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Effects of Blood Flow Restriction Training: A Systematic Review

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Abstract

The purpose of this systematic review is to compare the effects of blood flow restriction training (BFRT) to traditional resistance training (RT) with regards to muscular strengthening with a consideration of pain during exercise. The research databases used included PEDro Physiotherapy Evidence Database and CINAHL. The key search terms used were blood flow restriction training, blood flow restriction exercise, occlusion training, occlusion exercise, musculoskeletal, and rehabilitation. Six different peer-reviewed research articles address this clinical intervention are included with their respective results and applicability. The population totaled 186 participants who participated in clinical trials (Bryk et al., 2016; Bunevičius et al., 2019; Erickson et al., 2019; Hughes et al., 2019; Iversen & Larmo, 2016; Ladlow et al., 2018). BFRT is shown to be beneficial and significantly more effective in muscular strengthening (Bryk et al., 2016; Erickson et al., 2019; Ladlow et al., 2018), functionality (Bryk et al., 2016; Bunevičius et al., 2019; Erickson et al., 2019; Ladlow et al., 2018), pain reduction during exercise (Bryk et al., 2016; Hughes et al., 2019; Ladlow et al., 2018), and muscular endurance (Bunevičius et al., 2019). However, one clinical trial found the use of BFRT found no significant difference in muscular strengthening when compared to a control group ($p = 0.6265$) (Iversen & Larmo, 2016). BFRT shows the potential to be a more effective means of training in rehabilitation when compared to traditional high load resistance training. However, further and more comprehensive research is required to prove its efficiency in clinical application.

Introduction

Blood flow restriction training (BFRT) uses a pressurized cuff to occlude blood flow as the patient exercises. It is believed the application of this cuff with reduced loads can have similar effects of muscle fatigue, tension, and metabolic stress as traditional resistance training (RT) at high loads. This is accomplished by restricting venous return while still allowing arterial flow and causes the pooling of blood with its metabolic and chemical mediators to the targeted tissue. The amount of load in a joint and the surrounding tissue is an essential factor in many rehabilitation protocols, and blood flow restriction training is considered to reduce these loads and stress while regaining muscular strength, endurance, and function. The purpose of this systematic review is to compare the effects of BFRT to traditional RT with regards to muscular strengthening with a consideration of pain during exercise. The clinical question to be answered is if the use of BFRT is an effective tool in rehabilitation when compared to traditional RT. Six different peer-reviewed research articles address this clinical intervention are included with their respective results and applicability.

Methodology

The search criteria for this topic included a specific database, key terms, scoring criteria, and inclusion and exclusion criteria. The research databases used included PEDro Physiotherapy Evidence Database and CINAHL. The key search terms used were blood flow restriction training, blood flow restriction exercise, occlusion training, occlusion exercise, musculoskeletal, and rehabilitation. All articles used in this systematic review must have a minimum research score of 4 or higher according to the PEDro research scoring criteria. The inclusion criteria consisted of research within the past five years, a randomized controlled trial, a population of males and females between the ages of 18 to 30 years of age, the use of a blood flow restrictive device during exercise, patients participating in a form of rehabilitation protocol following an injury or musculoskeletal condition, research that did not assess muscular strength, endurance, and/or functionality with respect to pain levels, and a control group using traditional high load resistance training during a rehabilitation protocol. Research that did not meet the minimum score of 4 according to the PEDro scoring criteria, not within the past five years, did not use blood flow restrictive device for the purpose of musculoskeletal training, patients not between the ages of 18 to 30 years of age, patients who have a comorbidity that will affect rehabilitation, research without a control group of traditional high load restriction training, articles that did not randomized selection, and other systematic reviews were excluded. These criteria were used to find more applicable and specific research for the targeted clinical question. Six articles are included in these criteria while 31 articles were excluded for not meeting the specifically stated criteria.

Conclusion

BFRT shows the potential to be a more effective means of training in rehabilitation when compared to traditional high load RT. This is due to its manipulation of the physiology of the targeted tissue during exercise. Most gathered research supports the use of BFRT in increasing muscular strength, endurance, and function while minimize patient reported pain levels. These finding answer the stated clinical question and support the use of occlusion training as an effective tool in patient rehabilitation. However, further and more comprehensive research is required to prove its efficiency in clinical application. Therefore, its clinical use should also be supported by the patient's values and personal clinical experience.



Table 1
Collected Data on Blood Flow Restriction Training

Byrk et al., 2016	BFRT showed a significant decrease in pain when compared to traditional RT and increase muscular strength.
Bunevičius et al., 2019	BFRT can improve muscular endurance, resistance to fatigue, oxygen consumption during exercise, and recovery after training with a significant difference compared to traditional RT.
Erickson et al., 2019	BFRT can improve biomechanics, peak quadriceps strength, rate, and torque both isometrically and isokinetically with a significant difference when compared to traditional RT.
Hughes et al., 2019	BFRT can significantly decrease patient reported knee joint pain and perceived exertion following rehabilitation of an ACL reconstruction when compared to traditional RT.
Iversen & Larmo, 2016	BFRT does not significantly reduce quadriceps atrophy compared to traditional RT.
Ladlow et al., 2018	BFRT can significantly increase quadriceps strength, size, and functional capacity when compared to traditional RT