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Effects of spinal manipulation on lower limb strength and endurance in adolescent athletes: a randomized controlled trial

Submission date
25/07/2025

Recruitment status
No longer recruiting

Registration date
28/07/2025

Overall study status
Ongoing

Last Edited
28/07/2025

Condition category
Musculoskeletal Diseases

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

Plain English summary of protocol

Background and study aims
This study is looking at whether a chiropractic technique called spinal manipulation can help teenage athletes get stronger and perform better. Many young athletes have small joint or muscle issues that might affect how well they move or increase their risk of injury. The researchers want to see if spinal manipulation can support strength development during a short training program.

Who can participate?
Healthy teenage athletes aged 15 to 17 years can take part, as long as they've been cleared by a doctor for physical activity and haven't had spinal manipulation before.

What does the study involve?
Participants will be randomly placed into one of two groups. Both groups will do the same four-week strength training program. One group will also receive spinal manipulation once a week. Before and after the program, everyone will do tests to measure leg strength, balance, and how confident and tired they feel during exercise.

What are the possible benefits and risks of participating?
Taking part might help improve strength, balance, and body awareness. The risks are very low and similar to those of regular exercise. Spinal manipulation is commonly used and is considered safe for healthy teens when done by trained professionals.

Where is the study run from?
Caozhou Wu School in Heze, Shandong Province, China.

When is the study starting and how long is it expected to run for?
Recruitment began in August 2025, and the researchers expect to finish collecting data by September 2025.

Who is funding the study?
Investigator initiated and funded

Who is the main contact?
Qian Zhang, lemon28@icloud.com

Contact information

Type(s)
Scientific, Principal Investigator

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Public

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Additional identifiers

EudraCT/CTIS number
Nil known

IRAS number

ClinicalTrials.gov number
Nil known

Secondary identifying numbers

Nil known

Study information

Scientific Title
A randomized controlled trial evaluating the effects of spinal manipulation on lower extremity strength and functional performance in adolescent athletes

Study objectives
To evaluate the effects of spinal manipulation on lower extremity strength and functional performance in adolescent athletes. The study aims to determine whether spinal manipulation can enhance lower-limb power, endurance, and agility when compared to a control group undergoing physical training alone.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 11/07/2025, Sports Science Experiment Ethics Committee of Beijing Sport University (No. 48, Information Road, Haidian District, Beijing, 100084, China; +86 10-62989306; bsulb@bsu.edu.cn), ref: 2025325H

Study design
Prospective randomized controlled trial with two parallel groups

Primary study design
Interventional

Secondary study design
Randomised parallel trial

Study setting(s)
Built environment/local authority, Community

Study type(s)
Prevention, Quality of life, Treatment

Participant information sheet
See study outputs table

Health condition(s) or problem(s) studied
Musculoskeletal performance deficits, including suboptimal lower-limb strength and endurance, in adolescent athletes

Interventions
The experimental group received lumbopelvic spinal manipulation (SM) once a week for four weeks, targeting segmental dysfunction identified through motion palpation. The control group continued routine physical training without manual intervention. All participants underwent pre- and post-assessment of lower-limb strength, power, and endurance.

Participants were randomly assigned to the experimental or control group using a computerized random number generator created in Microsoft Excel. The RAND() function was used to generate a random number for each participant, which was then sorted to determine group allocation. An independent researcher—who was not involved in participant recruitment, intervention, or data analysis—managed the sequence and prepared sealed, opaque envelopes to conceal allocation. This process ensured both randomisation integrity and allocation concealment.

Intervention Type
Other

Primary outcome measure
Lower-limb strength measured using 40kg squat repetitions to fatigue and 1RM squat test (kg) at baseline and after 4 weeks (post-intervention)

Secondary outcome measures
1. Agility measured using the two-point agility test (s) at baseline and post-intervention (week 4)
2. Static balance measured using single-leg balance test (s) at baseline and post-intervention (week 4)
3. Perceived exertion and confidence measured using Session RPE and SRQ immediately after each training session

Overall study start date
01/06/2025

Completion date
10/09/2025

Eligibility

Key inclusion criteria
1. Medically cleared for physical activity
2. Participating in a structured physical training program
3. No musculoskeletal injuries within the past 3 months
4. No prior exposure to spinal manipulation
5. Provided signed informed consent (by participant and legal guardian)

Participant type(s)
Healthy volunteer, Learner/student

Age group
Child

Lower age limit
15 Years

Upper age limit
17 Years

Sex

Both

Target number of participants
70

Total final enrolment
66

Key exclusion criteria
1. Acute or chronic musculoskeletal injuries
2. Neurological or cardiovascular conditions affecting exercise performance
3. Current use of medications affecting neuromuscular function
4. History of spinal surgery
5. Refusal or inability to provide informed consent

Date of first enrolment
02/08/2025

Date of final enrolment
05/08/2025

Locations

Countries of recruitment
China

Study participating centre
CAO ZHOU WU School
Mu Dan South Rd No.855
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Sponsor information

Organisation
Beijing Sport University

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Sponsor type
University/education

Website
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ROR
https://ror.org/03w0k0x36

Funder(s)

Funder type
Other

Funder Name
Investigator initiated and funded

Results and Publications

Publication and dissemination plan
Planned publication in a peer-reviewed journal specializing in sports science, physical therapy, or chiropractic research. We also intend to present the findings at national and international academic conferences in the fields of sports medicine and adolescent athletic development.

Intention to publish date
01/12/2025

Individual participant data (IPD) sharing plan
The datasets generated during the current study will be available upon reasonable request from the lead researcher, Dr. Qian Zhang (qian.zhang@palmer.edu). The data shared will include de-identified individual performance scores and questionnaire results. Data will be available from December 2025 for up to 5 years. Access will be granted to academic researchers for non-commercial use, subject to ethical approval and data-sharing agreement. Data will be anonymised prior to release to ensure participant confidentiality.

IPD sharing plan summary
Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Participant information sheet			28/07/2025	No	Yes
Protocol file			28/07/2025	No	No