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Blood Flow Restriction Training Considerations

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What is Blood Flow Restriction Training?

In the rehabilitation world, there is a never ending search for advancements in treatment methodologies, techniques, and regimens to improve effectiveness and efficiency in care. Often times, we are faced with various conditions coming into the clinic with restrictions and/or limitations, which can then alter the way we attempt to successfully execute our plan of care. We are always striving to keep on adding to our clinical toolbox to help ensure that each patient gets the best opportunity for a successful recovery. In the recent years, blood flow restriction training (BFR) has evolved with the advancements in evidence-based practice models, covering a wide population, from professional athletes to NASA.

The purpose of blood flow restriction training is to utilize a pneumatic tourniquet cuff to restrict venous return while maintaining arterial blood flow to the musculature. Once applied, exercises are then performed at a lower intensity, ranging from 20-30% of a subject's 1RM [1,2]. The physiological impacts on growth hormone and IGF-1 help to simulate the effects of higher intensity training to help promote protein synthesis to enhance strength and hypertrophy [3-5]. There has been a wide array of various training strategies that have been utilized with the use of BFR training, most occurring at a higher volume of repetitions with short rest periods between sets.

Loenneke et al. [1] assessed various protocols of utilization, from low level exercises of 3 sets of 15 repetitions with 30 second rest breaks, to various low level walking/cycling protocols of varying times. The researchers concluded in their meta analysis that the resistance training programs performed more favorably to the aerobic protocols, and that the greatest effect size was achieved when performed 2 to 3 days per week [6]. From a clinical perspective, safety of interventions must always be the first factor to take into consideration before performing. There are various contraindications in regards to utilizing blood flow restriction training, so it is vital that we properly assess risk factors prior to application. Some contraindications for the use of blood flow restriction training use include but not limited to:

i. History of any of the following: DVT, Cancer, Open Fracture, Severe Hypertension, Stroke, Diabetes, Current Infection, Acidosis, Spinal Cord Injury, Rhabdomyalsis

ii. Compromised circulation or peripheral vascular systems

iii. Currently on medications that may alter clotting factor

iv. Extremities utilizing dialysis ports

v. Increased intracranial pressure

Clark et al. [7] assessed the safety following a 4 weeks protocol of blood flow restriction training and illustrated gains in strength measures without the alteration of nerve/vascular function, markers of coagulation or inflammation, while increasing fibrinolytic activity.

Practice Implications for Blood Flow Restriction Training

There are several clinical situations where blood flow restriction training can help to preserve current musculature while minimizing further damage to the injured area. In post-operative rehabilitation, especially when immobilization and protocol limitations are set, will provide the clinical with another modality to help facilitate hypertrophy at a lower load, while maintaining the integrity of the surgical intervention. This could provide an avenue to optimize earlier phases in the recovery process, and make clinical treatment more valuable and relevant to progress. An example of this could be in the earlier stages of ACL repairs where maintaining integrity of the graft is most important, and incorporating blood flow restriction training into Phase I exercises, such as quad sets, hamstring sets, hip straight leg raise activities.

Injuries resulting in restrictions of non-weight bearing can allow the condition to treat other portions of the kinetic chain while maintaining restrictions. Examples of this would be maintaining muscular strength of lower extremity following a high grade ankle sprain, where a patient may be placed in an immobilization boot. Performing open chain quadriceps

and hamstring activities can be performed with minimal resistance while achieving gains and reducing risks of kinetic chain dysfunction once weight bearing restrictions are lifted. In patients with osteoporosis, this can provide an avenue to provide high intensity muscular gains and potentially improving bone health [8].

Conclusion

This article is intended to help potentially establish studies to develop accelerated rehabilitation protocols implementing blood flow restriction training to help optimize care and reduce potential length of care. Blood flow restriction training could help to minimize degradation of various tissues and structures due to immobilization process. The potential to provide a high intensity physiological response with a low intensity volume of training can help to add another valuable tool to our clinical toolbox to deliver optimal care.

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