

A LITERATURE REVIEW ON SELECT MANUAL THERAPIES FOLLOWED BY A
STUDY DESIGN ON COMPARATIVE EFFECTS OF MASSAGE, BLOOD FLOW
RESTRICTION, AND DRY NEEDLING ON HAMSTRING INJURIES IN COLLEGE
ATHLETES

by

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ABSTRACT

Background: Manual therapies have become an increasingly popular supplemental therapeutic modality for hamstring injury recovery. Examples of manual therapies include massage, blood flow restriction (BFR), and dry needling. The increasing popularity of these modalities could be due, in part, to that they are often easily accessible and require little or no equipment. As a result, they have been used to aid in the recovery of a wide range of acute and chronic injuries. Massage has been shown to increase blood flow and promote relaxation through the strategic and methodic manipulation of soft tissues. Blood flow restriction can act as an early form of resistance training because it promotes similar muscle fatigue while not exposing weakened tissue to high loads of mechanical stress. Dry needling can provide precise relief of pain and stiffness by breaking apart trigger points in soft muscle tissue. These three manual therapies have gained particular traction in the recovery of hamstring injuries.

Purpose: To evaluate the comparative effectiveness of massage, BFR, and dry needling in hamstring injury recovery of college athletes. Hamstring injuries are among the most common in athletics, especially at the college level, and they occur frequently as either acute or chronic. As such, it would be valuable for medical professionals working with college athletes to know whether massage, BFR, and dry needling are equally effective in both circumstances.

Methods (proposed): A two-pronged study that incorporates a high volume of post-recovery surveys and a lower volume of mid-recovery randomized controlled trial (RCT).

Subjects will be college athletes ages 18 to 25 who have been diagnosed with a hamstring injury within the last 6 months. Participants in the mid-recovery RCT will be randomized into one of four treatment groups, consisting of massage, BFR, dry needling, or control, through block randomization. Participants will undergo treatments three times a week for 10 weeks.

Results: There are no results to report. The study was not completed due to time constraints.

Conclusion: If the proposed study can be conducted, the data collected should fill gaps in research on the comparative effectiveness of massage, BFR, and dry needling on hamstring injury recovery in college athletes.

I. LITERATURE REVIEW OF SELECT MANUAL THERAPIES

Manual Therapies:

Manual therapies require physical interaction between a patient and practitioner and often need some form of simple equipment and formal training^{1,2}. The practitioner can bring the equipment anywhere, allowing manual therapies to exist in a variety of settings¹. This presents a stark contrast to other treatments such as traditional e-stim or ultrasound, as these necessitate heavy, electric, and often expensive machines^{2,3}.

The proper utilization of manual therapies promotes healing of damaged tissue in two important ways, by promoting natural healing factors and by minimizing the barriers that prevent rehabilitation^{1,3}. Generally, the patient will focus on these barriers to rehabilitation, which can include pain, inflammation, reduced range of motion, spasms, and scar tissue build-up⁴. If the clinician can minimize the impact of pain and inflammation, the patient tends to feel comfortable advancing to later stages in rehabilitation sooner^{5,6}.

Hamstring Injuries:

The term “hamstring injury” loosely refers to strains, bruising, or tearing of one or more of the muscles involved in the hamstring group^{1,4,7}. These include the semimembranosus, semitendinosus, and biceps femoris^{2,8}. Non-specific hamstring strains occur at incredibly high rates in sports and the rate increases for athletes who have a history of hamstring injury^{6,9}.

Massage:**Definition:**

Massage involves the strategic and methodic manipulation of soft tissue with the intent of increasing blood flow to an area, reducing physical tensions, or providing psychological relaxation to the patient^{2,10}.

Indications:

The effects on the body that a medical professional wants to promote when performing massage include breaking a pain-spasm-pain cycle, evoking neurologic relaxation, benefitting local blood flow, and increasing the volume of blood returning to the heart^{10,11}. Depending on the technique and desired outcome, some massages will focus on physiological effects while others will focus on psychological relaxation and tension release¹⁰.

Contraindications:

Local conditions that might prevent the use of massage on a patient include an acute sprain or strain, a lesion, a skin disease, a site where a fracture failed to heal, or a patient who experiences hypersensitivity to touch¹. Additionally, massage is contraindicated when the patient has a bleeding disorder or is taking medication to thin their blood^{2,11}. A pregnant woman interested in massage as a therapeutic modality would benefit from consulting their doctor first to ensure their overall safety².

Modern Applications:

Currently, practitioners apply basic massage in five categories. Effleurage, petrissage, friction, tapotement, and vibration each affect the body differently, so the patient will experience a different sensation and physiological change depending on the

technique used by the practitioner². The combination of these movements helps to increase blood flow and promote relaxation^{1,11}. Outside of the basic massage, there are also eight common, specialized techniques. Myofascial Release, Graston, Rolfing, Neuromuscular Therapy, Shiatsu, Craniosacral therapy, Trigger Point Therapy, and Reflexology are the names of these specialized techniques².

Blood Flow Restriction:

Definition:

Blood flow restriction (BFR) uses a pressure cuff to limit arterial inflow and restrict venous outflow to musculature in combination with an exercise regimen. The exercise regimen may include low-intensity resistance training^{1,2,12}.

Indications:

A common utilization of BFR is in post-operative physical therapy. The reason for this use is that BFR mimics a high intensity environment, promoting growth and healing, but does not damage the tissue as much^{12,13}.

Contraindications:

The key contraindications for BFR are going to be any condition related to abnormal blood conditions. This includes a patient who is pregnant, hypertensive, or on a blood thinning medication^{2,14}.

Modern Applications:

The restriction of blood flow to soft muscle tissue while it is under stress forces specific enzymes and compounds to remain in the muscle for longer¹⁵. This mimics higher intensity environments without damaging the tissue, which can help assess

healing^{2,14}. In addition to allowing the practitioner to assess the structure, the high-performance environment provided by BFR can act as an excellent conditioning exercise^{1,16}. Though BFR is an excellent starting point for muscle gain and strengthening post-injury, it is shown to be less effective than traditional high-resistance exercises at increasing muscle strength. Therefore, it is most beneficial when used to reintroduce soft tissue to ranges of motion with resistance, not when used in place of a more traditional high-resistance regimen^{2,15}.

Dry Needling:

Definition:

Dry needling involves the directed placement of small, filament needles to break up and release trigger points in soft muscle tissue¹⁷. The term “dry needling” refers to the absence of any medication on the needle itself. As such, this modality only benefits the release of myofascial trigger points and not the wider array of conditions that traditional Chinese acupuncture can benefit¹.

Indications:

A key indication for dry needling is a clear myofascial trigger point or a series of them along the musculature¹⁸. The primary purpose of dry needling is to release tension through the release of myofascial trigger points, so there is little reason to utilize this manual therapy without this clear indicator¹⁹.

Contraindications:

Dry needling is such a simplistic manual therapy that the primary contraindications are when the patient has a fear of needles or is incapable of

understanding the process and anticipated effects^{2,20}. There is also an inherent, minor risk of infection due to breaking the skin. Some sources argue that patients on blood thinners or who are pregnant should not receive this treatment, but the consistent contraindications were fear of needles and those who could not understand the procedure²¹.

Modern Applications:

Due to lack of study data in other areas, dry needling can only be effectively utilized in the treatment of trigger points^{20,22}. Also, state-level regulations affect the availability of this therapeutic modality, preventing a wide-spread understanding of its potential⁷. This modality is most often used in conjunction with other, physically intensive modalities. By releasing pain and increasing range of motion in the short term, the patient is able to undergo massage, blood flow restriction, or even a traditional resistance training regimen that will benefit them in the long term^{1,23}.

An issue with the modern application of dry needling is the stigma surrounding its practice. Though research has begun to reach a consensus on the common effects, both good and bad, of dry needling, legislation and insurance companies restrict its use. State legislation already restricts the practice on outdated information, but the continued lack of coverage on insurance means that dry needling is used infrequently in the states that allow it^{1,2,19}.

II. STUDY DESIGN TO COMPARE THE EFFECTS OF MASSAGE, BLOOD FLOW RESTRICTION, AND DRY NEEDLING ON HAMSTRING INJURIES IN COLLEGE ATHLETES

Participants:

Primary demographics used in this study are college athletes ages 18 to 25 that have been diagnosed with a hamstring injury within the past 6 months. Though, the survey will be provided to an expanded group, the data within the primary demographic will be separated for evaluation alongside the data collected in the randomized controlled trial. Exclusion criteria for the second prong of the study are a hamstring injury outside the allotted timeframe, significant comorbidities alongside the hamstring injury, and a condition that contraindicates any of the three manual therapies evaluated.

Methods:

The study will include a two-pronged approach, beginning with a high volume of post-recovery surveys with the intention of evaluating expectations and perceived improvements of the athletes. The survey consists of descriptions of massage, BFR, and dry needling, quantitative questioning on the treatment the athlete received, and additional questions on their perception of that treatment. Results from the survey will be compared to data collected in the RCT in an effort to compare the expectations of the population with data on what was measured to be the most effective.

Second, a low volume of mid-recovery athletes will be placed in a randomized controlled trial. The participants will be placed into one of four treatment groups through block randomization. They will undergo the assigned treatment three times a week for ten weeks alongside traditional physical therapy. Range of motion, pain, quality of life,

satisfaction with the treatment, and expected recovery timeline data will be collected throughout trial.

Data Structures:

The below data structure is an example of the types of information that researchers completing the designed study would need to collect. It covers a wide range of necessary values, though some may be added or omitted depending on the expectations and requirements of the final project.

Patient #	
Age:	
Sex:	
Sport:	
Acute/Chronic:	
Date of Injury:	
First Clinical Visit:	
Diagnosis:	
Treatment Group:	

Results:

There are no results to report. The study was not completed due to time constraints.

Discussion:

The design of this study proposal directly influences a gap in understanding. Manual therapies as a whole have received dedicated research in the past two decades,

but little of that research has been directed at how these manual therapies impact targeted injuries. Additionally, a significant portion of the research available on manual therapies fails to focus on an age range, the activity level of a population, or the effect on hamstring injuries. Therefore, by evaluating the comparative effectiveness of massage, BFR, and dry needling in hamstring injury recovery of college athletes, part of this gap in research can be filled.

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