Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Topical Jitongzhi for low back myofascial pain syndrome: study protocol for a single- centre, randomised, double-blind, placebo- and active-controlled superiority trial

Kaiyang Xu
Nanjing University of Chinese Medicine
Zhenyu Tang
Nanjing University of Chinese Medicine
Yuxiang Dai
Nanjing University of Chinese Medicine
Yucheng Wang
Nanjing University of Chinese Medicine
Xiaorong Li
Nanjing University of Chinese Medicine
Wenjie Chang
Nanjing University of Chinese Medicine
Zihang Li
Nanjing University of Chinese Medicine
Jingtao Liu
Nanjing University of Chinese Medicine
Pengfei Yu
yupengfei86@163.com

Nanjing University of Chinese Medicine

Study protocol

Keywords: Jitongzhi, low back myofascial pain syndrome, low back pain, topical treatment, randomised controlled trial, study protocol

Posted Date: November 4th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10377119/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

Background: Low back myofascial pain syndrome is a clinically important source of persistent low back pain and disability. Existing treatments may provide symptomatic relief, but treatment response is variable and some options are invasive or associated with systemic adverse effects. Evidence for formulation-specific topical traditional medicines remains limited.

Methods: This single-centre, three-arm, parallel-group, randomised, double-blind, placebo- and active-controlled superiority trial will enrol 135 adults aged 18-65 years with low back myofascial pain syndrome. Participants will be allocated in a 1:1:1 ratio to topical Jitongzhi, matched placebo, or an active topical comparator, administered for 4 weeks alongside standardised education and exercise guidance. The primary outcome is change in average low back pain intensity on a 100-mm visual analogue scale from baseline to week 4. Secondary clinical outcomes include disability measured with the Oswestry Disability Index, pain and disability through week 12, rescue analgesic use, adherence, blinding credibility, and adverse events. Inflammatory markers, magnetic resonance imaging and infrared thermography are prespecified exploratory outcomes. The primary comparison is Jitongzhi versus placebo and will use analysis of covariance adjusted for baseline pain. Analyses will follow the intention-to-treat principle.

Discussion: This trial is primarily designed to evaluate the treatment-specific clinical efficacy and short-term safety of topical Jitongzhi. No robust formulation-specific human evidence currently establishes a biological mechanism for Jitongzhi. The inflammatory, magnetic resonance imaging and thermographic assessments are hypothesis-generating correlates and will not be interpreted as evidence of causality or used as substitutes for patient-reported outcomes. The findings will inform the design of a future multicentre confirmatory trial.

Trial registration: International Traditional Medicine Clinical Trial Registry (ITMCTR), registration number ITMCTR2026000179. Prospectively registered on 7 January 2026 before enrolment of the first participant.

Administrative information and structured summary

SPIRIT item numbers are shown in curly brackets. The completed SPIRIT 2025 checklist is provided as Additional file 1, and the schedule of enrolment, interventions and assessments is shown in Figure 1.

WHO trial registration data item	Information
Primary registry and trial identifying number {4}	International Traditional Medicine Clinical Trial Registry (ITMCTR); registration number ITMCTR2026000179.
Date of registration {4}	7 January 2026; registration completed before enrolment of the first participant.
Registry record URL {4}	https://itmctr.ccebtcm.org.cn/mgt/search (search registration number ITMCTR2026000179).
Secondary identifying numbers	SYWD2025296; ethics approval no. 2025□□□081.
Sources of monetary or material support {7a}	2025 Suzhou Science and Technology Program - Medical and Health Innovation (Third Batch), Suzhou Science and Technology Bureau (project no. SYWD2025296), with institutional support from Suzhou Hospital of Traditional Chinese Medicine.
Primary sponsor and contact information {3b}	Suzhou Hospital of Traditional Chinese Medicine, 18 Yangsu Road, Gusu District, Suzhou 215009, Jiangsu, China. Sponsor contact: Pengfei Yu; telephone +86 15850173990; email yupengfei86@163.com.
Role of sponsor and funders {3c}	The sponsor and funders provide administrative and financial support but will not control randomisation, outcome assessment, statistical analysis, interpretation, manuscript preparation, or the decision to publish.
Contact for public queries	Pengfei Yu; email: yupengfei86@163.com; telephone: +86 15850173990.
Contact for scientific queries	Pengfei Yu; email: yupengfei86@163.com. Jingtao Liu; email: okdoctor@163.com.
Public title	A randomised study of topical Jitongzhi for people with low back myofascial pain syndrome.
Scientific title	Topical Jitongzhi for low back myofascial pain syndrome: study protocol for a single-centre, randomised, double-blind, placebo- and active-controlled superiority trial.
Country of recruitment	China.
Health condition studied	Low back myofascial pain syndrome.
Interventions	Topical Jitongzhi, matched placebo, or an active topical comparator, each administered for 4 weeks with standardised education and exercise guidance.

WHO trial registration data item	Information
Key eligibility criteria	Adults aged 18-65 years with clinically diagnosed low back myofascial pain syndrome and an active myofascial trigger point; exclusions include pregnancy or breastfeeding, competing spinal or systemic pathology, previous lumbar surgery, damaged skin at the application site, serious uncontrolled illness, and known hypersensitivity to study products.
Study type	Interventional, single-centre, three-arm, parallel-group, randomised, double-blind, placebo- and active-controlled superiority trial; allocation ratio 1:1:1.
Date of first enrolment	August 2026 (planned; to begin after site initiation).
Target sample size	135 participants (45 per group).
Recruitment status	Not yet recruiting at the time this submission package was prepared.
Primary outcome	Change in 100-mm visual analogue scale pain score from baseline to week 4.
Key secondary outcomes	Change in ODI; pain and disability through week 12; rescue analgesic use; adherence; blinding credibility; and adverse events. Prespecified exploratory outcomes are CRP, ESR, IL-6, MRI and infrared thermography measures; these will not be used to establish efficacy or a causal mechanism.
Ethics review {30}	Ethics Committee of Suzhou Hospital of Traditional Chinese Medicine, Affiliated Hospital of Nanjing University of Chinese Medicine; approval no. 2025□□□081; approved 26 December 2025.
Expected primary completion date	September 2028 (anticipated).
IPD sharing statement {6}	De-identified participant-level data, a data dictionary and analysis code will be available from 6 months after publication of the primary results for 5 years, subject to ethics approval, institutional review and a data-use agreement.

Protocol version {2}

Protocol version 1.0, dated 30 December 2025.

Introduction

Background and rationale {9a}

Low back myofascial pain syndrome is characterised by regional pain associated with hyperirritable trigger points within taut bands of skeletal muscle. Compression of an active trigger point may reproduce the patient's familiar local or referred pain. The condition can impair activity, sleep and work

participation and may coexist with non-specific low back pain presentations encountered in orthopaedic and rehabilitation practice [1-3].

Management commonly includes education, exercise, physical therapy, non-steroidal anti-inflammatory drugs and trigger-point procedures. Responses are heterogeneous, and some options require repeated clinical visits, are invasive, or expose patients to systemic adverse effects [2,3].

Jitongzhi is a topical traditional Chinese medicine formulation developed for soft-tissue pain. The formulation contains Fangji, Weilingxian, Danggui, Chuanxiong, Mugua, Xiaohuixiang, Ruxiang, Shenjincao, Sumu, Bingpian and menthol in a topical base. Proposed explanations for its use include local analgesic and anti-inflammatory activity and changes in local microcirculation. However, no rigorous formulation-specific human evidence currently establishes that these proposed pathways mediate a clinical effect, and mechanistic hypotheses should not be regarded as evidence of efficacy. A recent multicentre placebo-controlled trial of another topical traditional medicine in a low-back-pain-related condition showed that rigorous blinded evaluation of such products is feasible, but its findings cannot be extrapolated directly to Jitongzhi or to myofascial pain syndrome [4].

A prospectively registered randomised trial is therefore required to evaluate the clinical efficacy and safety of Jitongzhi independently of any unproven mechanistic assumption. Clinical conclusions will be based primarily on patient-reported pain and disability, rescue medication use and harms. Inflammatory, imaging and thermographic outcomes are exploratory biological correlates; they are included to generate hypotheses and are not intended to establish mediation, causality or treatment efficacy. This protocol follows SPIRIT 2025 guidance [9-11].

Explanation for the choice of comparators {9b}

The matched placebo is intended to estimate the treatment-specific effect of Jitongzhi beyond contextual effects, natural symptom variation and regression to the mean. The active comparator provides a pragmatic benchmark against a topical product used in routine care; the Jitongzhi-versus-active-comparator contrast is secondary and exploratory.

Objectives {10}

- **Primary objective:** to determine whether 4 weeks of topical Jitongzhi reduces average low back pain intensity more than matched placebo.
- **Secondary objectives:** to compare groups for disability, maintenance of pain relief, rescue medication, adherence and harms and to estimate the Jitongzhi-versus-active-comparator difference.
- **Exploratory objectives:** to describe changes in inflammatory markers, MRI measures and infrared thermography and to examine their associations with clinical response. These analyses are

hypothesis-generating and are not designed to establish mediation or a causal biological mechanism.

Methods: patient and public involvement and trial design

Patient and public involvement {11}

Patients and the public were not involved in the design, conduct, reporting or dissemination planning of this trial. The visit schedule was aligned with routine outpatient care to reduce participant burden. Participants may request a plain-language summary after publication. No patient or public co-author is included because there was no formal patient or public involvement.

Trial design {12}

This is a single-centre, three-arm, parallel-group, randomised, double-blind, placebo- and active-controlled superiority trial with 1:1:1 allocation. Treatment lasts 4 weeks and follow-up continues to week 12. The prespecified primary superiority comparison is Jitongzhi versus placebo. The active-comparator contrast is secondary, and analyses of inflammatory, MRI and thermographic measures are exploratory biological-correlate analyses for which no causal mechanistic inference is planned.

Methods: participants, interventions and outcomes

Trial setting {13}

Participants will be recruited from outpatient services at Suzhou Hospital of Traditional Chinese Medicine, Suzhou, China. Screening, consent, randomisation, dispensing, outcome assessment, laboratory testing, MRI, thermography and safety follow-up will be conducted at the same centre under protocol-specific standard operating procedures.

Participant characteristics and equity, diversity and inclusion

Characteristic	Planned inclusion and reporting
Age	Adults aged 18-65 years; age will be summarised by group.
Sex	Participants of any sex are eligible; sex assigned at birth will be recorded and reported by group.
Gender	Self-described gender will be recorded when participants choose to disclose it.
Race, ethnicity and ancestry	Ethnicity will be self-reported using locally appropriate categories and summarised descriptively.
Socioeconomic position	Education, employment and health-insurance category will be collected where feasible; none is an eligibility criterion.
Geographical setting	Participants will be recruited from Suzhou and surrounding areas in Jiangsu Province, China.
Language and accessibility	Participants must be able to understand the consent materials in Chinese, with assistance permitted for reading difficulties where ethically appropriate.
Clinical characteristics	Symptom duration, baseline pain, active trigger-point location and prior treatments will be recorded.

Eligibility criteria for participants {14a}

Inclusion criteria

1. Age 18-65 years.
2. Clinical diagnosis of low back myofascial pain syndrome, including a palpable taut band, a hypersensitive spot within the taut band and reproduction of the participant's familiar pain on compression, with no more plausible dominant cause of symptoms [1-3].
3. No glucocorticoid injection, trigger-point procedure or prolonged systemic analgesic/anti-inflammatory treatment likely to materially affect outcome assessment during the preceding 2 weeks.
4. Capacity and willingness to provide written informed consent and comply with study procedures.

Exclusion criteria

5. Spinal or extraspinal pathology judged to be the dominant cause of pain, including tumour, infection, fracture, inflammatory spinal disease, severe spinal stenosis, major deformity, or clinically relevant urogenital disease.
6. Serious uncontrolled cardiovascular, hepatic, renal, malignant or other systemic disease.
7. Pregnancy, planned pregnancy during follow-up, or breastfeeding.
8. Previous lumbar surgery or intraspinal injection.

9. Expected need for surgery or another prohibited major intervention during the trial.
10. Damaged, infected or actively inflamed skin at the application site; known hypersensitivity to any study-product component or topical analgesic.
11. Psychiatric, cognitive, communication or other condition that precludes valid consent or reliable outcome assessment.
12. Concurrent participation in another interventional clinical study.

Eligibility criteria for sites and intervention providers {14b}

The site must have trained musculoskeletal clinicians, a pharmacy capable of concealed allocation and coded dispensing, laboratory and MRI facilities, and secure data-management systems. Intervention dispensing will be undertaken by pharmacy staff trained in the protocol and Good Clinical Practice. Outcome assessors, radiology readers and thermography operators will complete standardisation training before recruitment.

Informed consent {32a}

A trained physician or research coordinator delegated by the principal investigator will obtain written informed consent before any trial-specific procedure. Potential participants will receive written and verbal information about the purpose, procedures, foreseeable risks, potential benefits, alternatives, confidentiality, compensation and voluntary nature of participation and will have adequate time to ask questions.

Additional consent for data and biological specimens {32b}

Blood will be collected only for the prespecified inflammatory-marker analyses and will not be stored for unspecified future research. Any ancillary study using additional samples or identifiable data will require separate ethics approval and consent.

Interventions and comparators {15a}

The intervention details that must match the pharmacy manual, ethics approval and registry are summarised in Table 3. All products will be dispensed in coded, indistinguishable external containers by pharmacy personnel who have no role in enrolment or outcome assessment.

Arm	Product and composition	Dose and administration	Manufacture, quality and storage
Jitongzhi	Fangji, Weilingxian, Danggui, Chuanxiong, Mugua, Xiaohuixiang, Ruxiang, Shenjincao, Sumu, Bingpian, menthol and a yellow-petrolatum topical base. The product will be manufactured according to the hospital pharmacy's approved institutional preparation and quality-control standard; quantitative batch records will be retained in the trial master file.	Apply a thin, uniform layer sufficient to cover the principal painful lumbar area once daily for 4 weeks; massage gently in a circular motion for 5-10 minutes. Twice-daily use is not permitted in the trial regimen.	Prepared and dispensed by the pharmacy of Suzhou Hospital of Traditional Chinese Medicine. Each batch will undergo identity/chemical fingerprint assessment, appearance and uniformity checks, microbial-limit testing and relevant safety testing. Batch numbers, release certificates, labelled storage conditions and expiry dates will be documented in the accountability log.
Matched placebo	Yellow-petrolatum base without active herbal ingredients, with permitted colour- and odour-matching materials used only as required to approximate the experimental product. The complete placebo batch record will be retained by the hospital pharmacy.	Same quantity, application area, frequency and duration as Jitongzhi.	Prepared and quality controlled by the pharmacy of Suzhou Hospital of Traditional Chinese Medicine under the same packaging, storage and accountability procedures as Jitongzhi.
Active comparator	Compound Nanxing Zhitong plaster, a commercially available topical proprietary Chinese medicine obtained and documented by the hospital pharmacy. The manufacturer, batch number and regulatory approval number will be recorded in the trial drug-accountability file.	Apply one plaster to the principal painful lumbar area once daily for 4 weeks, according to the approved product instructions and the standardised study application schedule.	The product will be over-labelled, coded and dispensed in identical outer packaging by pharmacy personnel independent of recruitment and outcome assessment. Complete matching of odour and local sensory effects cannot be guaranteed; masking credibility will therefore be assessed at week 4 and reported.

All groups will receive the same standardised education on activity, posture and symptom monitoring. During an acute flare, participants may use local ice for 15 minutes twice daily for up to 72 hours. Thereafter, participants will be advised to perform approximately 10 minutes of Baduanjin or equivalent low-intensity mobility exercise daily. Exercise participation will be recorded in the study diary.

Criteria for discontinuing or modifying allocated intervention {15b}

The allocated product may be discontinued for an intolerable local reaction, a clinically important adverse event, pregnancy, a protocol deviation that affects safety, or a medical need for prohibited co-intervention. Participants may withdraw consent at any time without affecting usual care. Discontinuation of treatment will not automatically constitute withdrawal from outcome follow-up.

Strategies to improve and assess adherence {15c}

Participants will receive written and demonstrated application instructions, a daily diary, reminder messages or calls, and scheduled review of returned containers. Adherence will be calculated as completed applications divided by prescribed applications. The per-protocol adherence threshold will be completion of at least 80% of prescribed applications.

Concomitant care {15d}

Oral acetaminophen may be used as short-term rescue medication in accordance with the approved product information and the treating physician’s instructions; the dose, frequency and duration will be recorded in participant diaries. New systemic anti-inflammatory treatment, glucocorticoid injection, trigger-point procedure, acupuncture, massage, shock-wave therapy or other treatment likely to affect the primary outcome is prohibited during the 4-week treatment period unless medically necessary. Any prohibited or medically necessary co-intervention will be documented and considered in sensitivity analyses.

Outcomes {16}

The outcome variable, analysis metric and assessment time point are prespecified in Table 4. Patient-reported pain and disability outcomes are the principal efficacy outcomes. Laboratory, MRI and thermographic measures are exploratory biological correlates and will not be used to determine efficacy or establish a causal mechanism.

Outcome	Variable/instrument	Metric	Time point(s)	Analysis status
Pain intensity	100-mm VAS for average low back pain over the previous 24 hours	Change from baseline; lower scores indicate improvement	Week 4 (primary); weeks 2 and 12	Primary at week 4
Disability	Oswestry Disability Index, 0-100%	Change from baseline; lower scores indicate improvement	Weeks 2, 4 and 12	Key secondary
Clinical response	VAS and ODI	Proportion with at least a 30% reduction in VAS pain and proportion with at least a 20% reduction in ODI from baseline; additional thresholds will be explored descriptively.	Weeks 4 and 12	Secondary/exploratory
Rescue medication	Acetaminophen diary	Total dose and number of days used	Weeks 0-4 and 4-12	Secondary
Inflammatory markers	CRP, ESR and IL-6	Change from baseline	Weeks 2 and 4	Exploratory biological correlate
MRI	Fascial oedema signal and thickness on fat-suppressed T2-weighted/STIR and T1-weighted lumbar MRI. Superficial fascia at the lumbosacral junction and deep fascia around the erector-spinae/multifidus compartment will be assessed using a fixed reading template by blinded readers; duplicate readings will be used for reliability assessment.	Change from baseline	Week 4	Exploratory biological correlate
Infrared thermography	Affected-to-mirror-side skin-temperature difference measured using a calibrated infrared thermography	Change from baseline	Week 4	Exploratory biological correlate

Outcome	Variable/instrument	Metric	Time point(s)	Analysis status
	device after at least 15 minutes of acclimatisation in a room maintained at 22-24°C, with standardised positioning, imaging distance and lumbar regions of interest.			
Adherence	Diary and returned-container accountability	Percentage of prescribed applications completed	Weeks 2 and 4	Process outcome
Blinding credibility	Participant and assessor treatment-guess questionnaire	Distribution of guesses and Bang blinding index, if estimable	Week 4	Process outcome
Harms	Adverse events and serious adverse events	Counts, proportions, severity and relatedness	Continuous to week 12	Safety

Harms {17}

Adverse events will be elicited systematically at each contact using open questioning and a prespecified checklist and may also be reported spontaneously. Expected local events include erythema, pruritus, burning, contact dermatitis and allergic reaction. Events will be coded, graded for severity, assessed for relatedness and followed to resolution or stabilisation. Serious adverse events will be reported immediately to the principal investigator and promptly to the sponsor and ethics committee in accordance with applicable institutional and regulatory requirements.

Participant timeline {18}

The schedule of enrolment, intervention and assessment is shown in Figure 1. There is no run-in or washout period beyond the eligibility restriction on recent competing treatment.

*Additional study product will be dispensed at week 2 if required. CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; IL-6, interleukin-6; MRI, magnetic resonance imaging; ODI, Oswestry Disability Index; VAS, visual analogue scale.

Sample size {19}

The primary sample size calculation concerns the Jitongzhi-versus-placebo comparison for change in VAS at week 4. Assuming a clinically relevant between-group difference of 15 mm, a common standard deviation of 20 mm, two-sided α=0.05 and 80% power, 29 evaluable participants are required per group [5-8]. Allowing 20% attrition gives 37 participants per group. The target was increased to 45 per group (135 total) to maintain balanced three-arm allocation, improve precision for the secondary active-comparator contrast and allow limited covariate adjustment. No multiplicity adjustment is required for the single prespecified primary comparison; all other comparisons will be interpreted as secondary or exploratory.

Recruitment {20}

Potential participants will be identified in outpatient clinics, through internal referrals and through ethics-approved hospital advertisements. A screening log will document the number screened, eligibility, reasons for exclusion and reasons for declining participation. Recruitment will be reviewed monthly.

Methods: assignment of interventions

Sequence generation {21a, 21b}

An independent statistician not involved in enrolment, intervention delivery, outcome assessment or the primary analysis will generate the allocation sequence using computer-generated restricted randomisation with randomly varying, undisclosed block sizes and an allocation ratio of 1:1:1. No stratification is planned. Exact block sizes will be retained in a restricted randomisation document inaccessible to enrolment personnel.

Allocation concealment {22}

The sequence will be held by the independent trial pharmacy. Sequentially numbered coded treatment packs will be prepared according to the concealed sequence. Enrolling investigators will obtain the next available code only after eligibility and baseline assessment have been completed.

Implementation {23}

Clinical investigators will screen, consent and enrol participants but will not have access to the sequence. Pharmacy personnel will assign the treatment code and dispense the corresponding pack. The independent statistician who generates the sequence will not conduct the blinded primary analysis.

Blinding {24a, 24b}

Participants, treating clinicians who are not involved in product preparation, research coordinators, outcome assessors, radiology readers, data managers and statisticians will be blinded. Pharmacy personnel preparing and dispensing coded products will not be blinded and will have no outcome-assessment or analysis role. The placebo will be matched to Jitongzhi in base, appearance, texture, packaging and odour as closely as feasible. The active comparator will be over-labelled and dispensed in identical outer packaging; because complete sensory matching may not be achievable, the success of participant and assessor masking will be evaluated formally at week 4. Blinding credibility will be assessed at week 4.

Emergency unblinding {24c}

Unblinding is permitted only when knowledge of allocation is essential for immediate clinical management. The principal investigator or designated physician will request the code from the independent pharmacist. The date, reason, persons involved and consequences for further participation will be documented. Routine adverse-event management will not require unblinding unless clinically necessary.

Methods: data collection, management and analysis

Data collection and quality assurance {25a}

Baseline data will include demographics, symptom duration, trigger-point examination, prior treatment, VAS, ODI, laboratory markers, MRI and thermography. Staff will use standard operating procedures and undergo training before recruitment. Questionnaires will use validated Chinese versions where available; the simplified Chinese ODI version 2.1a validated by Liu et al. will be used [12]. MRI and thermography readers will be blinded. A random sample will undergo duplicate reading to estimate inter-rater reliability. Case-report forms and the intervention manual will be available to reviewers on request and may be archived with the final study materials.

Retention and follow-up {25b}

Appointment reminders, flexible visit scheduling and telephone contact will be used to support retention. Participants who discontinue the allocated product will be asked to continue primary-outcome and safety follow-up. Where an in-person visit is impossible, VAS, ODI, rescue medication and adverse-event data will be collected remotely when valid and permitted. Reasons for withdrawal and loss to follow-up will be recorded.

Data management {26}

Source data will be recorded on standardised forms and entered into a password-protected electronic case-report form with role-based access, range checks, logic checks, audit trails and verification of key variables. Identifiable information will be stored separately from trial data. The locked dataset will be archived for at least 5 years after publication or longer if required by institutional policy. A detailed data-management plan (version 1.0) will be maintained in the restricted trial master file and will be available to authorised monitors and reviewers on request.

Statistical methods {27a-27d}

The statistical analysis plan is provided as Additional file 2 and will be finalised before database lock. The intention-to-treat population will include all randomised participants analysed in their assigned groups. The safety population will include all participants who apply at least one dose. A per-protocol population will exclude prespecified major deviations and will be used only for sensitivity analyses.

The primary outcome will be analysed using analysis of covariance with week-4 VAS as the dependent variable, treatment group as a fixed effect and baseline VAS as a covariate. The primary contrast is Jitongzhi versus placebo and will be reported as an adjusted mean difference with a 95% confidence interval and two-sided P value. Repeated VAS and ODI observations will be analysed using mixed-effects models with treatment, time and treatment-by-time interaction and a participant-level random intercept. Biomarker and imaging outcomes will be analysed with baseline-adjusted models when distributional assumptions are reasonable or with appropriate transformations or non-parametric methods otherwise. These exploratory analyses will describe group differences and associations with clinical outcomes; they will not be interpreted as mediation or causal evidence. Adverse events will be summarised by group, and formal hypothesis testing for rare harms will be interpreted cautiously.

Mixed models use all available observations under a missing-at-random assumption. For the primary ANCOVA, multiple imputation will be used if missing week-4 outcome data are material; the imputation model will include treatment, baseline and post-baseline outcomes and variables associated with missingness. Sensitivity analyses will examine plausible departures from the missing-at-random assumption. Secondary and exploratory analyses will not be adjusted for multiplicity and will be interpreted using effect estimates and confidence intervals rather than dichotomous significance alone. Statistical analyses will use IBM SPSS Statistics, version 25.0 (IBM Corp., Armonk, NY, USA).

Methods: monitoring

Data monitoring committee {28a}

An independent data monitoring committee is not planned because the intervention is topical, follow-up is short and the anticipated risk is low. Safety oversight will be provided by the principal investigator, an institutional trial-monitoring group and the ethics committee. Members involved in safety oversight will declare relevant competing interests. An unexpected serious safety signal may prompt independent clinical review.

Interim analysis and stopping guidance {28b}

No formal interim efficacy analysis is planned. The principal investigator and sponsor may pause recruitment or intervention delivery if there is an unexpected pattern of serious or severe treatment-related harm, a product-quality concern, or a recommendation from the ethics committee. The decision and rationale will be documented and reported.

Trial monitoring and auditing {29}

Personnel independent of day-to-day enrolment and outcome assessment will conduct monitoring at least monthly. Monitoring will cover consent, eligibility, allocation concealment, product accountability, source-data consistency, adverse-event reporting, protocol deviations and data completeness. The sponsor or ethics committee may conduct additional audits.

Ethics

Research ethics approval {30}

The Ethics Committee of Suzhou Hospital of Traditional Chinese Medicine, Affiliated Hospital of Nanjing University of Chinese Medicine approved the study (approval no. 2025□□□081) on 26 December 2025. Written informed consent will be obtained before enrolment.

Protocol amendments {31}

Important amendments affecting eligibility, interventions, outcomes, analysis or participant safety will be approved by the ethics committee before implementation unless immediate action is required to remove an apparent hazard. Approved amendments will be updated in the registry and communicated to investigators, relevant departments, participants when applicable and the journal if the protocol has been published.

Confidentiality {33}

Each participant will receive a unique study identifier. Identifiers and research data will be stored separately in locked or access-restricted systems. Only authorised staff will have access to identifiable data. Publications and shared datasets will be de-identified.

Ancillary and post-trial care {34}

Participants with study-related harm will receive clinical assessment and treatment at the study hospital. Compensation will follow applicable Chinese regulations, institutional policy and ethics approval. If an independent clinical review confirms study-related harm, the project sponsor will assume the corresponding responsibility and provide medical assistance or reasonable compensation in accordance with applicable Chinese laws and institutional policy. Costs arising from treatment of unrelated comorbid conditions are not covered by the study. After follow-up, participants may receive usual clinical care according to clinical need.

Open science, oversight and dissemination

Protocol and statistical analysis plan {5}

The protocol will be publicly available through publication and the registry record. The statistical analysis plan is provided with this submission as Additional file 2 and will be version-controlled and finalised before database lock.

Data sharing {6}

De-identified participant-level data, a data dictionary and analysis code will be available from the corresponding author from 6 months after publication of the primary results for 5 years. Access will require a scientifically sound proposal, ethics and institutional approval where applicable, and a signed data-use agreement. The principal investigator and designated data manager will have access to the final trial dataset; funders will not have privileged analytic access.

Funding and competing interests {7a, 7b}

The study is supported by the 2025 Suzhou Science and Technology Program - Medical and Health Innovation (Third Batch), administered by the Suzhou Science and Technology Bureau (project no. SYWD2025296; project title: “Clinical efficacy and mechanism of Jitongzhi for low back myofascial pain syndrome”; project period: 1 October 2025 to 1 October 2028), together with institutional support from Suzhou Hospital of Traditional Chinese Medicine. The funders will not participate in allocation, outcome

assessment, analysis, interpretation, writing or publication decisions. The investigators declare no financial or non-financial competing interests.

Dissemination policy {8}

Results will be reported in the registry and disseminated through peer-reviewed publication, conference presentation and institutional reporting irrespective of direction or statistical significance. Authorship will follow ICMJE criteria. Participants may request a plain-language summary after publication.

Trial organisation {3d}

The coordinating site is Suzhou Hospital of Traditional Chinese Medicine. The trial management group comprises the principal investigators, co-investigators, coordinator, research nurses, pharmacist, data manager, imaging staff and statistician and will meet at least monthly. A separate endpoint-adjudication committee is not planned because the primary outcome is participant-reported and the exploratory imaging outcomes will be read by blinded trained readers.

Discussion

This trial addresses a clinically relevant but formulation-specific evidence gap. Its principal strengths are concealed randomisation, a matched placebo, a clinically relevant active comparator, blinded outcome assessment, a patient-centred primary endpoint and prespecified follow-up. The active-comparator arm provides context but is not a co-primary comparison.

At present, no robust formulation-specific human evidence establishes how Jitongzhi might produce any clinical effect. The trial therefore includes CRP, ESR, IL-6, MRI and thermographic measures solely as exploratory biological correlates. Their measurement properties and clinical meaning in low back myofascial pain are less established than those of pain and disability instruments. Any observed associations will be treated as hypothesis-generating rather than as evidence of mediation or causality, and efficacy conclusions will rely on patient-reported pain and disability, rescue medication use and harms. Although the official funding-project title includes the word “mechanism”, the present protocol is not powered or designed to confirm a causal biological mechanism.

Operational challenges include matching the sensory properties of topical formulations, maintaining adherence and limiting co-interventions in a fluctuating pain condition. Blinding credibility, product accountability and rescue-medication use will therefore be measured. The single-centre setting and the requirement for a traditional medicine syndrome pattern may limit generalisability. The sample is powered for Jitongzhi versus placebo, not definitive equivalence or non-inferiority against the active comparator.

Trial status

Protocol version 1.0, dated 30 December 2025. The trial was prospectively registered with the International Traditional Medicine Clinical Trial Registry (ITMCTR) on 7 January 2026 (registration number ITMCTR2026000179), before enrolment of the first participant. Recruitment had not started at the time this submission package was prepared. Recruitment is expected to begin after site initiation in August 2026, and the final participant is expected to complete the primary outcome visit by September 2028.

Abbreviations

ANCOVA, analysis of covariance; CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; GCP, Good Clinical Practice; IL-6, interleukin-6; IPD, individual participant data; ITMCTR, International Traditional Medicine Clinical Trial Registry; MRI, magnetic resonance imaging; MPS, myofascial pain syndrome; ODI, Oswestry Disability Index; SAE, serious adverse event; SAP, statistical analysis plan; VAS, visual analogue scale.

Declarations

Ethics approval and consent to participate

The Ethics Committee of Suzhou Hospital of Traditional Chinese Medicine, Affiliated Hospital of Nanjing University of Chinese Medicine approved this trial (approval no. 2025□□□081; approval date 26 December 2025). Written informed consent will be obtained from all participants before enrolment.

Consent for publication

Not applicable. The manuscript contains no identifiable individual participant information. A model participant information sheet and consent form will be made available to the journal on request.

Availability of data and materials

No participant dataset is available because recruitment and data collection have not started. The planned data-sharing arrangements are described above. The principal investigator and designated data manager will have access to the final dataset.

Competing interests

The authors declare that they have no competing interests.

Funding

This study is supported by the 2025 Suzhou Science and Technology Program - Medical and Health Innovation (Third Batch), administered by the Suzhou Science and Technology Bureau (project no. SYWD2025296), and by institutional support from Suzhou Hospital of Traditional Chinese Medicine. The award notice does not state the grant amount. The funding bodies have no role in study design, recruitment, allocation, outcome assessment, data management, analysis, interpretation, writing or publication decisions.

Authors' contributions

PY conceived the study and is a co-chief investigator. JL is a co-chief investigator and contributed to clinical oversight. KX and ZT drafted the protocol and coordinated revisions. YD, YW, ZL, WC and XL contributed to intervention standardisation, feasibility assessment and outcome selection. KX and ZT contributed equally and share first authorship. JL and PY jointly supervised the study and share corresponding authorship. All authors read and approved the final manuscript and agree to be accountable for the work.

Acknowledgements

The authors thank the pharmacy, radiology, laboratory and outpatient staff who will support trial implementation.

Authors' information

All authors are affiliated with the Department of Orthopaedics, Suzhou Hospital of Traditional Chinese Medicine, Nanjing University of Chinese Medicine, Suzhou, China.

References

1. Duarte FCK, West DWD, Linde LD, Hassan S, Kumbhare DA. Re-examining myofascial pain syndrome: toward biomarker development and mechanism-based diagnostic criteria. Curr Rheumatol Rep. 2021;23:69. doi:10.1007/s11926-021-01024-8.
2. Cao QW, Peng BG, Wang L, Huang YQ, Jia DL, Jiang H, et al. Expert consensus on the diagnosis and treatment of myofascial pain syndrome. World J Clin Cases. 2021;9:2077-89. doi:10.12998/wjcc.v9.i9.2077.

3. Lam C, Francio VT, Gustafson K, Carroll M, York A, Chadwick AL. Myofascial pain - a major player in musculoskeletal pain. Best Pract Res Clin Rheumatol. 2024;38:101944. doi:10.1016/j.berh.2024.101944.
4. Sun C, Sun K, Wang S, Wang Y, Yuan P, Li Z, et al. Effect of Baimai ointment on lumbar disc herniation: a multicentre, prospective, randomised, double-blind, placebo-controlled trial. Phytomedicine. 2024;122:155138. doi:10.1016/j.phymed.2023.155138.
5. Jagadish AJ, Ananda KH. Outcome measures in the management of low back pain-a systematized review. Musculoskelet Care. 2025;23:e70161. doi:10.1002/msc.70161.
6. Williams SA, Sharma S, Cashin AG, Jones MD, Chiarotto A, Hansford HJ, et al. Test-retest reliability and measurement error of the numerical rating scale and visual analogue scale in people with low back pain. J Pain. 2025;35:105528. doi:10.1016/j.jpain.2025.105528.
7. Koivunen K, Widbom-Kolhanen S, Pernaa K, Arokoski J, Saltychev M. Reliability and validity of the Oswestry Disability Index among patients undergoing lumbar spinal surgery. BMC Surg. 2024;24:13. doi:10.1186/s12893-023-02307-w.
8. Lee YS, Lee S, Lee YJ, Ha IH. Minimum clinically important difference for nonsurgical interventions for spinal diseases: choosing appropriate values for an integrative medical approach. Perspect Integr Med. 2023;2:86-99. doi:10.56986/pim.2023.06.003.
9. Qureshi R, Gough A, Loudon K. The SPIRIT checklist-lessons from the experience of SPIRIT protocol editors. Trials. 2022;23:359. doi:10.1186/s13063-022-06316-7.
10. Chan AW, Boutron I, Hopewell S, Moher D, Schulz KF, et al. SPIRIT 2025 statement: updated guideline for protocols of randomised trials. JAMA. 2025;334:435-43. doi:10.1001/jama.2025.4486.
11. Hróbjartsson A, Boutron I, Hopewell S, Collins GS, Moher D, et al. SPIRIT 2025 explanation and elaboration: updated guideline for protocols of randomised trials. BMJ. 2025;389:e081660. doi:10.1136/bmj-2024-081660.
12. Liu H, Tao H, Luo Z. Validation of the simplified Chinese version of the Oswestry Disability Index. Spine (Phila Pa 1976). 2009;34(11):1211-1216; discussion 1217. doi:10.1097/BRS.0b013e31819e2b34.

Figures

Study procedure	Screening / baseline	Week 2	Week 4 (end of treatment)	Week 12 (follow-up)	Unscheduled /safety
Eligibility assessment	X				
Written informed consent	X				
Demographics and clinical history	X				
Trigger-point examination	X				
Randomisation	X				
Dispense study intervention	X	X*			
VAS	X	X	X	X	
ODI	X	X	X	X	
CRP, ESR and IL-6	X	X	X		
MRI	X		X		
Infrared thermography	X		X		
Adherence assessment		X	X		
Rescue medication record		X	X	X	X
Adverse-event assessment		X	X	X	X
Blinding credibility questionnaire			X		

Figure 1

Schedule of enrolment, interventions and assessments

*Additional study product will be dispensed at week 2 if required. CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; IL-6, interleukin-6; MRI, magnetic resonance imaging; ODI, Oswestry Disability Index; VAS, visual analogue scale.