Duke University School of Medicine

Doctor of Physical Therapy

Safety of Blood Flow Restriction Training for Patients with Musculoskeletal Disorders: A Systematic Review

Melissa Minniti[1], SPT, Andrew Statkevich[1], SPT, Ryan Kelly[1], SPT, Victoria Rigsby[1] SPT, Meghan Exline[1], SPT, Dan Rhon[2,3], PT, PhD, Derek Clewley[1], PT, DPT, PhD

1.Department of Orthopedics, Division of Physical Therapy, Duke University 2. Physical Performance Service Line, Office of the Army Surgeon General 3. Duke CLinical Research Institute

Background

What is Blood Flow Restriction training (BFRT)?

- Training intervention that uses blood pressure cuff to occlude blood flow to targeted muscle groups during exercise
- Has comparable physiological effects to resistance training

What is known?

- Large variability in protocols
- No standard way to determine who is eligible and likely to benefit from BFRT
- Has been studied largely in non-clinical populations

What is unknown?

- Is BFRT safe in clinical populations?
- What adverse outcomes of BFRT are we seeing clinically?

Purpose

Evaluate the safety and adverse events associated with blood flow restriction training in patients with musculoskeletal disorders.

Methods (Eligibility)

Inclusion

- BFRT was used as clinical intervention
- Study participants had a disorder of the musculoskeletal system
- Authors addressed adverse events

Exclusion

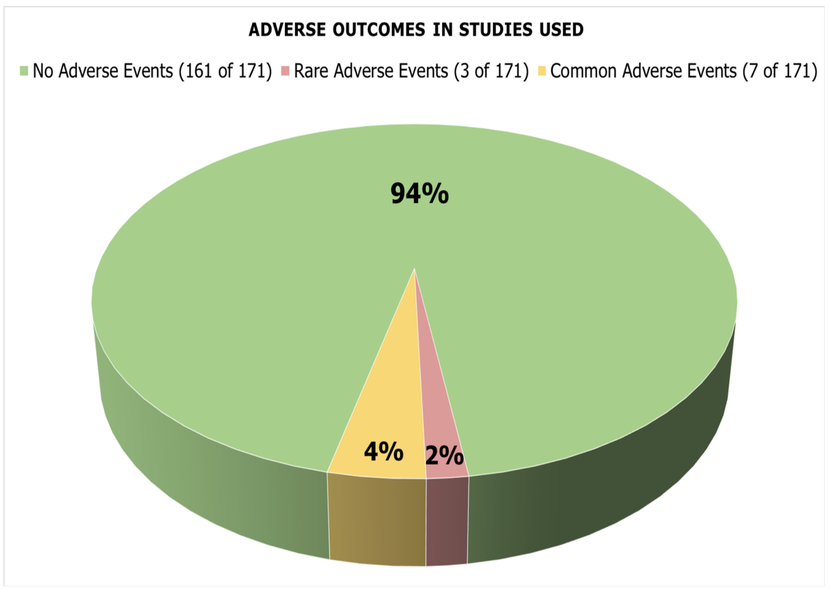
- Studies not published in English language
- Non-human subjects
- Systematic or narrative reviews

Systematic Search

- MEDLINE
- CINAHL
- Embase

Results

3304 articles screened → **87** full-text articles assessed for eligibility → **19** included for qualitative synthesis



Adverse event: unintended or detrimental effects from a treatment or condition

Common Adverse Events	Rare Adverse Events
• Acute muscle pain • Acute muscle fatigue • intolerance to blood pressure cuff/intervention	• Deep Vein Thrombosis • Rhabdomyolysis

Results

Diagnosis	Number of subjects	Number of subjects who experienced adverse event
Post-Op Non-Reconstructive Knee Arthroscopy*	17	0
Knee Osteoarthritis*	48	0
Knee Osteoarthritis*	34	0
Non-Active Polymyositis or Dermatomyositis*	13	0
Anterior Knee Pain	40	0
ACL-R	30	0
Achilles Tendon Rupture	2	0
Lower leg, ankle, foot fractures	7	0
Knee Osteoarthritis and Post-Op Total Knee Arthroplasty	3	0
Fracture of medial femoral condyle	1	0
Knee Osteoarthritis*	42	1
Knee Osteoarthritis*	45	1
ACL-R*	44	2
Inclusion Body Myositis	1	1
Inclusion Body Myositis	1	1
Inclusion Body Myositis	1	1
Thoracic Outlet Syndrome	1	1
Knee Articular Cartilage Reseaction	1	1
Ankle Sprain	1	1

**indicates randomized control trials, all good to excellent quality*

Conclusions

- Clinical BFRT appears to be a safe exercise-based intervention for use with adult patients with orthopedic knee conditions
- Further research is needed to:
  - Define adverse events
  - Develop screening methods to determine risk for adverse events

Clinical Relevance

- Under appropriate conditions, BFRT is safe to use in clinical practice with minimal risk.
- Understanding the current evidence based guidelines and advocating for consistent BFRT application is essential to minimizing risk

Acknowledgements

We acknowledge Emily S Mazure, MSI, Research and Education Librarian at the Duke University Medical Center Library & Archives, for conducting the search and managing Rayyan