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Comparing two hands-on therapy methods for improving ankle motion in college athletes

Submission date
08/08/2025

Recruitment status
No longer recruiting

Registration date
13/08/2025

Overall study status
Completed

Last Edited
13/08/2025

Condition category
Injury, Occupational Diseases, Poisoning

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[ ] Record updated in last year

Plain English summary of protocol

Background and study aims
The primary aim of this study was to compare the effectiveness of two manual therapy interventions on ankle motion. The second aim was to look at the association between ankle joint assessment and the movement of the bones around the joint. The third aim was to find out how manual therapy techniques aimed at the ankle joint can affect the injury risk of ankle sprains.

Who can participate?
Athletes aged 18 to 25 years from the men's and women's soccer, basketball, and lacrosse teams

What does the study involve?
Participants have their ankle motion measured and are randomly allocated to one of three groups:
1. Control group
2. High-velocity low amplitude thrust (HVLAT)
3. Closed kinetic chain mobilization with movement (CKCMWM)
The researchers determine the short-term impact of the manual therapy interventions on ankle motion.

What are the possible benefits and risks of participating?
Participation in this study involved minimal risk to subjects. Potential risks included temporary soreness, mild discomfort or joint stiffness following manual therapy interventions. These effects were
expected to be short-lived and to resolve without lasting harm. The screening and intervention procedures carried no known risk of serious injury when performed by licensed physical therapists trained in the study techniques.
Potential benefits to participants included an improvement in ankle range of motion, which may enhance function and potentially reduce the risk of ankle sprains. Participants also contributed to advancing clinical knowledge regarding the effectiveness of manual therapy techniques in sports medicine, which may benefit future athletes.

Where is the study run from?
Lebanon Valley College (USA)

When is the study starting and how long is it expected to run for?
September 2018 to October 2019

Who is funding the study?
Investigator initiated and funded

Who is the main contact?
Dr Michael E. Lehr, mlehr@messiah.edu

Contact information

Type(s)
Public, Scientific, Principal investigator

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Study information

Scientific Title
A randomized control trial comparison of high-velocity low amplitude thrust and closed kinetic chain mobilization with movement on dorsiflexion range of motion and lateral ankle sprain risk in collegiate athletes

Acronym
MT-DFROM-LAS

Study objectives
Closed kinetic chain mobilization with movement (CKCMWM) will produce greater improvements in closed chain dorsiflexion range of motion compared to high-velocity low amplitude thrust (HVLAT) and control. Observed association of the relationship of joint play of the talocrural joint and osteokinematic motion of ankle dorsiflexion.

Ethics approval required
Ethics approval required

Ethics approval(s)

Approved 24/09/2018, Andrew's University Institutional Review Board (IRB) (8488 E Campus Circle Drive, Berrien Springs, MI, 49104-0355, United States of America; +1 (0) (269)471-6361; irb@andrews.edu), ref: 18-075

Primary study design
Interventional

Study design
Randomized control trial experimental and interventional pre- and post-test design

Study type(s)
Other, Treatment

Health condition(s) or problem(s) studied
Injury risk for lateral ankle sprains and ankle range of motion

Interventions
A randomized control trial experimental and interventional pre- and post-test design, participants were randomized in a block manner within one's sport into one of three interventional groups:
1. Control group
2. High-velocity low amplitude thrust (HVLAT)
3. Closed kinetic chain mobilization with movement (CKCMWM)

Participants proceeded through a standardized station sequence for data collection, which included the following:
1. Initial intake
2. Pre-test CKCDFROM
3. Joint play assessment
4. Intervention or control
5. Post-test CKCDFROM
6. Exit station/debrief

CKCDFROM Assessment Instrumentation & Procedures:
CKCDFROM was measured using a digital inclinometer via an iPhone device. The front leg was placed on a 30 cm box in height, with the medial aspect of the calcaneus and medial first ray aligned along a vertical line on the box. A medial longitudinal arch wedge was used to maintain navicular height in weight bearing to control for excessive midtarsal joint pronation and rearfoot eversion. The inclinometer was placed 15 cm from the most prominent portion of the tibial tuberosity. Standardized verbal instructions complemented a demonstration of the test via a video. Each subject's right and left CKCDFROM were assessed and recorded in degrees. Examiners for CKCDFROM were blinded to the participant's group assignment.
The leg of interest was the ankle that demonstrated the greatest restriction of CKCDFROM. If both ankles were equally restricted, then the default selection was the right. Pre- and post-test measures were taken in all subjects. The examiners were blinded to the pre-test measures during post-testing procedures and the experimental group assignments.

Joint Play Assessment of the Talocrural Joint:
Joint play assessment (posterior talar glide) was performed in an open-packed position in an open kinetic chain (OKC). Joint play assessment was administered by the primary investigator of the study, who was a board-certified orthopedic specialist (OCS) by the American

Board of Physical Therapy Specialities (ABPTS), holding an advanced certification in manual therapy. The assessment was conducted in an open-packed OKC position on the most restricted side, followed by either HLVAT or CKCMWM, unless the subject was in the control group. The assessment was performed in an open-packed position OKC on the most restricted side, followed by one of the interventions (HLVAT or CKCMWM) unless the subject was assigned to the control group. The examiners were blinded to the pre- and post-test CKCDFROM findings.

Manual Therapy Techniques for the Talocrural Joint:
Participants were randomly assigned within their respective sport to either group #2 (HVLAT) or group #3 (MWM). Participants received the HVLAT “J stroke” technique or the MWM, applied to the most restricted CKCDFROM side based on pre-test CKCKDFROM assessment. Two licensed physical therapists, both certified orthopedic clinical specialists with additional advanced manual therapy certification, performed the interventions. To ensure reliability within the study, one examiner conducted manual technique #1 HVLAT (talocrural distraction “J stroke” technique), while the other performed manual technique #2 (CKC MWM) as described by Mulligan. Participants assigned to the control group remained standing against a wall until completing the circuit - no sham intervention was used. Technique #1 involved the HVLAT method. The HVLAT-modified technique combined distraction force with a slight posterior glide of the talus bone. Technique #2 included the CKCMWM procedure in the weight-bearing position on the standardized footstool and aligning the medial aspect of the foot with the vertically lined tape. The CKC mobilization with movement (MWM) involved a sustained posterior glide of the talus in a weight-bearing position while the subject performed five successful repetitions. This technique was modified slightly from the weight-bearing technique originally described by Vincenzio and did not utilize a belt for anterior translation of the tibia. The therapist imposed a slight IR of the tibia to assist with relative external rotation of the talus during the posterior translation.

Intervention Type
Behavioural

Primary outcome(s)
Closed kinetic chain dorsiflexion range of motion (CKCDFROM) measured using a digital inclinometer via an iPhone device at baseline (pre-test) and post-test within a single session

Key secondary outcome(s)
Injury risk factors present for lateral ankle sprains, including the evidence-informed cut points of <35 degrees of CKCDFROM or >5 cm asymmetry between right and left ankle. CKCDFROM was measured with a digital inclinometer via the iPhone device for both pre- and post-testing sessions, which occurred in stations 2 and 5, respectively, averaging 17 minutes (10-21 min) between stations.

Completion date
01/10/2019

Eligibility

Key inclusion criteria
1. No reported musculoskeletal injury within 3 months before the start of the study
2. No lower extremity musculoskeletal pain at the time of testing
3. Medical clearance for sport participation
4. No previous lower extremity surgery that included hardware in the ankle/foot complex that is

currently in place
5. No weight-bearing restrictions
6. Hip active range of motion of 0-90 degrees
7. Knee active range of motion of 0-120 degrees
8. Previously diagnosed concussion over the last year
9. Presence of any contraindication to orthopedic manual therapy (OMT) to the ankle complex

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 Years

Upper age limit
25 Years

Sex
All

Total final enrolment
73

Key exclusion criteria
1. Under medical restrictions
2. Inability to bear weight on limb due to pain

Date of first enrolment
21/10/2018

Date of final enrolment
28/11/2018

Locations

Countries of recruitment
United States of America

Study participating centre
Lebanon Valley College
101 College Avenue
Annville, PA
United States of America
17003

Sponsor information

Organisation
Andrews University

ROR
https://ror.org/04aaa2n62

Funder(s)

Funder type
Other

Funder Name
Investigator initiated and funded

Results and Publications

Individual participant data (IPD) sharing plan
The de-identified dataset generated and analyzed for the study will be made available upon request to Michael E. Lehr (mlehr@messiah.edu)

IPD sharing plan summary
Available on request