise is a training intervention that utilizes an inflatable cuff to restrict blood flow to an exercising limb.**
- **BFR exercise is being implemented in many physical therapy clinics in an attempt to induce similar muscle adaptations as heavy weight training in clinical populations.**
- **Despite its current use in the clinic, how BFR training affects skeletal muscle in different clinical populations is not well understood.**

In the physical therapy world, it is commonly known that exercise is medicine. According to the American College of Sports Medicine, consistent exercise of at least 150 minutes per week of moderate intensity activity can reap significant health benefits[1]. Resistance exercise is a type of training recommended for preserving skeletal muscle function and mass in the aging population, allowing older adults to generate the power needed to maintain their independence in daily tasks such as climbing stairs, getting up from a bed or chair, and safely navigating public spaces[1]. However, resistance exercise training typically includes lifting heavy loads which may not be feasible for all older adults. Recently, blood flow restriction (BFR) training has been increasing in popularity as a potential alternative intervention for clinical populations because it can be combined with lifting lower loads to potentially elicit similar adaptations to heavy load training[2]. Blood flow restriction training utilizes an inflatable pressure cuff to restrict blood flow to the exercising limb. Although BFR is being used in the clinic, the underlying cellular effects and resulting adaptations in skeletal muscle are not well understood.

BFR training is similar to heavy resistance training in that both provide an acute stress on the exercising muscle. Heavy resistance training creates this stress via the heavy load on the muscle whereas BFR utilizes a lack of blood flow. This temporary stress causes your muscles to tire (fatigue) more quickly and recruit the fast, type II muscle cells that are important for strength and power production. By using an exercise that recruits these cells, they are encouraged to grow and strengthen. BFR has also been shown to cause other adaptations seen in heavy resistance training such as an increase in satellite cells, a stem cell in muscle that aids in growth and repair, and a decrease in levels of myostatin, a protein that inhibits muscle protein synthesis[3].

Although there are reported benefits of BFR training, other studies have found limited adaptations compared with heavy resistance training. For example, a study analyzing six weeks of BFR versus heavy resistance training in untrained males and females and found no increase in the size of the type I or type II muscle cells after the BFR training[2]. The heavy resistance training, in contrast, increased the size of the type II muscle cells with no increase in size of the type I (Figure 1) [2]. These findings suggest that despite the reported benefits of decreased myostatin and increased satellite cell content with BFR training[3], it may not be the most viable training intervention to improve muscle size, which is an important factor to increase strength and power.

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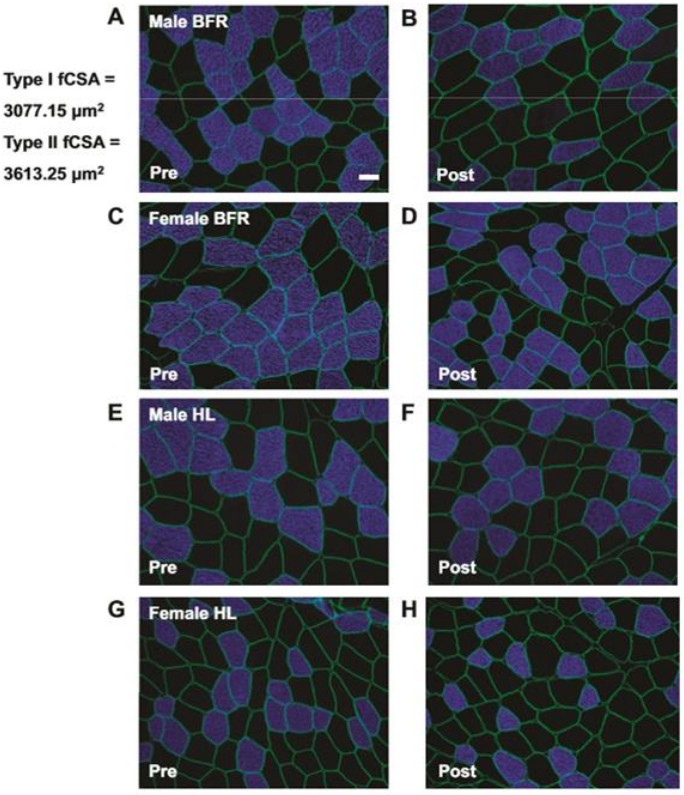

Figure 1: Cross-sectional area of muscle cells before and after both training programs. High load resistance training resulted in bigger fast type II (black) muscle cells whereas the BFR training did not show a significant increase in the size of the fast or the slow type I cells (blue) [2].

In conclusion, BFR exercise could be a potentially safe training intervention for clinical populations to obtain some of the adaptations seen in heavy resistance training. As previously mentioned, there are some benefits such as an increase in satellite cell content and a decrease in myostatin. However, whether these benefits result in increased muscle size and function remains unclear. Therefore, it is important to continue research on how the muscle adapts to BFR training across the lifespan and in different clinical populations.

References

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