# Blood Flow Restriction

Blood flow restriction therapy (BFR) is relatively new to the rehabilitation world, however was pioneered in the 1970s and 1980s by Yoshiaki Sato of Japan. Yoshiaki Sato termed BFR, Kaatsu training, “Ka” meaning additional and “Atsu” meaning pressure. (Pearson and Hussain, 2014). Since then BFR has gained interest and was first implemented for military personal who were struggling to improve muscle strength after rehabbing amputations and limb salvage procedures. BFR is utilized by professional and Olympic athletes to decrease risk for injury and optimize training.

**What is BFR?**

BFR training involves wrapping an elastic band or cuff around the most proximal portion of upper or lower limbs. The band will partially restrict venous blood flow, however will not affect the arterial flow. The restriction of venous blood flow is thought to induce ischemic/ hypoxic environment that enhances the training effect in the exercising muscle leading to increase in muscle mass and strength (Pearson, 2014).

There are two theories to build muscle; (i) the traditional theory of mechanical tension and loads, and (ii) inducing metabolic stress which is the theory behind BFR. Increased levels of metabolic stress is the driving stimulus to activate systematic hormone production and increased fast-twitched fiber recruitment which facilitate muscle growth via autocrine and paracrine actions (Pearson, 2014).

With BFR being relatively new it lacks standardization, with ranges of cuff sizes and pressures, and amount of sets and reps. The literature often follows a protocol of 30 x 15 x 15 x 15 or completion of all sets to volitional fatigue theorizing that it will produce greater metabolic stress. Frequency of training can increase with BFR training vs. traditional due to low load vs. high load. Frequency of training has ranged from 2x per week to 2x per day. BFR resistance training 2x per day has shown to be effective for increasing muscle size and strength within six days. (Fahs, Loenneke, Rossow, Thiebaud, Bemben, 2012)

To build muscle mass and increase strength, loads should be about 70% to 85% for one rep. BFR is theorized to create the same effect using 10% of 1 rep max with less load therefore creating decreased risk of injury. BFR can be beneficial for people who cannot tolerate heavy loads such as the elderly, people with chronic disease, athletes and people rehabbing from injury or surgery. (Slysz, Stultz and Burr, 2018) Several studies have reported that low intensity aerobic exercise combined with BFR can facilitate strength adaptations whereas hypertrophy and strength only occur with anaerobic exercises. (Slysz et. al, 2018) Some clinical applications for BFR include but are not limited to: generalized weakness, limb salvage, amputations, sarcopenia, arthrogenic muscle inhibition, tendinopathy, post surgical cases (TKA, ACL), and OA.

References:

1. Pearson, S. and Hussain, S. (2014). A Review on the Mechanisms of Blood-Flow Restriction Resistance Training-Induced Muscle Hypertrophy. *Sports Medicine*, 45(2), pp.187-200.
2. Slysz, J., Stultz, J. and Burr, J. (2018). *The efficacy of blood flow restricted exercise: A systematic review & meta- analysis*. [online] Jsams.org. Available at: https://www.jsams.org/article/S1440-2440(15)00182-6/fulltext [Accessed 23 Dec. 2018].
3. Fahs, Christopher A et al. "Methodological Considerations For Blood Flow Restricted Resistance Exercise". *Journal of Trainology* 1.1 (2012): 14-22. Web.